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Decoding Oil Demand: The Role of Vehicle Fleet Shifts in ICE and EV on Production Forecasting

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Abstract: ***This article delves into the detailed relationship between vehicle streams—specifically sales, fleet composition, and oil displacement—and their influence on oil production forecasting. The study zeroes in on two primary vehicle categories: Internal Combustion Engine (ICE) vehicles and Electric Vehicles (EVs). Through a comprehensive analysis of trends within these streams, the research aspires to develop a robust predictive model that oil companies can leverage to enhance the accuracy of their production forecasts. The findings underscore the evolving dynamics between ICE and EV vehicles, elucidating their profound implications for future oil demand. This study not only offers valuable insights for strategic planning within the oil and gas industry but also contributes to the broader discourse on energy transition and sustainability. By understanding these shifting paradigms, stakeholders can make more informed decisions, aligning their strategies with the anticipated trajectory of the automotive and energy sectors.***

Keywords: Vehicle sales, fleet composition, oil displacement, ICE vehicles, EV vehicles, oil production forecasting, energy demand, oil and gas industry

1. Introduction

The automotive industry is undergoing a significant transformation with the rise of Electric Vehicles (EVs) and the gradual decline in the dominance of Internal Combustion Engine (ICE) vehicles. This shift has profound implications for the oil and gas industry, particularly in terms of oil demand and production. As the global fleet composition changes, understanding the relationship between vehicle sales, fleet dynamics, and oil displacement becomes critical for accurate oil production forecasting. This study examines these areas to present a comprehensive model that can help oil companies adapt their production strategies to future demand.

2. Problem Statement

I work for an oil and gas company, and we have been assigned the task of gathering and analyzing data to compare electric vehicles (EVs) and internal combustion engine (ICE) vehicles. Our focus includes various types of vehicles such as cars, buses, trucks, and vans, and spans across three key areas: sales, fleet composition, and the extent of oil displacement that will occur as a result of the shift to EVs. Additionally, we are required to provide both actual and forecasted data, measured in millions, up to the year 2030. This analysis will also encompass an evaluation of the demand for battery metals, which are crucial for the production of EV batteries. Our goal is to deliver a comprehensive chart that not only highlights the current trends but also projects future scenarios, thereby enabling strategic planning and decision - making for our company.

The increasing adoption of EVs poses a challenge to traditional oil production forecasting models, which have historically relied on data from ICE vehicles. With EVs contributing to reduced oil demand, there is a pressing need for an updated forecasting model that incorporates the growing presence of EVs in the market. Oil companies are faced with the dilemma of either overproducing, leading to excess supply, or underproducing, resulting in potential shortages. The problem is exacerbated by the lack of integrated data on vehicle sales, fleet composition, and oil displacement categorized by ICE and EV vehicles.

3. Solution Implemented

Two primary data providers, the International Energy Agency (IEA) and Bloomberg New Energy Finance (BNEF), supply the essential data for comparing electric vehicles (EVs) and internal combustion engine (ICE) vehicles. We have loaded data from both sources and created stacked bar charts to illustrate the displacement of oil. To address this issue comprehensively, our study proposes a forecasting model that integrates vehicle sales data, fleet composition, and oil displacement metrics for both ICE and EV vehicles. This model leverages historical and real - time data to predict future trends in oil demand. By categorizing vehicles into ICE and EV, the model offers a detailed understanding of how the transition from ICE to EV impacts oil consumption. Designed to be adaptable, the model enables oil companies to adjust their production strategies in response to evolving market conditions.

Sales Stream: Analysis and Comparison

Electric Vehicles (EVs)

- Initial Values (2019): Both data sets start with similar values, 2.12 million (IEA) and 2.14 million (BNEF).
- Growth Trends: IEA shows a more aggressive growth pattern compared to BNEF. By 2030, IEA projects 41 million EVs, whereas BNEF projects 32 million EVs.
- Mid - Term (2025): By 2025, IEA projects 18 million EVs, while BNEF projects 14 million EVs.
- Long - Term (2030): The difference in projections widens significantly by 2030, with IEA being 9 million higher than BNEF.

