

# Tech Saksham

## Case Study Report

### Data Analytics with Power BI

# **“ANALYSIS OF COMMERCIAL ELECTRICITY CONSUMPTION IN INDIAN STATES”**

**“College Name: S. T. HINDU COLLEGE,  
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# ABSTRACT

Energy is one of the most important points of interest for any country as its economy thrives only if it manages to be in possession of adequate energy resources. **Commercial electricity** refers to the electric energy which is used by non-residential properties such as offices, shops, and small businesses.

With the advent of the digital era, data has become an invaluable asset for education, health, research and development(R&D), businesses, etc.

The proposed project, “**Analysis of Commercial Electricity consumption in Indian states**” aims to leverage **Power BI**, a leading business intelligence tool, to analyze and visualize real-time data. The project will offer valuable insights and key takeaways on consumption of commercial electricity across the different states of our country to the policy makers, administrators, researchers, etc. They will get to understand the energy demands and its usage across the nation. This project helps in predicting the future trends in electric energy requirements across our country. As a result of this, they will be able to make data-driven decisions (figuring out answers to questions such as how much electric power needs to be generated, where high amounts of electric power should be supplied, how much capital should be invested for its generation and supply, etc.). Thereby, the energy requirements of the nation can be fulfilled, satisfactorily. This project will also promote innovation (especially in R&D related to electric power generation and its supply), improve the efficiency of the activities which are to be executed, and facilitate end user satisfaction.

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## CHAPTER 1

### INTRODUCTION

#### 1.1 Problem overview

##### 1.1.1 Problem Statement

In-order to nourish and nurture the economy and future of India, understanding our energy needs is mandatory. It is necessary to keep a check on the growing energy needs of the nation with the passage of time. It is vital to keep a track of which regions/states across India have a large demand for electric energy. Therefore, the electric energy consumption data should be analyzed with extreme care.

##### 1.1.2 Proposed Solution

The proposed solution is to develop a Power BI dashboard that can analyze and visualize real-time consumption data. The dashboard will integrate data from various sources such as surveys, official reports and demographic data. It will provide a comprehensive view of consumption behavior and trends, enabling policy makers, administrators and scientists to make informed decisions. The dashboard will be interactive, user-friendly, and customizable, allowing those in the energy sector to tailor it to the end users' specific needs. The real-time analysis capability of the dashboard will enable the professionals in the energy sector to respond promptly to changes in energy consumption behavior and tailor their services to meet consumers' needs.

#### 1.2 Feature

- **Real-Time Analysis:**  
The dashboard will provide real-time analysis of consumption data.
- **Segmentation of states based on their consumption:**  
It will segment states based on the magnitude of electric energy consumed.
- **Trend Analysis:**  
The dashboard will identify and display trends in energy consumption across different states of India.
- **Predictive Analysis:**  
It will use historical data to predict future energy needs.

## 1.3 Advantages

- **Data-Driven Decisions:** Policy makers, administrators and scientists can make informed decisions based on real-time data analysis.
- **Promoting innovations in the R&D sector:** Meticulous analysis of data will promote innovations in the R&D sector, especially in the projects dealing with electric energy production and supply.
- **Improved efficiency of activities:** Understanding consumption behavior and trends can help the professionals to engage with their end users more effectively. Thereby, increasing the efficiency of the tasks which are undertaken.

## 1.4 Scope

The scope of this project to leverage data for decision-making. The project can be further extended to incorporate more data sources and advanced analytics techniques, such as machine learning and artificial intelligence, to provide more sophisticated insights into consumption behavior. The project also has the potential to be adapted for other sectors which are dependent on the energy sector.

Furthermore, the project contributes to the broader goal of digital transformation in the energy sector, promoting efficiency, innovation and end user satisfaction and ultimately contributes to the growth and development of India.

## CHAPTER 2

### SERVICES AND TOOLS REQUIRED

#### 2.1 Services Used

- **Data Collection and Storage Services:** The professionals in the energy sector need to collect and store customer data in real-time. This could be achieved through services like Azure Data Factory, Azure Event Hubs, or AWS Kinesis for real-time data collection, and Azure SQL Database or AWS RDS for data storage.
- **Data Processing Services:** Services like Azure Stream Analytics or AWS Kinesis Data Analytics can be used to process the real-time data.
- **Machine Learning Services:** Azure Machine Learning or AWS SageMaker can be used to build predictive models based on historical data.

#### 2.2 Tools and Software used

##### Tools:

- **Power BI:** The main tool for this project is Power BI, 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 Desktop:** This is a Windows application that one can use to create reports and publish them to Power BI.

