Tech Saksham

Case Study Report

Data Analytics with Power BI

“ Analysis of commercial electricity consumption in Indian states”

“A.P.C.Mahalaxmi college for women”

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ABSTRACT

This study delves into the intricate dynamics of commercial electricity consumption across various Indian states. Leveraging comprehensive data sets spanning multiple years, our analysis focuses on identifying discernible trends, underlying patterns, and key drivers that significantly influence commercial electricity usage. We meticulously examine factors such as economic growth, industrialization, regional policies, and infrastructural development to unravel their impact on commercial electricity demand. Additionally, our research explores the pivotal role of renewable energy integration and efficiency measures in shaping consumption patterns. Employing statistical modeling and advanced data visualization techniques, we aim to provide valuable insights for policymakers, energy stakeholders, and businesses. These insights will facilitate optimized energy planning, informed investment decisions, and sustainable strategies tailored to the unique characteristics and needs of different states in India.

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CHAPTER 1

INTRODUCTION

1.1 Problem Statement

The commercial sector occupies a pivotal position in India's electricity consumption landscape. However, despite its significance, there exists a notable gap in comprehensive analysis regarding variations in electricity consumption patterns across different states. Our research seeks to address this gap by thoroughly understanding and analyzing the multifaceted factors influencing commercial electricity consumption. Specifically, we investigate the impact of economic growth, industrialization, regional policies, infrastructural development, renewable energy integration, and efficiency measures on commercial electricity demand. By bridging this knowledge gap, our study aims to empower policymakers, energy stakeholders, and businesses with actionable insights for effective energy planning, strategic investment choices, and sustainable practices tailored to each state's specific context.

1.2 Proposed Solution

Our proposed solution involves conducting an exhaustive and meticulous analysis of commercial electricity consumption patterns across Indian states. By leveraging robust data and employing rigorous methodologies, we intend to provide a comprehensive understanding of the dynamics at play. Armed with these insights, stakeholders can make informed decisions, optimize resource allocation, and contribute to a more sustainable and resilient energy landscape.

1.3 Feature

- **Sectoral Breakdown**: Divide consumption into sectors (Retail, Hospitality, offices) to understand contributions from each other.
- **Time -Series Analysis**: Study consumption patterns over time (monthly, quarterly, anually)
- **Tariff Analysis**: Evaluate commercial electricity tariffs in each state.
- **Predictive Analy**: Create load profiles for different commercial segments.

1.4 Advantages

- **Demand Forecasting**: Predicts future demand for capacity planning and load management.
- **Sector -Specific Strategies**: Tailors strategies for different commercial sectors.
- **Climate Goals**: Contributions to achieving national and global climate goals.

1.5 Scope

The scope for analyzing commercial electricity consumption in Indian states includes temporal, spatial, sectoral, economic, policy, technological, environmental, and infrastructure analyses to understand trends, disparities, economic implications, policy effectiveness, technological adoption, environmental impact, and infrastructure efficiency.

CHAPTER 2

SERVICES AND TOOLS REQUIRED

2.1 Services Used

- **Data Analysis software**: Platforms like python with libraries such as pandas, Numpy provides robust capabilities for data manipulation ,visualization and statistical analysis.

- **Consulting services**: Energy consulting firms specialized in data analysis and energy management can provide expert guidance and support for analysing electricity consumption data and deriving actionable insights.

- **Machine Learning Services**: Machine learning frameworks like tensorflow enable the development of predictive model to forecast future electricity consumption trends based on historical data.

2.2 Tools and Software used

Tools:

- **PowerBI**: The main tool for this project is PowerBI, which will be used to create interactive dashboards for real-time data visualization.

- **Power Query**: This is a data connection technology that enables you to discover, connect, combine, and refine data across a wide variety of sources.

Software Requirements:

- **PowerBI Desktop**: This is a Windows application that you can use to create reports and publish them to PowerBI.