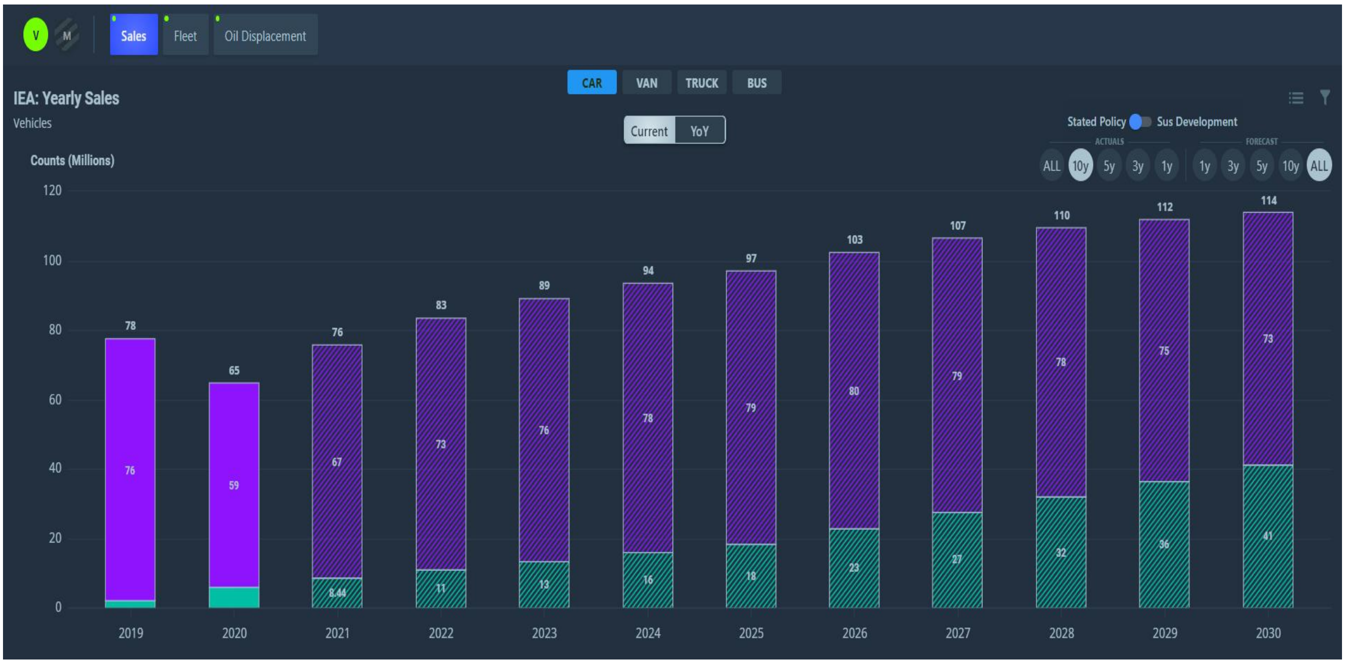
Internal Combustion Engine Vehicles (ICEs)