- **Power BI Service:** This is an online SaaS (Software as a Service) service that one uses to publish reports, create new dashboards, and share insights.
- **Power BI Mobile:** This is a mobile application that one can use to access the 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:** Real-time consumption data is collected from various sources like surveys, official reports and demographic data. This could be achieved using services like Azure Event Hubs or AWS Kinesis.
2. **Data Storage:** The collected data is stored in a database for processing. Azure SQL Database or AWS RDS can be used for this purpose.
3. **Data Processing:** The stored data is processed in real-time using services like Azure Stream Analytics or AWS Kinesis Data Analytics.
4. **Machine Learning:** Predictive models are built based on processed data using Azure Machine Learning or AWS SageMaker. These models can help in predicting consumption trends, etc.
5. **Data Visualization:** The processed data and the results from the predictive models are visualized in real-time using Power BI. Power BI allows you to create interactive dashboards that can provide valuable insights into the data.
6. **Data Access:** The dashboards created in Power BI can be accessed through Power BI Desktop, Power BI Service (online), and Power BI Mobile.

This architecture provides a comprehensive solution for real-time analysis of consumption of commercial electricity across different states of our country. It's also important to ensure that all tools and services comply with relevant data privacy and security regulations.



## CHAPTER 4

### MODELING AND RESULT

The following visualizations depict the consumption of commercial electricity across different states of our country before and after lockdown (02-01-2019 to 05-12-2020).