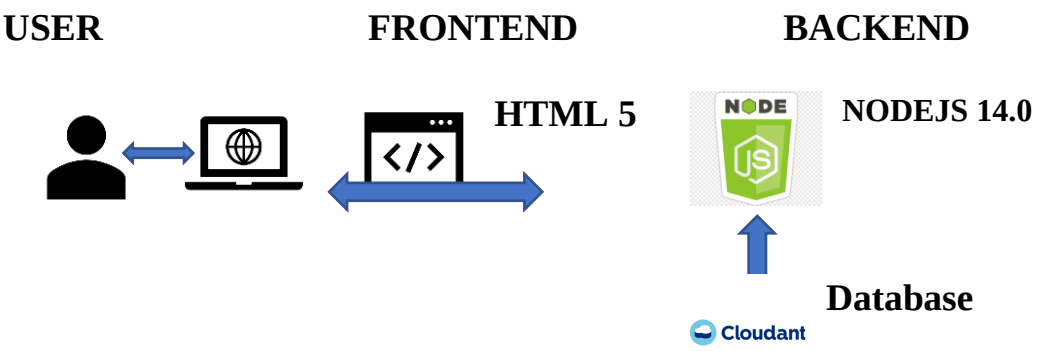
- **PowerBI Service**: This is an online SaaS (Software as a Service) service that you use to publish reports, create new dashboards, and share insights.

- **PowerBI Mobile**: This is a mobile application that you can use to access your reports and dashboards on the go.

CHAPTER 3

PROJECT ARCHITECTURE

3.1 Architecture



Here's a high-level architecture for the project:

1.Data Collection: Data should include electricity consumption data for commercial establishments, demographic information, economic indicators, and any other relevant factors.

2.Data Storage: Store the processed data in a centralized data warehouse or data lake for easy access and analysis.

3.Data Processing: Cleanse and preprocess the collected data to handle missing values, outliers, and inconsistencies.

4.Machine Learning: Apply statistical methods, machine learning algorithms, and

time series analysis to uncover insights and correlations.

5.Data Visualization: The processed data and the results from the predictive models are visualized in real-time using PowerBI. PowerBI allows you to create interactive dashboards that can provide valuable insights into the data.

6.Data Access: The dashboards created in PowerBI can be accessed through PowerBI Desktop, PowerBI Service (online), and PowerBI Mobile.

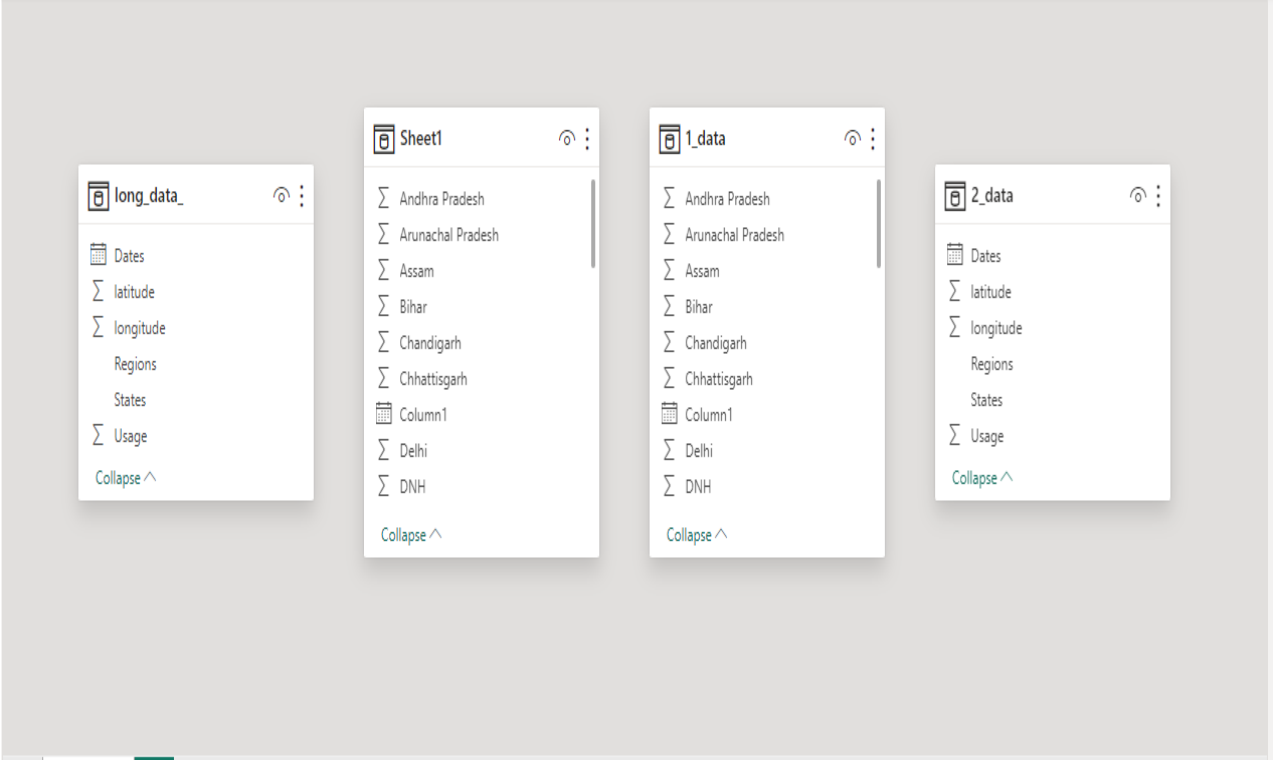
This architecture provides a comprehensive solution for real-time analysis of electricity consumption. By following this architecture, you can effectively analyze commercial electricity consumption in Indian states and derive actionable insights for decision-making and policy formulation.

