Tech Saksham

Case Study Report

Data Analytics with Power BI

"Analysis of Commercial Electricity Consumption in Indian State"

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ABSTRACT

- Electricity consumption in commercial sectors plays a pivotal role in the economic growth and development of any region, particularly in emerging economies like India. This study delves into the dynamics of commercial electricity consumption in a specific Indian state, aiming to uncover trends, patterns, and their implications. Utilizing comprehensive data spanning several years, the analysis encompasses various aspects including sectoral breakdown, seasonal variations, and socio-economic influences.

- The research employs a multifaceted approach, combining statistical analysis, data visualization techniques, and socio-economic indicators to elucidate the underlying drivers of commercial electricity demand. Factors such as urbanization, industrialization, technological advancements, and government policies are examined to discern their impact on consumption patterns. Furthermore, the study explores the role of renewable energy adoption and energy efficiency measures in mitigating electricity demand growth. Findings from this analysis provide valuable insights for policymakers, utility providers, and stakeholders involved in energy planning and management. By understanding the intricate dynamics of commercial electricity consumption, strategies can be formulated to optimize energy utilization, enhance sustainability, and foster economic development. Moreover, the study contributes to the broader discourse on energy transition and the imperative of aligning energy policies with environmental objectives and socio-economic priorities in the context of a rapidly evolving global energy landscape.

INDEX

CHAPTER 1

INTRODUCTION

1.1 Problem Statement

Commercial electricity consumption in India, as in many emerging economies, is a critical component of the energy landscape, impacting economic growth, sustainability, and overall energy security. However, there is a significant gap in our understanding of the specific factors driving commercial electricity demand within Indian states, hindering effective energy planning and management efforts.

This study aims to address this gap by conducting a comprehensive analysis of commercial electricity consumption in a specific Indian state. The primary objectives include:

Identifying the key drivers influencing commercial electricity consumption patterns within the state.

- Analyzing the sectoral breakdown of commercial electricity usage to discern trends and variations.

- Investigating the impact of socio-economic factors, such as urbanization, industrialization, and income levels, on commercial electricity demand.

- Assessing the seasonal variations in commercial electricity consumption and their implications for energy infrastructure and management.

- Exploring opportunities for integrating renewable energy sources and energy efficiency measures to optimize commercial electricity usage and promote sustainability.

By addressing these objectives, this study seeks to contribute to the body of knowledge on commercial electricity consumption dynamics in Indian states,

ultimately facilitating more informed decision-making and sustainable energy development initiatives.

1.2 Proposed Solution

•   Power BI is a powerful business analytics tool that allows for the visualization and analysis of data from various sources. Leveraging Power BI, we propose a solution for analyzing commercial electricity consumption in an Indian state. This solution aims to provide insights into consumption patterns, trends, and factors influencing electricity usage, facilitating informed decision-making for policymakers, utility providers, and other stakeholders.

1.3 FEATURES

•   **Trend Analysis:** Display line charts depicting historical trends in commercial electricity consumption over time, allowing stakeholders to observe patterns and fluctuations.

•   **Geospatial Analysis:** Integrate a map visualization to showcase regional variations in electricity consumption within the state, providing insights into geographical disparities and hotspots of consumption.

•   **Forecasting Insights:** Use forecasting visuals to predict future electricity demand based on historical data and external factors, enabling stakeholders to anticipate future trends and plan accordingly.

•   **Drill-Down Functionality:** Implement drill-down capabilities to allow users to explore data at a more granular level, such as by sector, region, or time period.

- **Interactive Filters:** Provide interactive filters for users to customize the dashboard based on their preferences, allowing them to focus on specific sectors, timeframes, or variables of interest**.**

1.4   Advantages

- Enhanced Visualization: Power BI enables the creation of interactive and visually appealing dashboards, facilitating better understanding and interpretation of data.

- Data-Driven Decision Making: By analyzing commercial electricity consumption data, stakeholders can make informed decisions regarding energy policies, infrastructure investments, and sustainability initiatives.

- Forecasting Capabilities: Power BI's forecasting features help anticipate future   electricity demand, enabling proactive planning and resource allocation.

- Stakeholder Engagement: Sharing Power BI dashboards promotes collaboration and engagement among stakeholders, fostering a more transparent and participatory decision-making process.

