TECH SAKSHAM

Case Study Report

Data Analytics with Power BI

Analysis of Commercial Electricity

Consumption in Indian State

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ABSTRACT

The Analysis of Commercial Electricity Consumption using Power BI in an Indian State is a project aimed at understanding and analyzing the patterns of electricity usage in commercial establishments within a specific region of India. This project utilizes Power BI, a powerful data visualization and analysis tool, to gather, analyze, and present insights from the collected data.

The project begins by gathering data from various sources, such as electricity providers, smart meters, and government agencies, to create a comprehensive dataset. This dataset is then cleansed, transformed, and integrated to ensure its accuracy and reliability. Next, the data is modeled and organized using Power BI's robust capabilities to build a structured and meaningful representation of commercial electricity consumption.

Power BI's visualizations and analytical features are then utilized to explore and analyze the data. This may include creating interactive dashboards, charts, and reports that display key metrics, trends, and patterns in electricity consumption. Geographic visualization can also be incorporated to provide a spatial understanding of consumption across different areas within the Indian state.

The analysis aims to identify factors that contribute to higher electricity consumption in commercial establishments, such as specific industries, time of day, or season. By identifying these patterns, stakeholders can make informed decisions regarding energy conservation measures, sustainability initiatives, and optimizing electricity usage for commercial purposes.

The project serves as a valuable resource for understanding and managing commercial electricity consumption within the Indian state. The insights gained through this analysis can help guide policymakers, energy providers, and commercial establishments toward more efficient and sustainable energy practices. Power BI's capabilities enable the visualization and interpretation of complex data, making it an ideal tool for this type of analysis.

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CHAPTER-1

INTRODUCTION

1.1 Problem Statement:

The commercial sector in India includes a wide range of industries, such as retail, hospitality, healthcare, and office spaces. These industries require electricity for various purposes, including lighting, heating, cooling, and operating equipment. With the growth of the Indian economy, the demand for electricity in the commercial sector has also increased. According to the Central Electricity Authority, the commercial sector accounted for approximately 8% of the total electricity consumption in India in 2019. In the context of the Indian state, commercial establishments, including large industries, shopping malls, hotels, and commercial buildings, are major consumers of electricity. The growing economic activities and increased commercial sectors have led to a significant rise in electricity demand. However, high electricity consumption poses challenges such as increased energy costs, strain on the power grid, and environmental impact due to greenhouse gas emissions.

The problem lies in identifying the key drivers of high electricity consumption in commercial establishments and understanding the patterns and trends associated with it. Additionally, there is a need to uncover opportunities for energy optimization, cost savings, and sustainability improvements in the commercial sector.

1.2 Proposed Solution:

The solution for the analysis of commercial electricity consumption in an Indian state is using Power BI. It involves the creation of a comprehensive dashboard that can provide stakeholders with a clear and detailed picture of electricity consumption patterns.

The solution can be summarized as follows:

1. Data collection:

The first step is to gather data on commercial electricity consumption from the relevant stakeholders. This data includes electricity bills, meter readings, and other relevant information.

2. Data cleaning:

Once the data is collected, it needs to be cleaned and prepared for analysis. This involves removing any duplicates, filling in missing values, and structuring the data in a format that can be analyzed using Power BI.

3. Data analysis:

Using Power BI, the data can be analyzed to identify patterns and trends in commercial electricity consumption. This analysis can include identifying peak usage times, seasonal variations, and identifying patterns that indicate energy-efficiency opportunities.

4. Creation of a dashboard:

Based on the analysis, a comprehensive dashboard can be created using Power BI. The dashboard should provide an interactive overview of commercial electricity consumption, including current usage, trends, and opportunities for optimization.

5. Identifying Trends and Patterns:

With the help of Power BI, it is possible to identify trends and patterns in commercial electricity consumption over a period of time. This can help in understanding the growth or decline of commercial electricity consumption in different sectors and regions of the state.

1.3 Feature:

The proposed features for the analysis of commercial electricity consumption in an Indian state using Power BI are as follows:

1. Customizable dashboard:

The ability to customize the dashboard according to stakeholders' needs and preferences is crucial. This can include selecting specific visualizations, adjusting data filters, and adding or removing metrics as required.