CHAPTER 4

MODELING AND RESULT

Manage relationship

The dataset is used to understand the variations in electricity rates across different states. To manage the relationship for analysis, consider focusing on specific states or regions.



1_data

Column1	Punjab	Haryana	Rajasthan	Delhi	UP	Uttarakhand	HP	J&K	Chandigarh
03-01-2019 00:00:00	121.9	133.5	240.2	85.5	311.8	39.3	30.1	54.1	4
04-01-2019 00:00:00	118.8	128.2	239.8	83.5	320.7	38.1	30.1	53.2	4
05-01-2019 00:00:00	121	127.5	239.1	79.2	299	39.2	30.2	51.5	4

2_data

States	Regions	latitude	longitude	Dates	Usage
UP	NR	27.59998069	78.05000565	02-01-2019 00:00:00	313.9
UP	NR	27.59998069	78.05000565	03-01-2019 00:00:00	311.8
UP	NR	27.59998069	78.05000565	04-01-2019 00:00:00	320.7

Establish Relationships

Define the relationship between different entities in the data, such as states, years and electricity consumption metrics. This may involve creating primary and foreign keys to link tables together.

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1_data

Preview downloaded on Monday

Column1	Punjab	Haryana	Rajasthan	Delhi	UP
02-01-2019 00:00:00	119.9	130.3	234.1	85.8	313.9
03-01-2019 00:00:00	121.9	133.5	240.2	85.5	311.8
04-01-2019 00:00:00	118.8	128.2	239.8	83.5	320.7
05-01-2019 00:00:00	121	127.5	239.1	79.2	299
06-01-2019 00:00:00	121.4	132.6	240.4	76.6	286.8
07-01-2019 00:00:00	118	132.1	241.9	71.1	294.2
08-01-2019 00:00:00	107.5	121.4	237.2	69	289.4
09-01-2019 00:00:00	132.5	148.2	197	89.2	258.6
10-01-2019 00:00:00	131.5	157	199.9	92.8	284.2
11-01-2019 00:00:00	130.3	145.3	187.7	79.5	281.4
12-01-2019 00:00:00	137.9	151.9	189.9	92.6	298.6
13-01-2019 00:00:00	135.8	141.4	186.9	89.4	310
14-01-2019 00:00:00	139.3	143.8	195.2	82.2	319.5
15-01-2019 00:00:00	141.1	142.9	185.4	77.8	326.7

