TECHNICAL ANALYSIS ASSIGNMENT

DS680 MARKETING ANALYTICS AND OPERATIONS RESEARCH

Prepared by: Sonali Gupta

SPU ID: 1056612

Introduction

The history of electric vehicles goes back to the 1800s. The interest in electric vehicles has seen its fair share of rise and fall. With the advancements in the 21st century, it now seems that EVs are here to stay. This project seeks to propose to the company XYZ (which is an oil and gas company) why it should expand the current capacity of its gas stations by installing charging points for electric vehicles. The company, named XYZ henceforth, is one of the nationwide leaders of oil producers in India and also leads in the count of petrol and diesel pumps they have across the country.

The goal is to ask for investment by justifying why the company should expand its market into Electric vehicles, starting by first expanding its current capacity of gas stations by setting up charging points at the gas stations. For ease of research and from the data we have, we will consider fast and slow charging points as simply charging points needed.

Data Process

Data Source

The data is taken from the International Energy Agency's (IEA) Global EV Outlook, an annual publication that identifies and assesses recent developments in electric mobility worldwide.

Link to the data

Data Summary

Global EV Data from 2010-2023, with some predictions for 2025-2035, this data has information about EV sales, stocks, charging points, etc. across countries and regions.

Data Cleaning

1.	There is data on multiple transportation modes(for example, buses, cars, trucks and vans). For the sake of this research, we have narrowed it to cars because almost 95% of sales of electric vehicles are contributed by cars globally. So we will focus on cars.
2.	There is an overlap in data where the numbers are provided by continents, countries and regions of the world. For example, the EU, Europe and individual countries within Europe all have separate rows. We resolved that overlap by picking segments of regions.
3.	Introduced a column to differentiate major players(China, USA, Europe and India) as specific regions to investigate and clubbed the rest of the regions(countries) of the world under the category "Remaining world" as a single group.

4.	The single group(“Remaining world”) was removed from the data analyses.
5.	There is historical data and projection of two types of projection – APS, projection -STEPS. For comparative analysis, we removed the projection data and only made use of historical data. We chose this over predictive analysis to first understand existing markets.

Data Highlights

Quick Highlights

95%

EV Cars market share within the Global EV market

32%

EV Cars market share within total Car sales in India

~700K

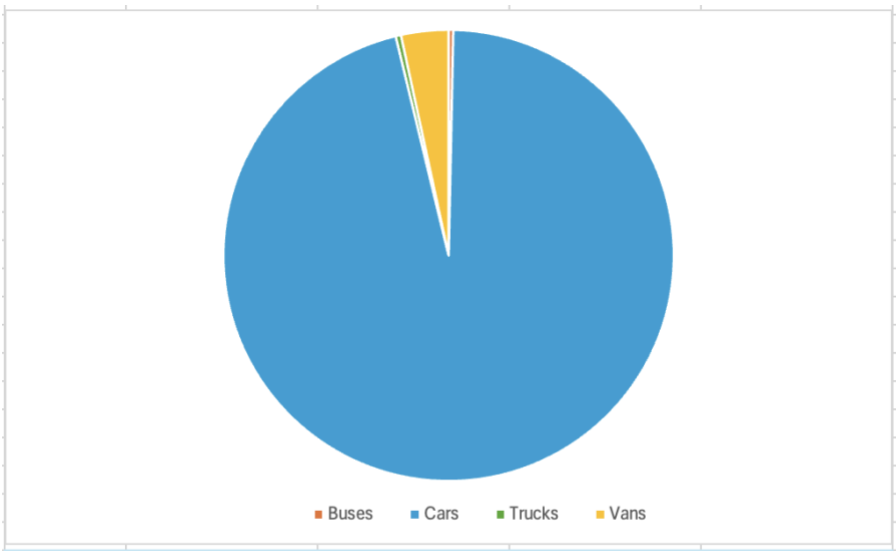
Projected EV charging points needed in India by 2030