#### BEFORE LOCKDOWN



#### AFTER LOCKDOWN



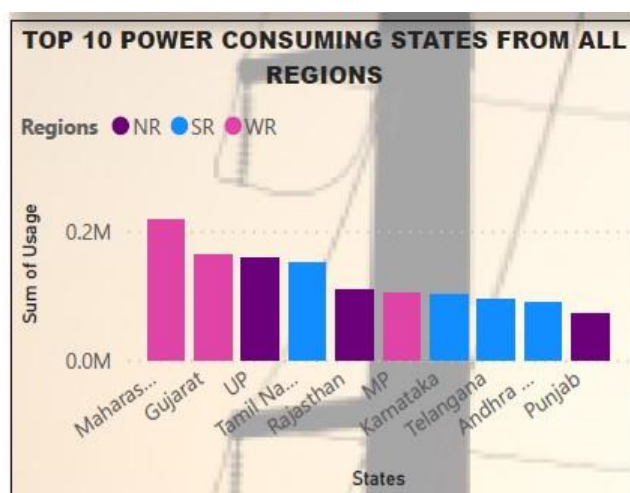
#### BEFORE LOCKDOWN



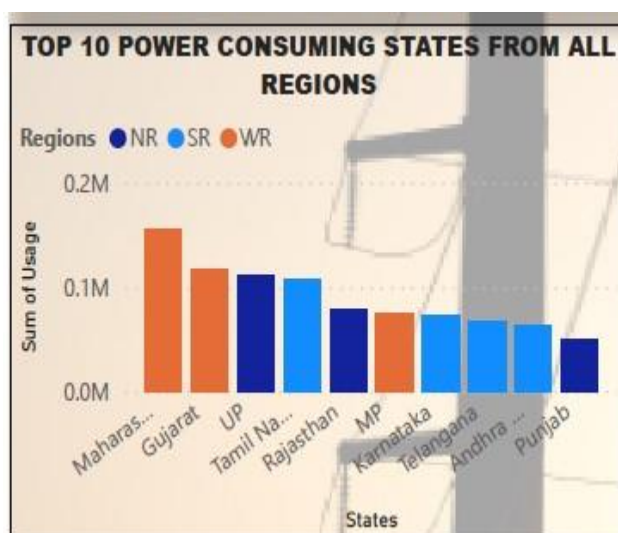
## AFTER LOCKDOWN



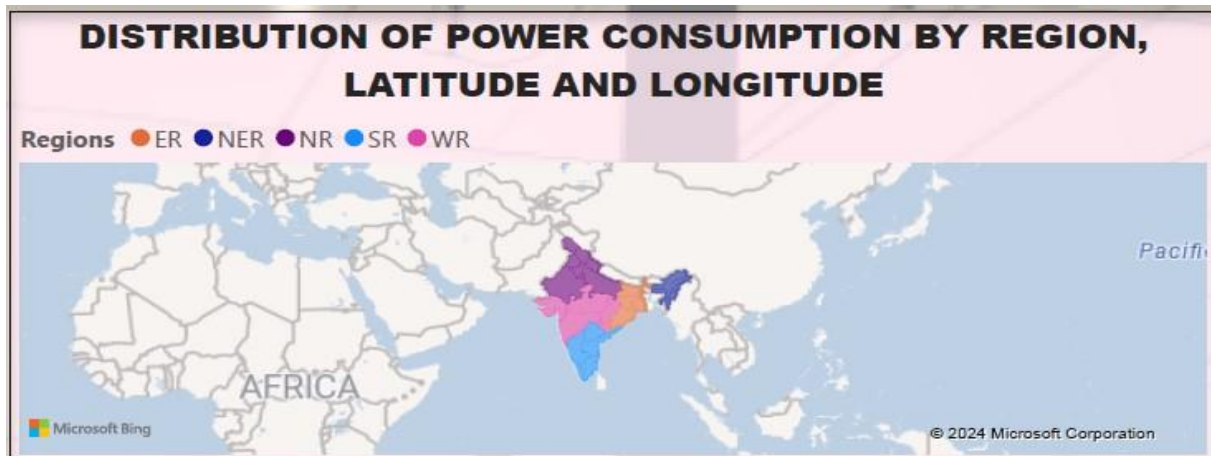
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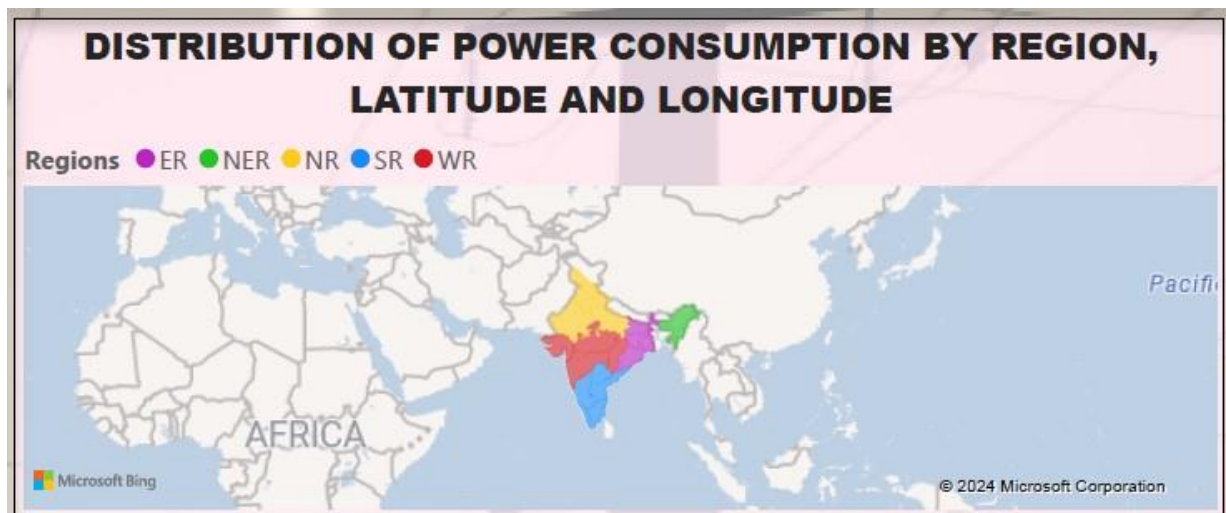
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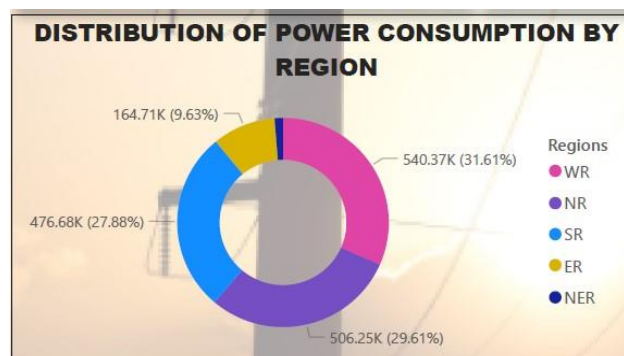
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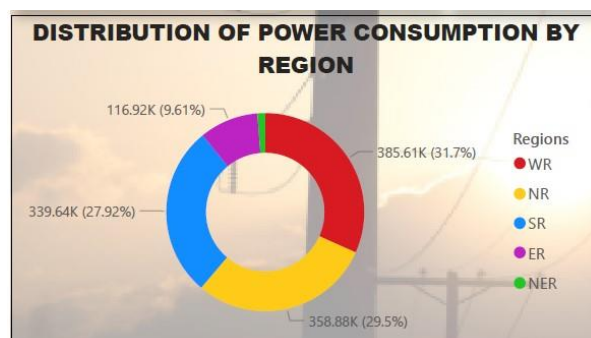
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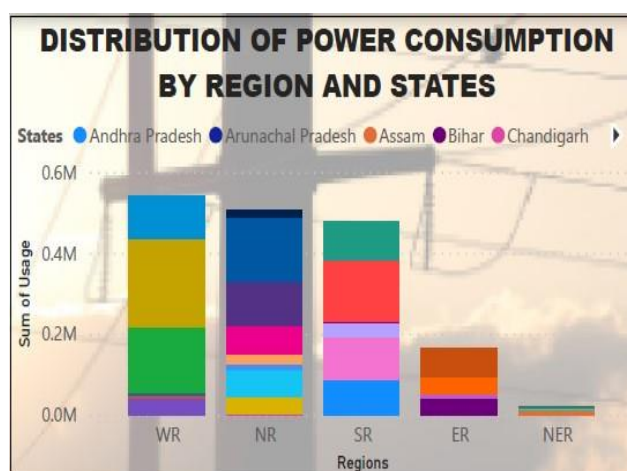
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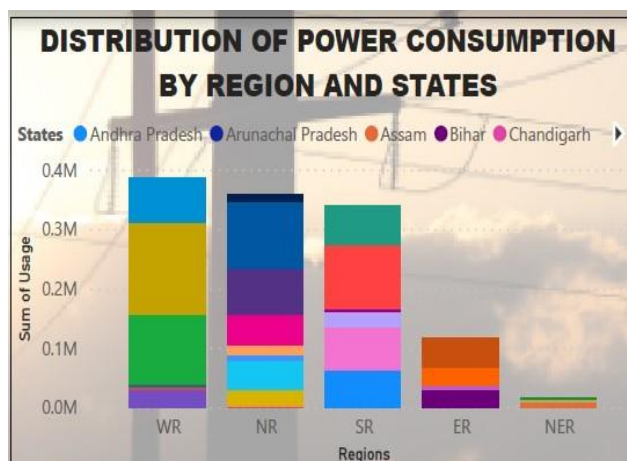
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## BEFORE LOCKDOWN