2. Real-time monitoring:

The dashboard should offer real-time monitoring of electricity consumption patterns, allowing stakeholders to quickly identify any unusual usage that may require attention.

3. Interactive visualizations:

The dashboard should include interactive visualizations, such as charts and graphs that allow stakeholders to visualize and analyze data easily. These visuals should be easy to interpret using colors, shapes, and other data points.

4. Comparison and benchmarking:

The dashboard should feature the ability to compare and benchmark commercial electricity consumption patterns across establishments, regions, and industries.

5. Data Integration:

Power BI has the ability to integrate with various data sources, making it easy to combine and analyze data from different sources. This feature can be used to analyze commercial electricity consumption along with other relevant data such as economic indicators, population demographics, and weather data, providing a more comprehensive understanding of the consumption patterns.

6. Mobile Compatibility:

Power BI reports and dashboards are accessible on mobile devices, making it convenient to analyze and track commercial electricity consumption on the go.

This feature allows for real-time monitoring and analysis, making it easier to identify any sudden changes in consumption patterns.

7. Collaboration:

Power BI also has collaboration features that allow multiple users to work on the same report or dashboard, making it easier for teams to analyze and share insights on commercial electricity consumption. This feature enables collaboration between different departments and stakeholders, facilitating better decision-making.

1.4 Advantages:

1. Improved energy efficiency:

By analyzing electricity consumption patterns, stakeholders can identify areas where energy efficiency can be improved. Such optimizations can lead to cost savings and also promote sustainability.

2. Easy identification of potential issues:

Power BI gives stakeholders a comprehensive overview of electricity consumption patterns. By using the tool, stakeholders can quickly identify any problems such as unexplained spikes in usage or patterns of wasteful energy consumption.

3. Cost savings:

By optimizing energy consumption, stakeholders can lower electricity bills and other energy-related costs. Power BI provides stakeholders with a quick and easy way of identifying opportunities to cut costs.

4. Identifying areas of improvement:

Power BI provides stakeholders with easy-to-understand visualization tools that allow them to identify areas of improvement quickly. By addressing these areas, stakeholders can reduce energy waste, lower expenses, and promote greater sustainability.

1.5 Scope:

The scope of analyzing commercial electricity consumption in an Indian state using Power BI is quite extensive. The following are some of the key areas where Power BI can be utilized to analyze electricity consumption patterns:

1. Industry:

Power BI can be used to analyze electricity consumption patterns in various industries, including manufacturing, hospitality, healthcare, retail, and others.

2. Commercial establishments:

Commercial establishments, such as corporate offices, shopping malls, hotels, hospitals, etc., can use Power BI to monitor, manage and optimize their electricity consumption patterns.

3. Regions:

Power BI can be used to analyze electricity consumption data across different regions within an Indian state, which can help stakeholders identify regional differences and opportunities to optimize energy consumption.

4. Time of day/week/month:

Power BI can be used to analyze electricity consumption patterns in specific time frames, such as on a daily, weekly, or monthly basis. This can provide stakeholders with more granular insights into energy usage patterns.

CHAPTER 2

SERVICES AND TOOLS REQUIRED

2.1 Services Used:

When it comes to analyzing commercial electricity consumption in an Indian state, various services can be used to gather and analyze the necessary data. Here are some commonly used services for this purpose:

1. Electricity Data Collection:

To collect electricity consumption data, services such as Azure Data Factory, Azure Event Hubs, or AWS Kinesis for real-time data collection, and Azure SQL Database can be employed. These systems capture and record energy usage data at regular intervals for further analysis.

2. Data Management:

To manage the collected energy consumption data, services like cloud-based databases or data management platforms can be utilized. These platforms allow for secure storage, organization, and retrieval of large amounts of data.

3. Data Analytics tools:

Services like Power BI can be used for data visualization and analytics. These tools enable the creation of interactive dashboards, reports, and visualizations to analyze and present electricity consumption trends, patterns, and anomalies.