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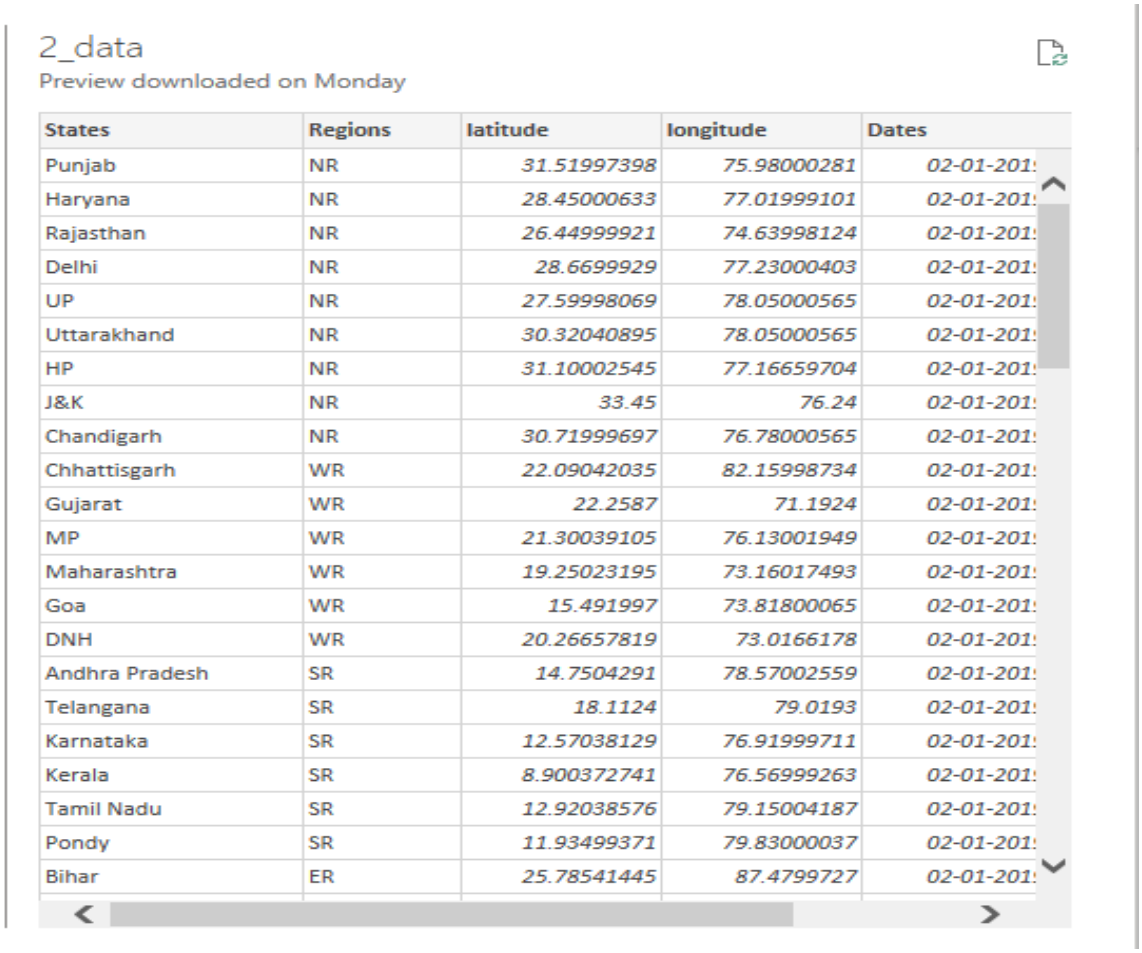