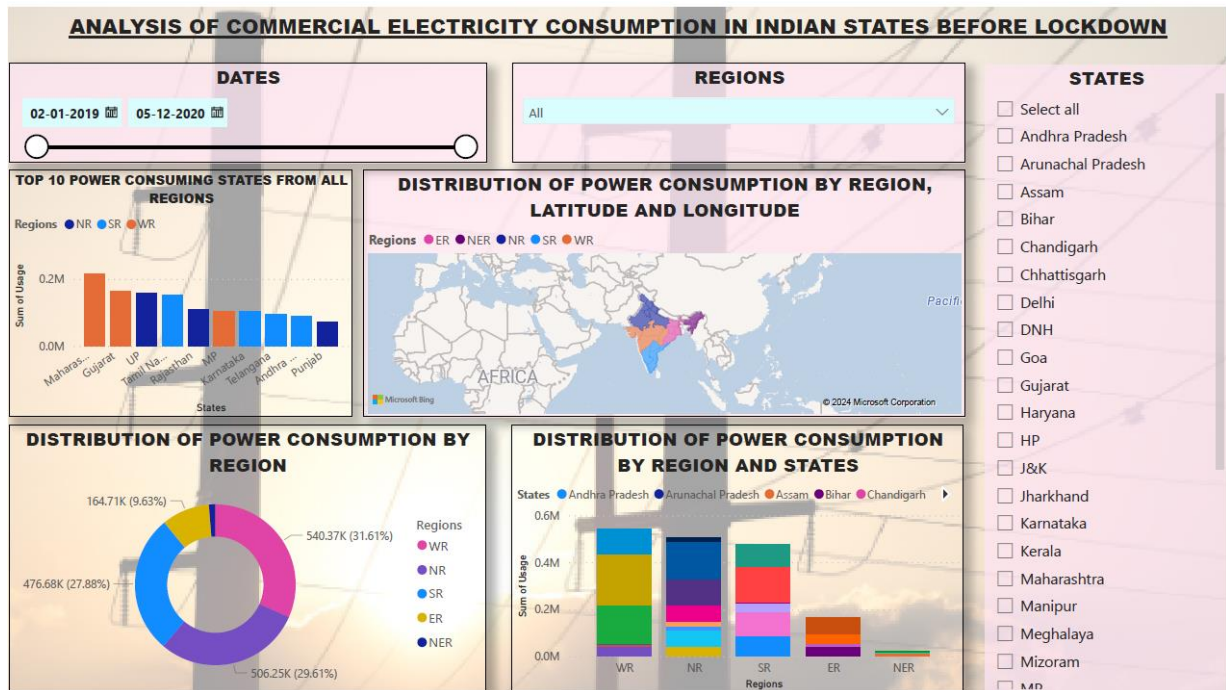
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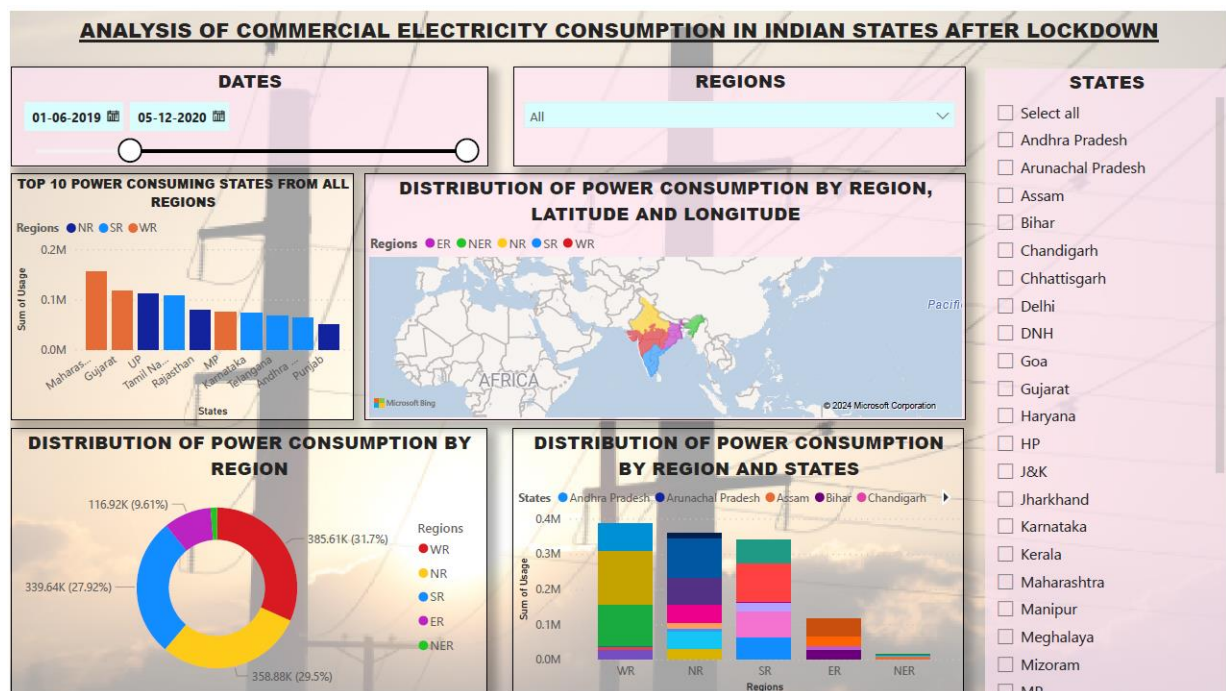