4. Machine Learning and AI:

By leveraging machine learning and artificial intelligence algorithms, services like Azure Machine Learning can be used to gain deeper insights into energy consumption data. These services can help identify patterns, anomalies, and predict future energy consumption 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:
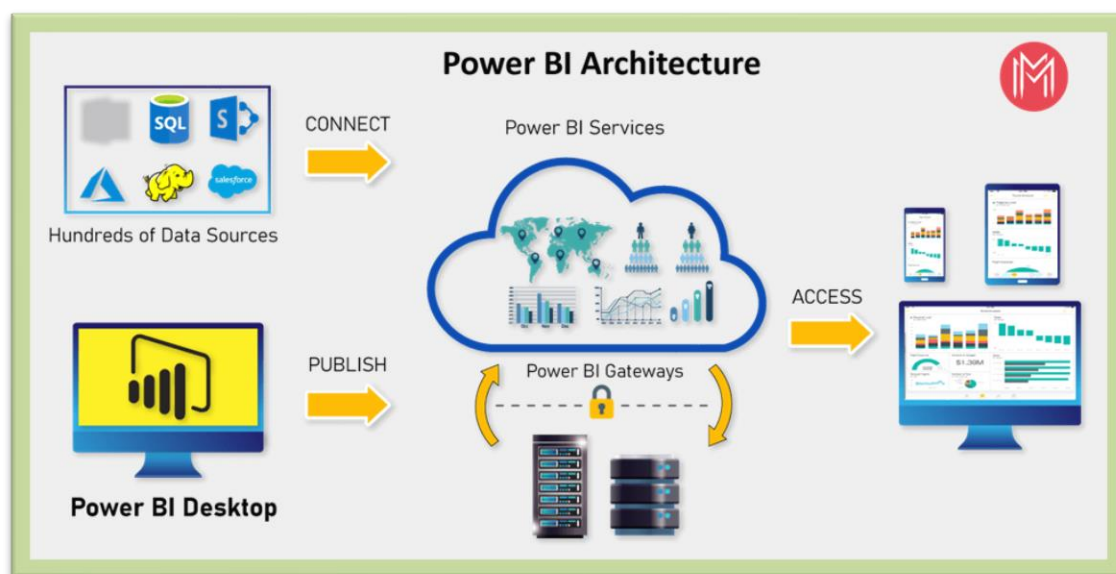
Power BI is a business intelligence and analytics tool developed by Microsoft. It is used to create interactive visualizations and reports that provide insights into an organization's data. The architecture of Power BI is designed to handle large amounts of data and provide a secure and scalable platform for data analysis.

1.Data Sources:

Data sources refer to the various databases, files, and applications that contain data that needs to be analyzed. Power BI supports a wide range of data sources including Excel, SQL Server, Azure, and many more. These data sources can be connected to Power BI through various methods such as direct query, scheduled refresh, or using a gateway.

2. Power BI Desktop

Power BI Desktop is a free application that allows users to create interactive visualizations and reports. It is a Windows-based application that can be used to

connect to various data sources, transform and clean data, and create visualizations using drag-and-drop tools.

3. Power BI Service

Power BI Service is a cloud-based platform that allows users to publish and share their Power BI reports and dashboards. It also provides additional features such as data refresh, collaboration, and administration.

4. Power BI Mobile Apps

Power BI Mobile Apps are available for iOS, Android, and Windows devices. These apps allow users to access and interact with their Power BI reports and dashboards on the go.

5. Power BI Gateway

Power BI Gateway is a data connectivity tool that allows on-premises data sources to be connected to Power BI Service. It can be used to refresh data from on-premises data sources, schedule data refreshes, and secure data transfer between Power BI Service and on-premises data sources.

6. Power BI Report Server

Power BI Report Server is an on-premises server that allows organizations to host and manage their Power BI reports and dashboards internally. It provides similar features to Power BI Service, but the data and reports are stored and managed within the organization's network.