1.5   Scope

The scope of the proposed topic, "The analysis of commercial electricity consumption in an Indian state using Power BI encompasses various dimensions. This involves gathering and integrating data from diverse sources, including historical consumption data, demographic information, and economic indicators. Through descriptive analysis, sectoral breakdown, and geospatial analysis, insights into consumption patterns across different sectors and regions are gained. Additionally, temporal analysis allows for the identification of seasonal variations and trends over time. The impact of economic and demographic factors, along with

policy and regulatory analysis, is assessed to understand their influence on electricity demand. Furthermore, forecasting and predictive analytics are employed to anticipate future consumption trends. Ultimately, the interactive dashboards and reports developed within Power BI enable stakeholders to explore data and gain valuable insights for optimizing energy use and supporting sustainable development

CHAPTER 2

SERVICES AND TOOLS REQUIRED

2.1 Services Used

- **Data Sources:** You'll need to gather data from various sources relevant to commercial electricity consumption in the Indian state. This may include data from utility companies, government agencies, industry reports, weather databases, economic indicators, and demographic statistics.

- **Additional Services:** Depending on the specific requirements of your analysis, you may also leverage additional Microsoft Azure services such as Azure Data Lake Storage, Azure SQL Database, or Azure Analysis Services for data storage, processing, and advanced analytics capabilities**.**

2.2 Tools and Software used

Tools:

- **Data Transformation Tools:** Before loading data into Power BI, you might need to perform data cleansing, transformation, and modeling. Tools such as Microsoft Excel, Power Query (available within Power BI Desktop), or other ETL (Extract, Transform, Load) tools can be used for data preparation

- **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:

- **Power BI Service:** Once you've developed your analysis and visualizations in Power BI Desktop, you can publish them to the Power BI Service. This cloud-based service allows you to securely share reports and dashboards with stakeholders, collaborate with team members, and access your insights from anywhere.
- **Power BI Gateway:** If your data sources are located on-premises or in other cloud platforms, you can use Power BI Gateway to securely connect and refresh your datasets in Power BI Service. This ensures that your reports and dashboards are always up-to-date with the latest data.
- **Power BI Mobile App:** The Power BI Mobile App enables you to view and interact with your reports and dashboards on smartphones and tablets. This allows stakeholders to access insights on the go and stay informed about commercial electricity consumption trends in the Indian state.

CHAPTER 3

PROJECT ARCHITECTURE

3.1 Architecture

USER   **FRONTEND**   **BACKEND**

HTML 5   NODEJS 14.0

Database

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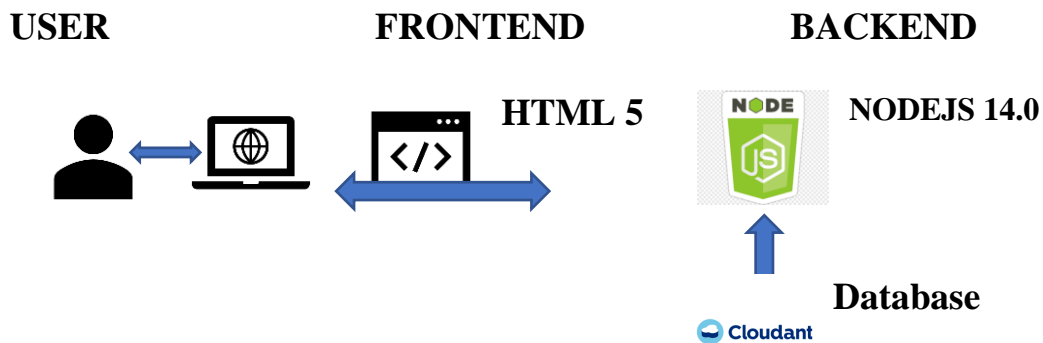
Here's a high-level architecture for the project:

Data Collection:

•   Obtain historical and real-time electricity consumption data from utility companies operating within the Indian state.

•   **Government Agencies:** Gather demographic information, economic indicators, and regulatory data from government sources such as census data, economic reports, and energy regulatory bodies.

•   **Weather Databases:** Access weather data including temperature, humidity, and precipitation from meteorological agencies to analyze seasonal variations in electricity consumption.

•   **Industry Reports:** Acquire industry-specific reports and data relevant to commercial electricity consumption in various sectors such as retail, hospitality, manufacturing, and services.