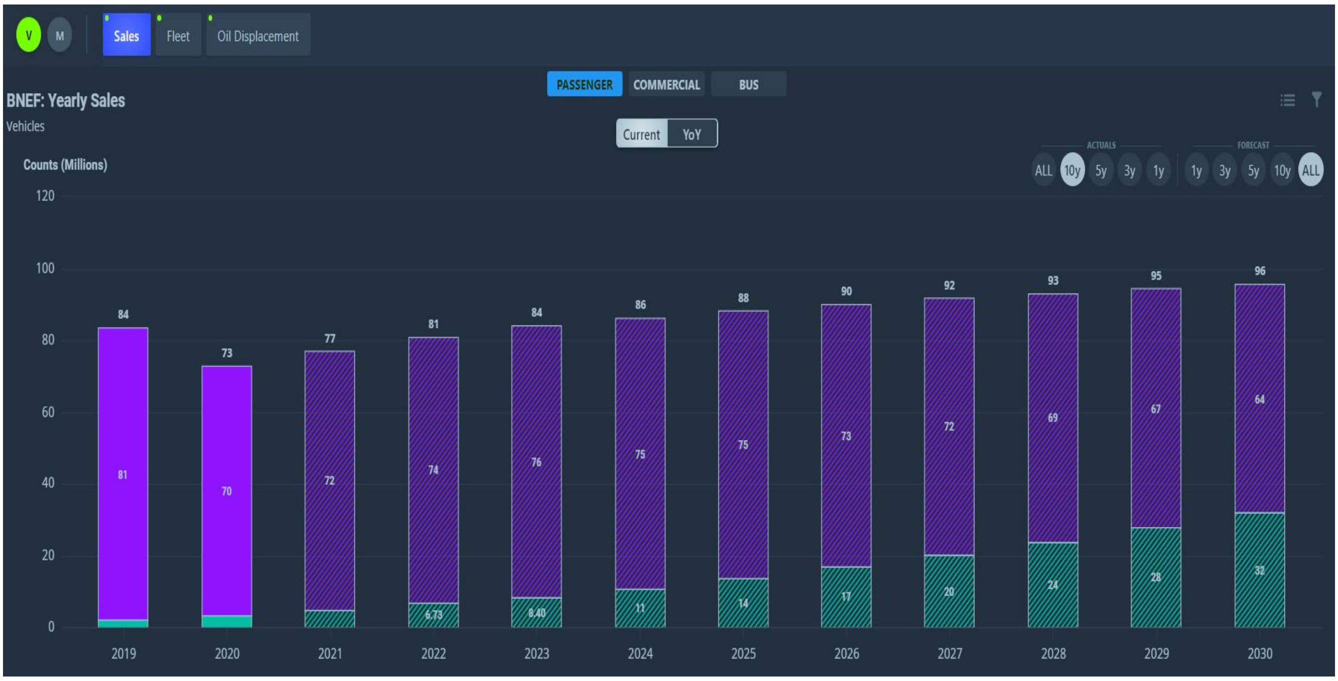
- Initial Values (2019): IEA starts at 76 million, while BNEF starts higher at 81 million.
- Decline Trends: Both data sets show a decline in ICE vehicles over time, but BNEF shows a steeper decline.

- Mid - Term (2025): By 2025, IEA projects 79 million ICE vehicles, while BNEF projects 75 million.
- Long - Term (2030): By 2030, IEA projects 73 million ICE vehicles, whereas BNEF projects a lower number at 64 million.

Summary

- EV Growth: IEA is more optimistic about the growth of EVs compared to BNEF.
- ICE Decline: BNEF predicts a more rapid decline in ICE vehicles compared to IEA.
- Market Shift: Both data sets indicate a significant shift from ICE to EVs by 2030, but the extent of this shift varies between the two data sets.





Fleet Stream: Analysis and Comparison

Electric Vehicles (EVs)