2_data

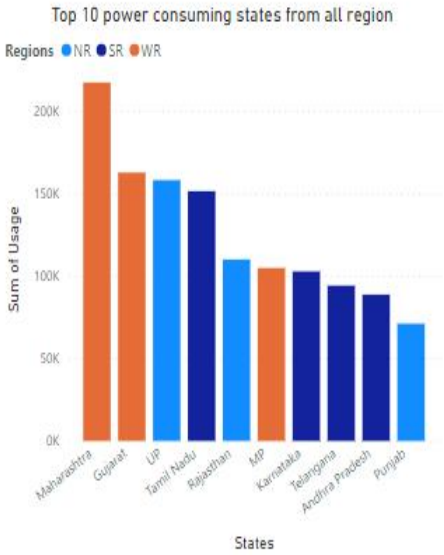
Preview downloaded on Monday

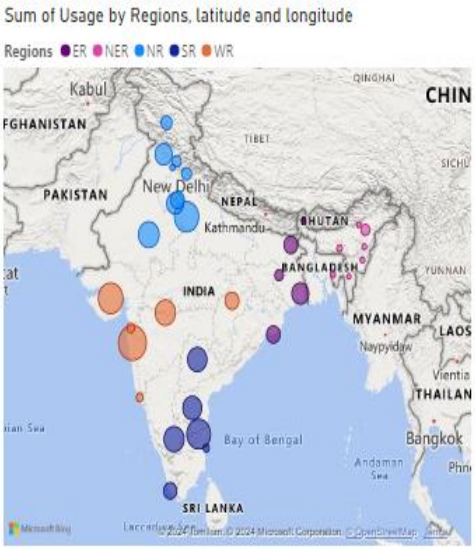
States	Regions	latitude	longitude	Dates
Punjab	NR	31.51997398	75.98000281	02-01-201
Haryana	NR	28.45000633	77.01999101	02-01-201
Rajasthan	NR	26.44999921	74.63998124	02-01-201
Delhi	NR	28.6699929	77.23000403	02-01-201
UP	NR	27.59998069	78.05000565	02-01-201
Uttarakhand	NR	30.32040895	78.05000565	02-01-201
HP	NR	31.10002545	77.16659704	02-01-201
J&K	NR	33.45	76.24	02-01-201
Chandigarh	NR	30.71999697	76.78000565	02-01-201
Chhattisgarh	WR	22.09042035	82.15998734	02-01-201
Gujarat	WR	22.2587	71.1924	02-01-201
MP	WR	21.30039105	76.13001949	02-01-201
Maharashtra	WR	19.25023195	73.16017493	02-01-201
Goa	WR	15.491997	73.81800065	02-01-201
DNH	WR	20.26657819	73.0166178	02-01-201
Andhra Pradesh	SR	14.7504291	78.57002559	02-01-201
Telangana	SR	18.1124	79.0193	02-01-201
Karnataka	SR	12.57038129	76.91999711	02-01-201
Kerala	SR	8.900372741	76.56999263	02-01-201
Tamil Nadu	SR	12.92038576	79.15004187	02-01-201
Pondy	SR	11.93499371	79.83000037	02-01-201
Bihar	ER	25.78541445	87.4799727	02-01-201

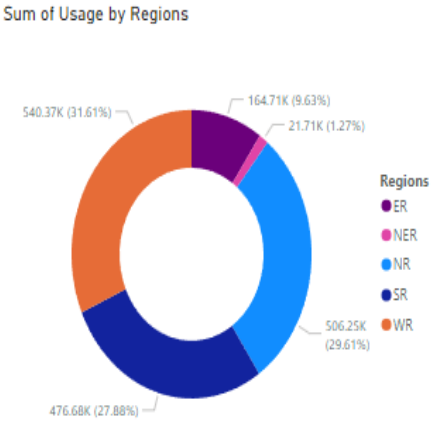
Create visualizations such as charts, graphs and maps to communicate the findings of the analysis effectively. This could help identify patterns,trends and outliers in the data.

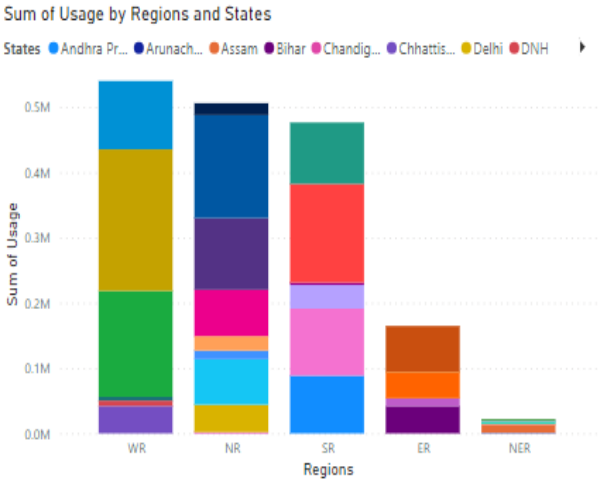
Dashboard

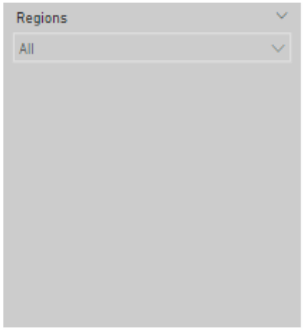
Analysis of commercial electricity consumption in Indian states