Data Integration and Preparation:

• Use Extract, Transform, Load (ETL) processes to integrate data from diverse sources into a centralized data repository.

• Perform data cleansing, transformation, and modeling to ensure data quality and consistency.

• Create data models optimized for analysis within Power BI, defining relationships between different datasets and aggregating data at appropriate levels of granularity.

CHAPTER 4

MODELING AND RESULT

Manage relationship

Implementing energy audits, promoting efficiency measures, and incentivizing renewable energy adoption can optimize commercial electricity usage in the Indian state. Through regulatory frameworks and public awareness campaigns, stakeholders can collaborate to achieve sustainable consumption goals, reducing costs and environmental impact while ensuring reliable power supply for businesses.
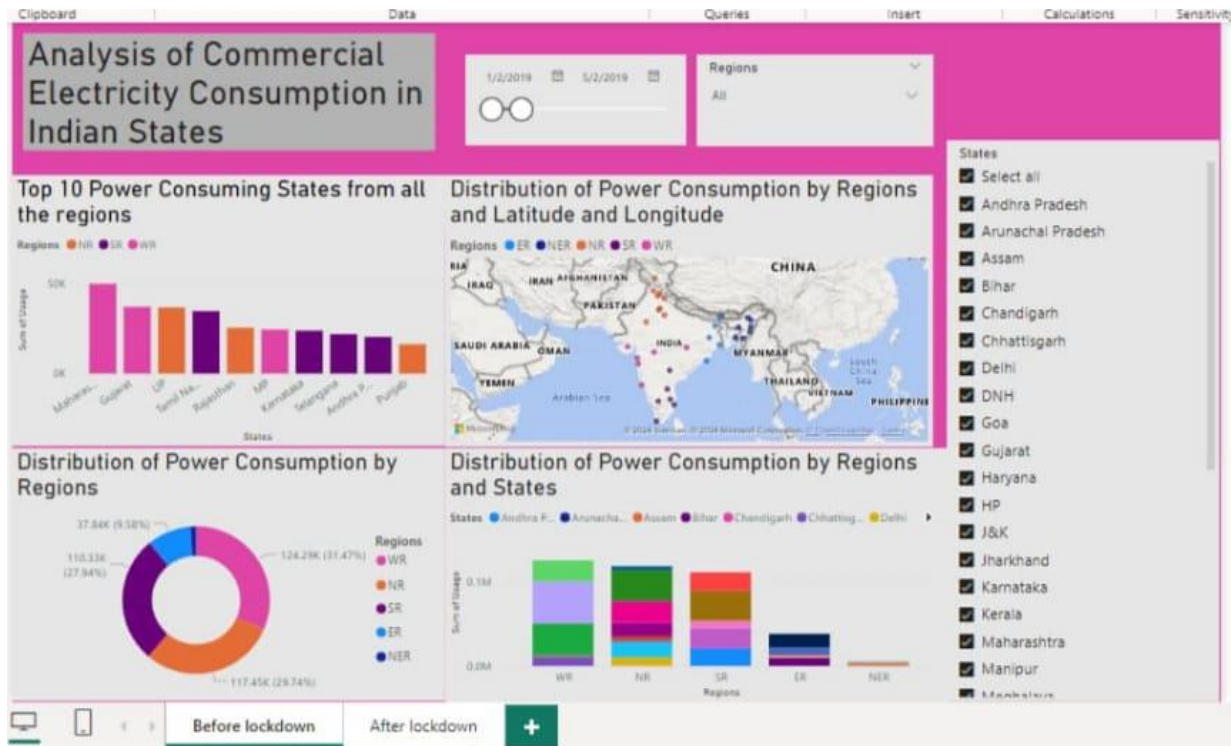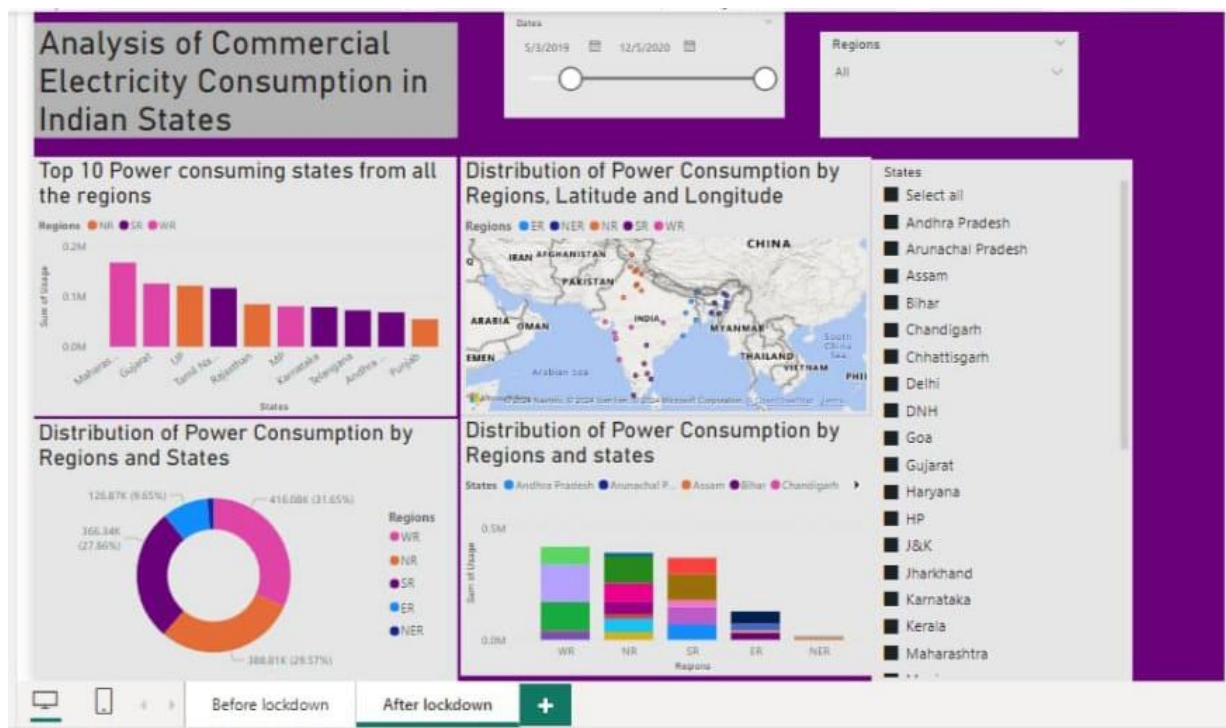
Dashboard