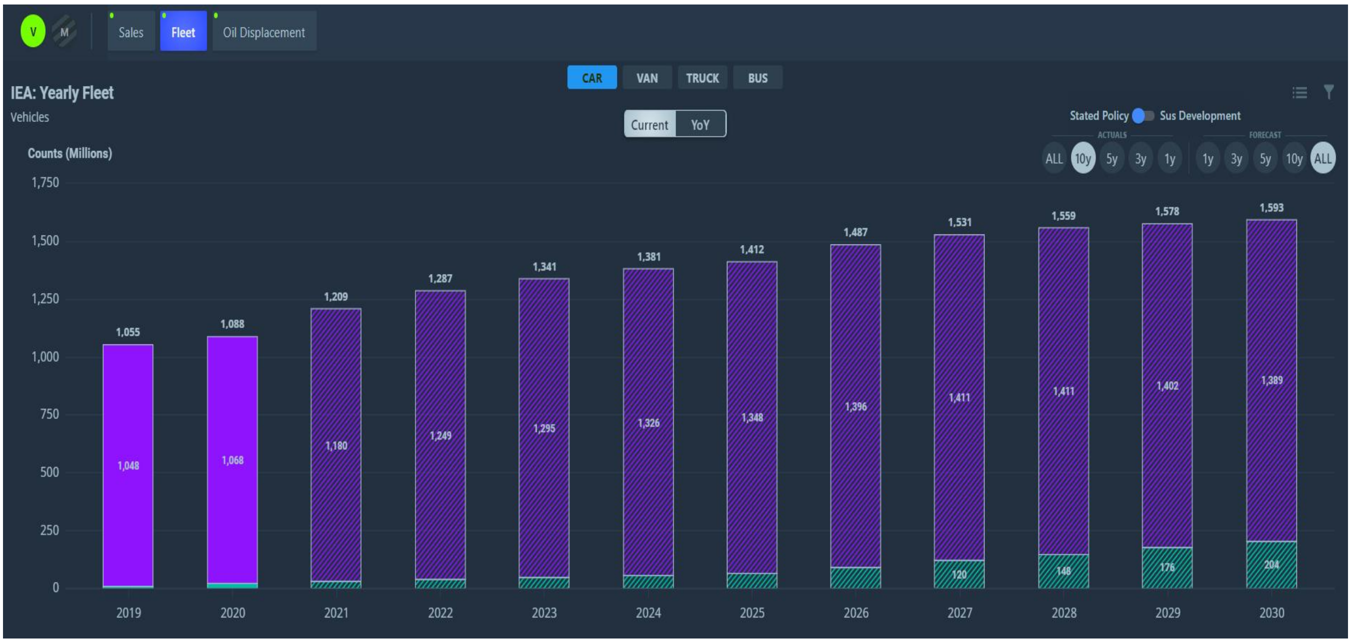
- Initial Values (2019): Both data sets start with similar values, 7.15 million (IEA) and 6.98 million (BNEF).
- Growth Trends: The IEA data set shows a more aggressive growth pattern compared to the BNEF data set. By 2030, the IEA projects 204 million EVs, whereas BNEF projects 169 million EVs.
- Mid - Term (2025): By 2025, the IEA projects 63 million EVs, while BNEF projects 54 million EVs.
- Long - Term (2030): The difference in projections widens significantly by 2030, with the IEA being 35 million higher than BNEF.