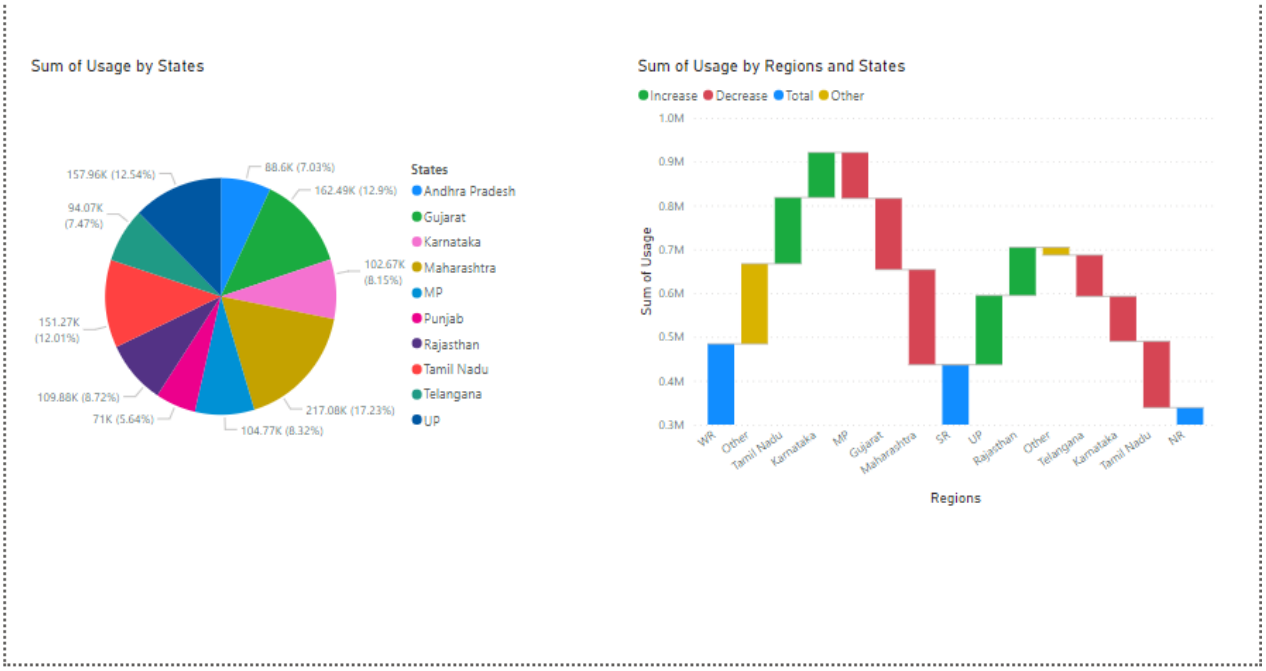


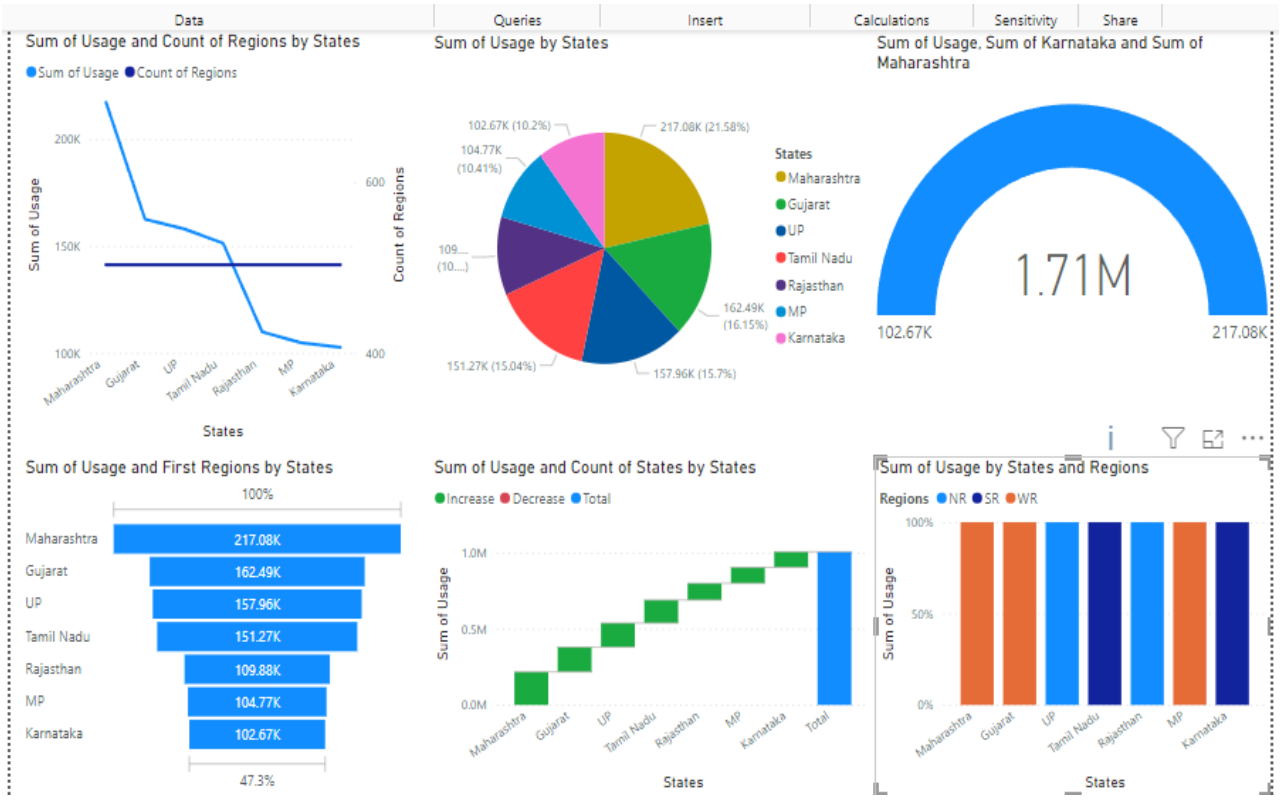












CONCLUSION

In conclusion, analyzing commercial electricity consumption in Indian states requires a collaborative approach involving stakeholders from government agencies, DISCOMs, research organizations, and commercial establishments. By fostering strong relationships, ensuring data access and quality, providing capacity building, and maintaining communication channels, meaningful insights can be derived to inform policy decisions, optimize resource allocation, and drive sustainable energy practices in the commercial sector across Indian .The project has also highlighted the importance of data visualization in making complex data more understandable and accessible. The use of PowerBI has made it possible to present data in a visually appealing and easy-to-understand format, thereby aiding in better decision-making.

FUTURE SCOPE

The future scope of this project is vast. With the advent of advanced analytics and machine learning, PowerBI can be leveraged to predict future trends based on historical data. Integrating these predictive analytics into the project could enable the bank to anticipate customer needs and proactively offer solutions. Furthermore, PowerBI's

capability to integrate with various data sources opens up the possibility of incorporating more diverse datasets for a more holistic view of customers. As data privacy and security become increasingly important, future iterations of this project should focus on implementing robust data governance strategies. This would ensure the secure handling of sensitive customer data while complying with data protection regulations. Additionally, the project could explore the integration of real-time data streams to provide even more timely and relevant insights. This could potentially transform the way banks interact with their customers, leading to improved customer satisfaction and loyalty.

REFERENCE

https://www.emerald.com/insight/content/doi/10.1108/IJESM-03-2019-0009/full/pdf

LINK