parameter	EV sales				
category	Historical				
consider	(All)				
Sum of value	**mode**				
year	**Buses**	**Cars**	**Trucks**	**Vans**	**Grand Total**
2010	2,355.00	17,481.00	134.00	6,094.00	26,064.00
2011	1,736.00	1,16,745.00	245.00	11,882.00	1,30,608.00
2012	4,088.50	2,85,910.00	73.00	34,541.00	3,24,612.50
2013	7,968.70	5,10,334.00	96.00	35,159.00	5,53,557.70
2014	20,982.00	8,10,712.20	160.00	36,226.00	8,68,080.20
2015	1,15,178.00	14,12,771.00	34,065.00	71,891.00	16,33,905.00
2016	1,71,436.00	18,52,523.00	93,170.00	69,177.00	21,86,306.00
2017	1,79,902.00	28,27,858.00	1,42,145.00	2,01,540.00	33,51,445.00
2018	1,75,949.00	47,37,614.00	75,009.00	2,03,976.00	51,92,548.00
2019	1,51,832.00	51,80,742.00	55,648.00	1,69,630.00	55,57,852.00
2020	1,35,206.00	84,19,233.00	41,090.00	2,39,026.00	88,34,555.00
2021	1,11,209.00	1,72,27,095.00	46,859.00	4,54,317.00	1,78,39,480.00
2022	1,29,413.00	2,51,81,068.00	90,462.00	7,88,636.00	2,61,89,579.00
2023	1,12,726.00	3,31,52,899.00	1,31,404.00	11,75,438.00	3,45,72,467.00
Grand Total	**13,19,981.20**	**10,17,32,985.20**	**7,10,560.00**	**34,97,533.00**	**10,72,61,059.40**

Figure 1 Contribution of different modes in EV Sales across the globe for 2010-2023

Methodologies considered

- Time Series Analysis: Time series analysis encompasses a wider range of patterns within a data set over time, including seasonality and cyclical fluctuations. Since the dataset doesn’t have data points to do that analysis, this mythology was considered but not used.
- Predictive Analysis: Predictive analytics uses historical data to forecast future outcomes, which we want to do for EV charging stations to make better business decisions and help support our ask for investment into setting up EV charging stations. Fortunately, this dataset already has predicted numbers in it which we will directly consume.



	Buses	Cars	Trucks	Vans
EV Share	0.33%	95.89%	0.38%	3.40%

Figure 2 Market share by sale of different EV modes globally in 2023

Methodologies used

- Comparative Analysis: For this research, the comparative analysis focuses on comparing multiple datasets. We studied markets of China, Europe, India and the USA across the years 2010 to 2023 to study the numbers of EV charging stations and EV car sales. We also did a comparative study of the percentage of EV car sales out of total car sales in these regions.
- Trend analysis: Since we are studying parameters like EV sales and EV charging over the span of 13 years (2010-2023) and trying to see the long-term direction of the data without focusing on short-term fluctuations, our analysis will fall under Trend analysis. This made sense since the dataset has values per year and not finer details.

parameter	EV sales				
mode	Cars				
category	Historical				
Sum of value	**consider**				
year	**China**	**Europe**	**India**	**USA**	**Grand Total**
2010	1440	1837	450	1200	4927
2011	5120	11448	1400	17800	35768
2012	9860	28229	190	54000	92279
2013	15730	59042	410	97000	172182
2014	73000	96032	1000	118055	288087
2015	211000	189190	450	114100	514740
2016	339000	213180	730	161100	714010
2017	580000	300340	920	196300	1077560
2018	1090000	400280	920	362700	1853900
2019	1060000	580610	687	327000	1968297
2020	1140000	1400740	3143	295200	2839083
2021	3250019	2300960	12051	633100	6196130
2022	5900240	2701300	48025	992700	9642265
2023	8100520	3300820	82270	1393000	12876610
Grand Total	**21775929**	**11584008**	**152646**	**4763255**	**38275838**