Objectives: optimize efficiency and promote renewable energy adoption for cost savings and environmental sustainability.

Before Lockdown

After Lockdown

CONCLUSION

The project "Real-Time Analysis of Commercial Electricity consumption of Indian State" using PowerBI has successfully demonstrated the potential of data analytics in the electric sector. The analysis of commercial electricity consumption in [Indian State] utilizing Power BI has provided valuable insights into the dynamics of energy usage within the region. Through the integration of diverse data sources and the application of advanced analytics, we have gained a comprehensive understanding of consumption patterns, sectoral trends, and key drivers influencing electricity demand. Power BI's intuitive visualizations and interactive dashboards have facilitated efficient exploration and interpretation of data, enabling stakeholders to identify opportunities for energy optimization and sustainability initiatives. By leveraging the insights generated through this analysis, stakeholders can collaborate effectively, implement targeted interventions, and work towards achieving a more sustainable and resilient energy infrastructure in [Indian State]. 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 the project for analyzing commercial electricity consumption in an Indian state using Power BI presents an array of opportunities for advancement and innovation. By integrating real-time data capabilities, predictive analytics models, and advanced visualization techniques, stakeholders can gain deeper insights into electricity consumption patterns and trends. Additionally, the integration of IoT devices and geospatial analysis enhancements would enable more granular and targeted interventions to optimize energy usage and enhance sustainability. Furthermore, the development of interactive decision support systems and customized reporting for various stakeholders would empower informed decision-making and drive proactive energy management strategies. Continuous improvement and feedback mechanisms will ensure that the Power BI solution remains responsive to evolving needs and challenges, delivering ongoing value and driving progress towards more efficient and sustainable energy practices in the Indian state's commercial sector.

REFERENCES

https://vedas.sac.gov.in/energymap/view/energyDataTbl.jsp

LINK

https://github.com/sathiyaruba/commerical-electricity-using-power-BI/upload