7. Data Visualization

Data visualization refers to the process of creating interactive and other visual elements that help in understanding and analyzing data. Power BI provides a wide range of visualization options to represent data in a meaningful way. In summary, Power BI has a multi-tier architecture that includes data sources, Power BI Desktop, Power BI Service, Power BI Mobile Apps, Power BI Gateway, and Power BI Report Server. This architecture allows organizations to connect to data from various sources, create interactive visualizations, and securely share and manage their reports and dashboards.
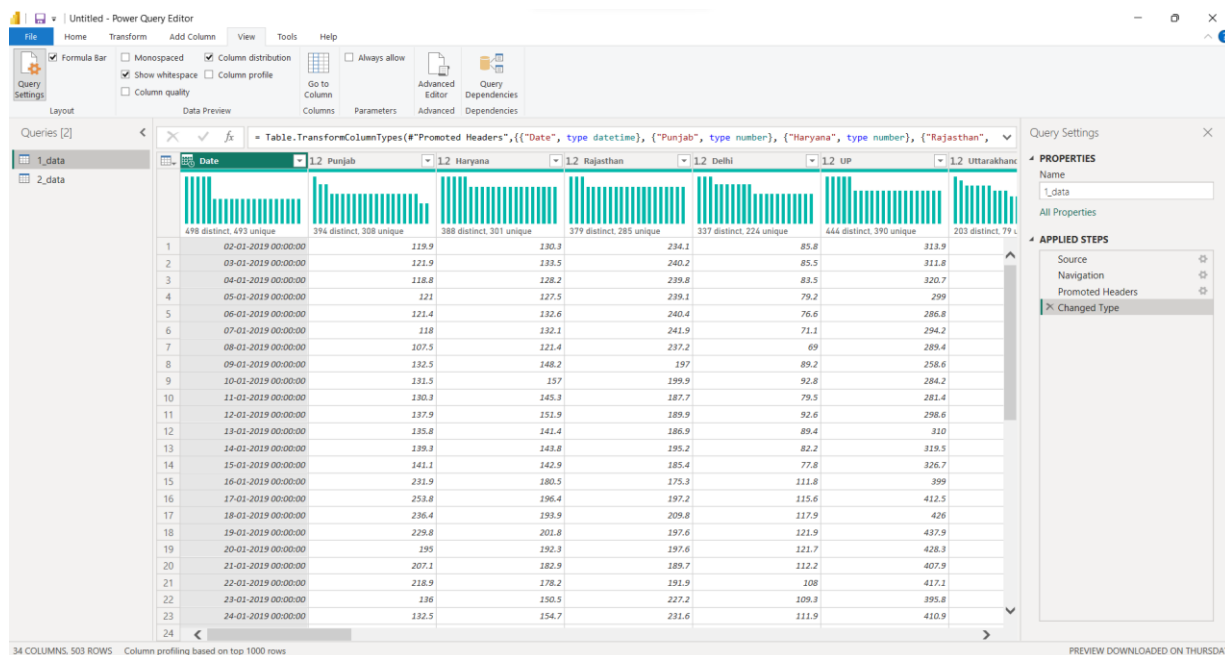
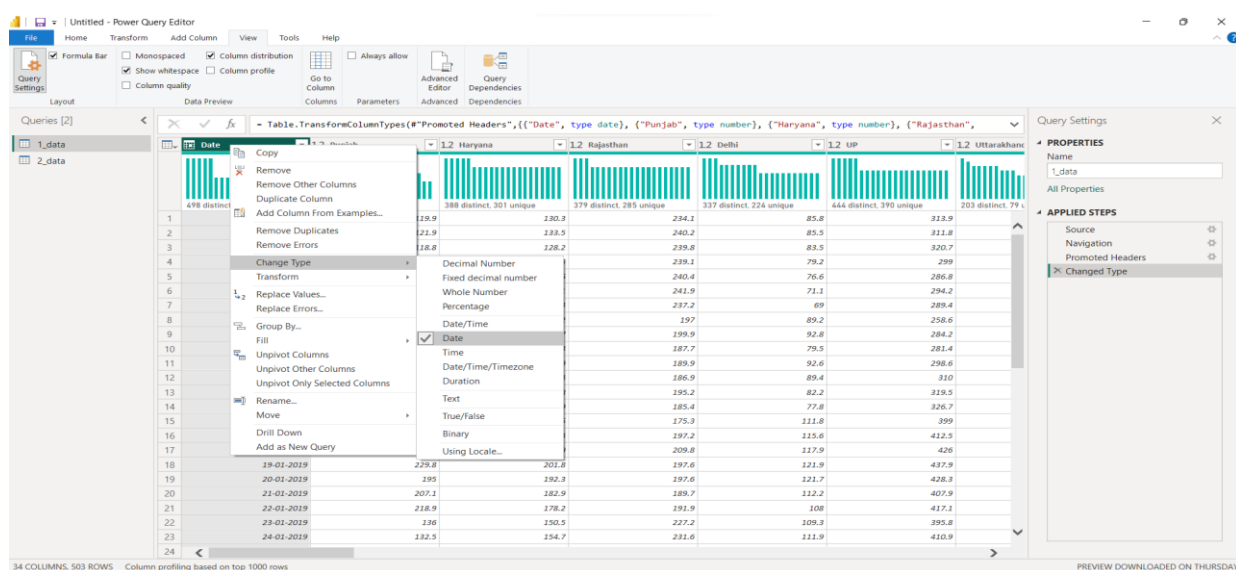# CHAPTER 4