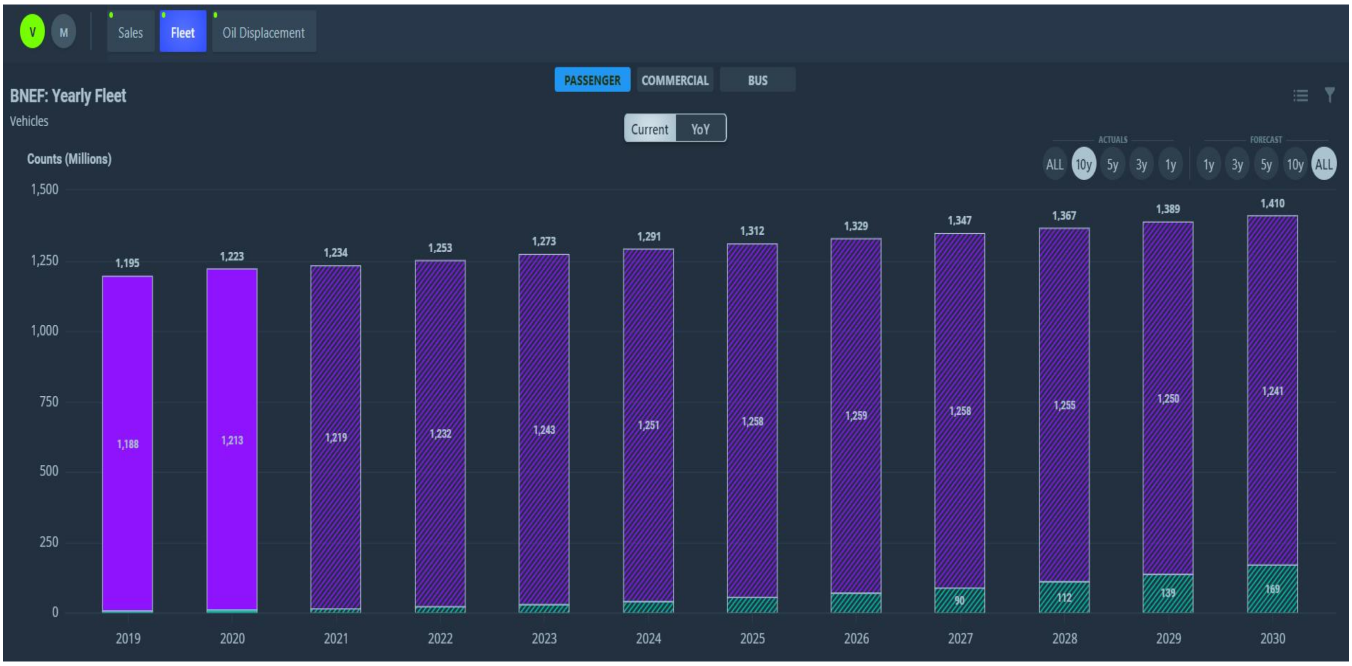
Internal Combustion Engine Vehicles (ICEs)

- Initial Values (2019): The IEA data set starts at 1, 048 million, while the BNEF data set starts higher at 1, 188 million.
- Trends Over Time: Both data sets show a general increase in ICE vehicles initially, but the IEA data set shows a higher peak and a subsequent decline, whereas the BNEF data set shows a more stable trend with a slight decline towards 2030.
- Mid - Term (2025): By 2025, the IEA projects 1, 348 million ICE vehicles, while BNEF projects 1, 258 million.
- Long - Term (2030): By 2030, the IEA projects 1, 389 million ICE vehicles, whereas BNEF projects a lower number at 1, 241 million.

Summary

- EV Growth: The IEA data set is more optimistic about the growth of EVs compared to the BNEF data set.
- ICE Trends: The IEA data set predicts a higher peak and a subsequent decline in ICE vehicles, while the BNEF data set shows a more stable trend with a slight decline.
- Market Shift: Both data sets indicate a significant shift from ICE to EVs by 2030, but the extent of this shift varies between the two data sets.





Oil Displacement: Analysis and Comparison

Growth Trends

- IEA: The IEA data set shows a steady increase in oil displacement, reaching 1, 882 MBO/D by 2030.
- BNEF: The BNEF data set shows a more aggressive growth pattern, reaching 2, 619 MBO/D by 2030.

Mid - Term (2025)