Figure 3 EV Sales of cars across major players for 2010-2023

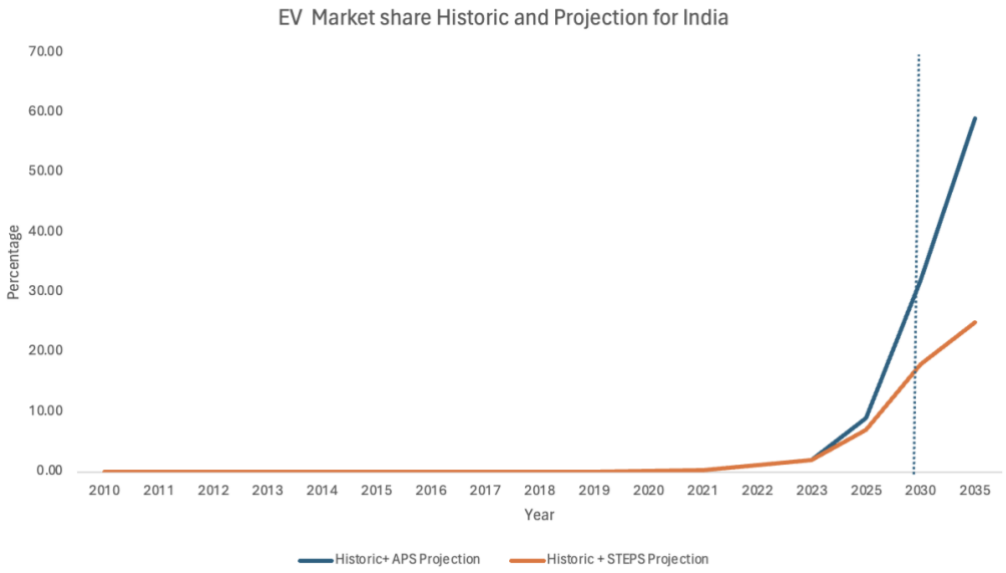


Figure 4 EV market share of Cars in India

Data Insights

1. India has been a late entrant in the electric vehicle (EV) charging infrastructure race. While efforts began in 2016, significant progress only started to take shape in 2022. In contrast, countries like China and the USA have been far ahead, having established more robust charging networks much earlier.
2. As of 2023, China has 2.7 million charging points. Likewise, The USA has 183K charging points. India currently has ~10k charging points.
3. The percentage of EV sales in India is 2% as of 2023 which is less than other countries. Infrastructure is a must for EV success.
4. The global growth in the EV market can be used to project that the market in India will grow as well. India is targeting a 30% market share of EVs by 2030. Comparing this to China, which is similar to India by population but 2.5 times the size, quick estimation would mean that India would need around 700k charging points vs a mere 10k.
5. According to the data, there are two predictions(STEPS and APS) about Indian EV Market by 2030.
    a. APS(Announced Pledges Scenario): 32% of the market share within cars will be of EV cars. This will lead to 607K EV charging points requirement to meet the need to sustain this industry.
    b. STEPS(Stated Policies Scenario): 18% EV of the market share within cars will be of EV cars. This will lead to 310K EV charging points requirement to meet the need to sustain this industry.

Proposal

- Since the percentage of traditional vehicles will decrease over time, so will the revenue generated solely by them. This proposition will help keep the existing gas stations operational and present an opportunity to expand in a new market while re-using existing resources. The company should focus on selling energy and not just oil.

- The client has 37K gas stations across the country. A gas stations can hold 1-6 charging points. Averaging this for urban and countryside gas pumps for the area available, an average of 4 points. That'll lead to 150K charging points in the country. This will be 25% of the projected required charging points.

year	2030					
category	Projection-APS					
consider	India					
Sum of value	**mode**					
parameter	**Buses**	**Cars**	**EV**	**Trucks**	**Vans**	**Grand Total**
EV charging points			6,07,000.00			6,07,000.00
EV sales	61,211.00	18,17,770.00		12,000.00	1,62,870.00	20,53,851.00
EV sales share	34.00	32.00		2.00	31.00	99.00
Grand Total	**61,245.00**	**18,17,802.00**	**6,07,000.00**	**12,002.00**	**1,62,901.00**	**26,60,950.00**
year	2030					
category	Projection-STEPS					
consider	India					
Sum of value	**mode**					
parameter	**Buses**	**Cars**	**EV**	**Trucks**	**Vans**	**Grand Total**
EV charging points			3,10,000.00			3,10,000.00
EV sales	61,270.00	10,06,500.00		10,400.00	52,900.00	11,31,070.00
EV sales share	34.00	18.00		2.00	9.00	63.00
Grand Total	**61,304.00**	**10,06,518.00**	**3,10,000.00**	**10,402.00**	**52,909.00**	**14,41,133.00**

Figure 5 Projected Numbers for EV charging points

Resources

- https://www.virta.global/global-electric-vehicle-market
- https://www.ibef.org/industry/electric-vehicle
- https://www.kazam.in/category/blog/what-is-the-profit-margin-of-ev-charging-stations-in-india
- https://bolt.earth/blog/indian-ev-charging-infrastructure-by-2030?srsltid=AfmBOoo48Zr1cs5Z8PjAL0gQ2euUTkZ49UqNvpYgyv1CZvFGKZTCrwcP