DATASET AND RESULT

Connecting the Dataset:

- Dataset is Connected to Power BI Desktop
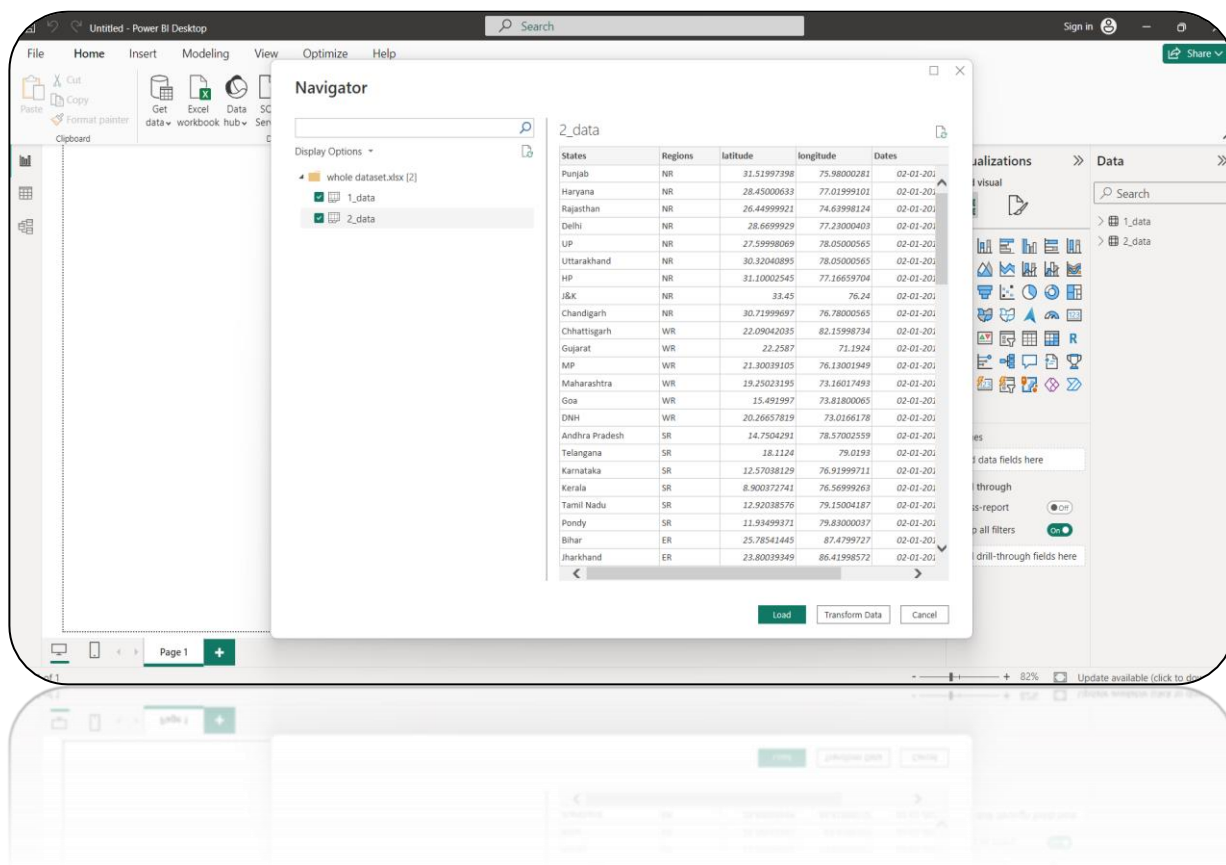
- Transform of Dataset