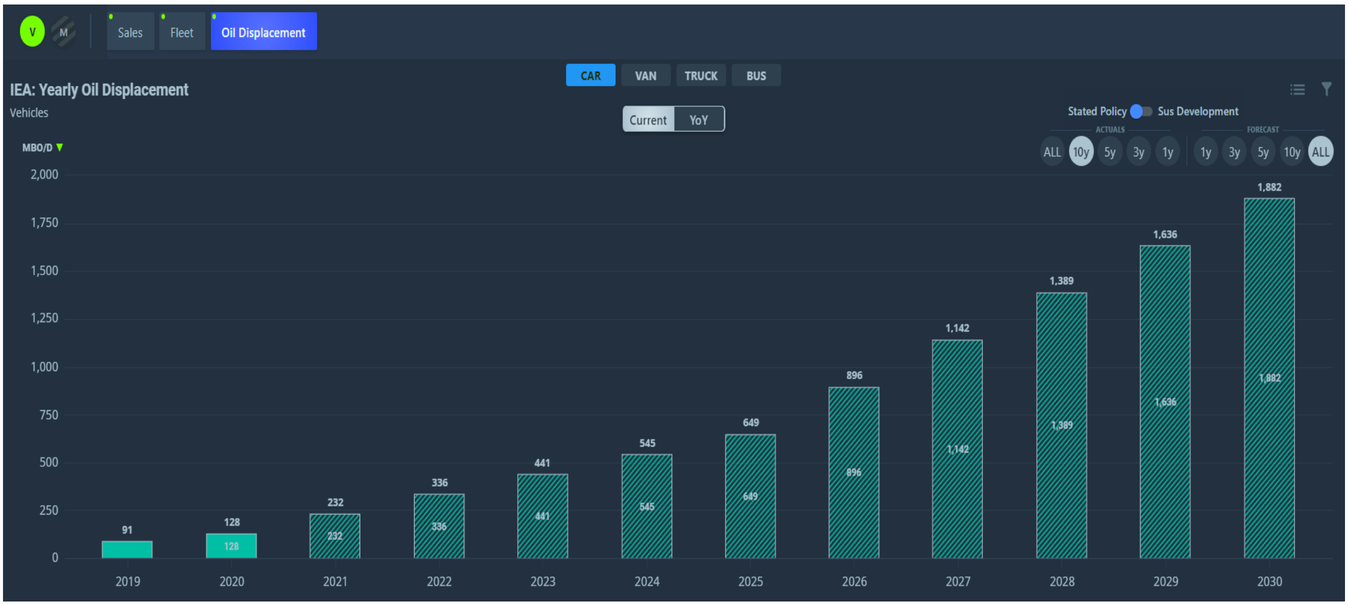
- IEA: By 2025, the IEA projects an oil displacement of 649 MBO/D.
- BNEF: By 2025, the BNEF projects a higher oil displacement of 720 MBO/D.

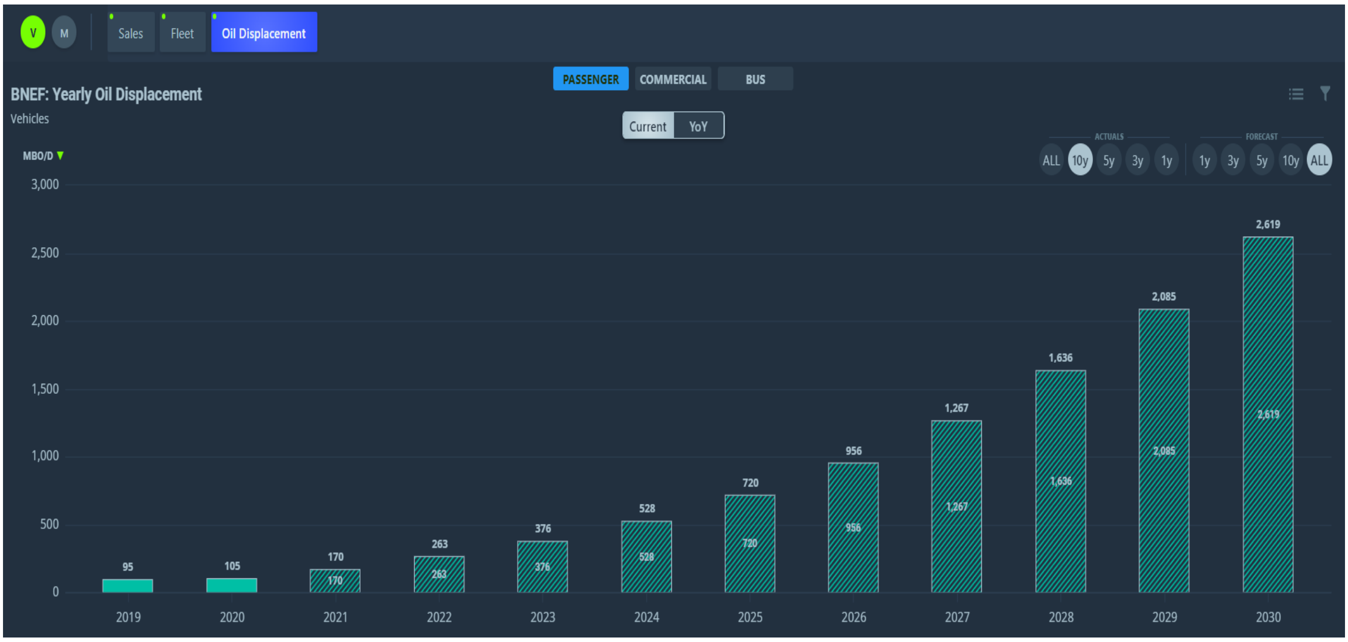
Long - Term (2030)