# DASHBOARDS

## BEFORE LOCKDOWN



## AFTER LOCKDOWN



## CONCLUSION

The project “**Analysis of Commercial Electricity consumption in Indian states**” using Power BI has successfully demonstrated the potential of data analytics in the energy sector. The real-time analysis of consumption data has provided valuable insights into varying levels of consumption across the nations, and trends, thereby facilitating informed decision-making. The interactive dashboards and reports have offered a comprehensive view of energy consumption data, enabling the identification of patterns and correlations. This has not only improved the efficiency of data analysis but also enhanced the ability of policy makers, administrators and scientists to provide appropriate services to their end users. The project has also highlighted the importance of data visualization in making complex data more understandable and accessible. The use of Power BI 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, Power BI can be leveraged to predict future trends based on historical data. Integrating these predictive analytics into the project could enable the policy makers, administrators and scientists to anticipate the energy needs across different parts of India and proactively offer solutions. Furthermore, Power BI's capability to integrate with various data sources opens up the possibility of incorporating more diverse datasets for a more holistic view of consumption. 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 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 promote innovation especially in R&D related to electric power generation and its supply, improve the efficiency of the activities which are to be executed, and facilitate end user satisfaction.

## LINK

## GITHUB LINK

<https://github.com/Vivasvaan40/Analysis-of-Commercial-Electricity-consumption-in-Indian-states-377FA521A4581F7BD6B4BB030F395040>