- Changing the date time format as date format

- **Using Text After Delimiter**

- **Using Text Before Delimiter**

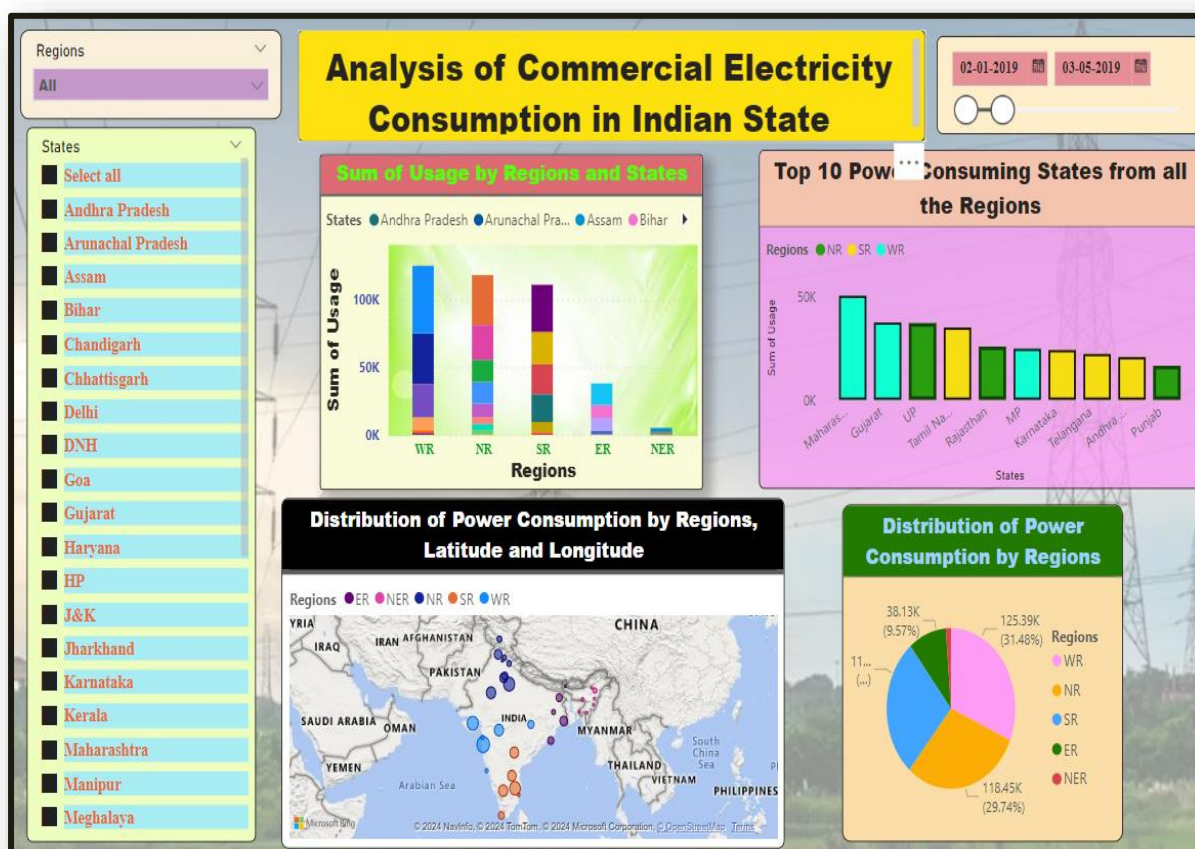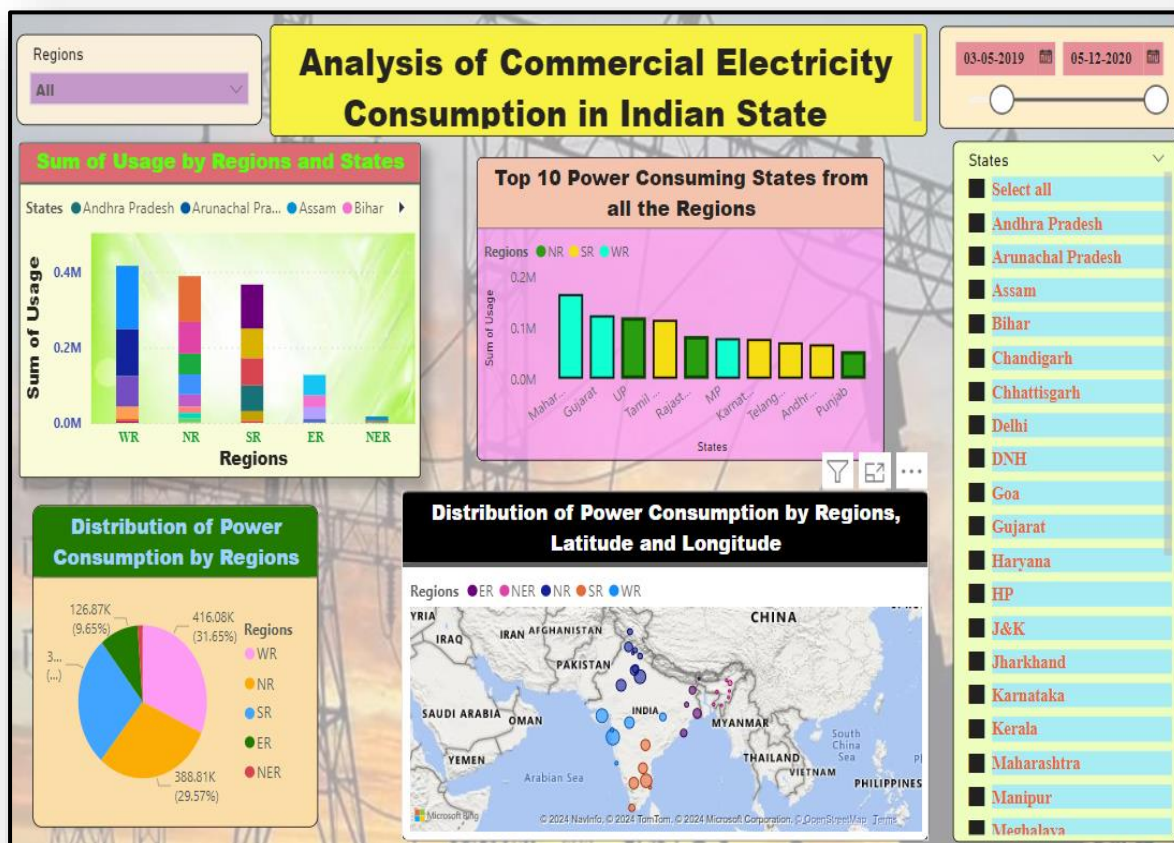- Output after using Text Before and After Delimiter