- IEA: By 2030, the IEA projects an oil displacement of 1, 882 MBO/D.
- BNEF: By 2030, the BNEF projects a significantly higher oil displacement of 2, 619 MBO/D.

Summary

- Initial Similarity: Both data sets start with similar initial values for oil displacement due to EVs in 2019.
- Growth Disparity: The BNEF data set shows a more aggressive growth in oil displacement compared to the IEA data set.
- Mid - Term Projections: By 2025, BNEF projects a higher oil displacement than IEA.
- Long - Term Projections: By 2030, the difference in projections widens significantly, with BNEF projecting a much higher oil displacement than IEA.





Potential Extended Use Cases:

The forecasting model offers a range of applications beyond oil production. Policymakers can leverage it to craft more effective energy policies that consider the shift to electric vehicles (EVs). Automotive manufacturers can also utilize the model to align their production and marketing strategies with anticipated trends in energy demand. Furthermore, the model can be expanded to incorporate additional variables such as economic factors, technological advancements in EVs, and shifts in consumer behavior. This comprehensive approach provides a holistic view of the automotive market and its influence on energy demand.

4. Impact

This section explores the economic, environmental, and social impacts of implementing advanced forecasting models. Key highlights include cost savings achieved through optimized energy distribution and reduced crude oil wastage. Additionally, the environmental benefits are significant, as these models help minimize unnecessary fuel production. The discussion also addresses policy implications, advocating for infrastructure improvements and the adoption of sustainable energy practices.

5. Scope

The scope of this study encompasses the analysis of vehicle sales, fleet composition, and oil displacement for both internal combustion engine (ICE) and electric vehicles (EVs) across major automotive markets. The research examines data from the past decade and includes projections for the next 20 years. Although the primary emphasis is on the oil and gas industry, the study also delves into the broader implications for the automotive and energy sectors. The model is designed to be scalable, enabling future updates as new data becomes available.

6. Conclusion

This study underscores the pivotal role of vehicle streams—sales, fleet composition, and oil displacement—in forecasting oil production. The proposed model presents a robust framework for oil companies to address the challenges arising from the transition from internal combustion engine (ICE) vehicles to electric vehicles (EVs). By integrating data from both vehicle categories, the model offers a more precise and reliable method for predicting future oil demand. The findings highlight the necessity for the oil and gas industry to adapt to the evolving automotive landscape and adopt new forecasting methodologies to ensure long - term sustainability.

References

[1] Global EV Outlook 2021: Accelerating ambitions despite the pandemic, Available at https: //www.iea. org/reports/global - ev - outlook - 2021
[2] Electric Vehicles and Their Impact on Oil Demand: Why Forecasts Differ, Available at https: //energypolicy. columbia. edu/research/report/electric - vehicles - and - their - impact - oil - demand - why - forecasts - differ
[3] Annual Energy Outlook 2022 with projections to 2050, Available at https: //www.eia. gov/outlooks/aeo/
[4] EVs are shoving aside real volumes of oil, Available at https: //www.axios. com/2022/05/18/evs - are - shoving - aside - real - volumes - of - oil