Result:

Dashboard:

Analysis of Commercial Electricity in Indian State(Before Lockdown)

Analysis of Commercial Electricity in Indian State(After Lockdown)

CONCLUSION:

The project "Analysis of Commercial Electricity Consumption in India" using PowerBI has successfully demonstrated the potential of data analytics in Electricity Consumption. The real-time analysis of Electricity Consumption has provided valuable insights into usage of electricity by State, Region. The interactive dashboards and reports have offered a comprehensive view of Electricity Consumption especially Before and After Lockdown. 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 easily analyse the Electricity Consumption.

FUTURE SCOPE:

Power BI can be used to create predictive models to forecast future electricity consumption trends in different Indian states. This can help the government and businesses to plan for future energy demands and take necessary actions.

Power BI offers training and enablement resources to help facility managers and building owners learn to effectively use Power BI analytics capabilities. Power BI also has a significant community of contributors who share insights and best practices to support facility team members on implementation. In conclusion, the future scope of analyzing commercial electricity consumption using Power BI is vast, and significant improvements to energy performance and efficiency are predicted. The use of Power BI to analyze commercial electricity consumption in Indian states offers insights into precise data that are critical for effective energy management. The functionalities through Power BI mentioned above will enable facility managers and building owners to take a more informed and proactive approach to energy consumption patterns and optimize their operations in the medium to long-term.

REFERENCES

https://askqx.qxlabai.com/home

https://www.freepik.com/

LINK

https://github.com/christyrathna/Analysis-of-Commercial-Electricity-Consumption-in-Indian-State

Thank You