



# Tech Saksham

## Case Study Report

### DATA ANALYTICS WITH POWER BI

#### “Analysis of Commercial Electricity Consumption In Indian States”

#### “V.O.CHIDAMBARAM COLLEGE”

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## **ABSTRACT**

Commercial electricity consumption in Indian states is a crucial aspect of energy management, with significant implications for economic growth, environmental sustainability, and societal well-being. This abstract outlines the scope, methodologies, and potential contributions of analyzing commercial electricity consumption in Indian states. The analysis encompasses a comprehensive examination of historical consumption patterns, sectoral dynamics, policy frameworks, and socio-economic factors influencing electricity demand. Leveraging available data sources from government agencies, utilities, and research institutions, the study employs advanced data analytics techniques to extract actionable insights and forecast future trends. Key areas of focus include assessing energy efficiency opportunities, evaluating policy effectiveness, optimizing infrastructure investments, and promoting technological innovation. Moreover, the study explores the socio-economic implications of commercial electricity consumption, including its impact on economic development, employment generation, and social equity. Through international collaboration and knowledge sharing, benchmarking against global best practices.

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# CHAPTER 1

## INTRODUCTION

### 1.1 Problem Statement:

Commercial electricity consumption in Indian states presents a complex challenge that requires thorough analysis to support effective energy management and policy formulation. The problem statement revolves around understanding the dynamics of commercial electricity consumption in Indian states, identifying key factors influencing consumption patterns, and developing strategies to optimize energy usage while promoting sustainability and economic growth. limited availability and reliability of data on commercial electricity consumption pose challenges in conducting comprehensive analysis and decision-making. Data gaps, inconsistencies, and inaccuracies hinder efforts to understand consumption patterns and forecast future demand accurately. Evaluating the effectiveness of existing policies and regulations related to commercial electricity consumption is crucial for identifying gaps, inefficiencies, and opportunities for improvement. Assessing the impact of policy interventions on consumption behavior, energy efficiency, and sustainability outcomes is essential for informed policy formulation and implementation. To analyze commercial electricity consumption patterns in Indian states comprehensively. To evaluate the effectiveness of existing policies and regulations related to commercial electricity consumption.

### 1.2 Proposed Solution:

Proposed Solution for Analysis of Commercial Electricity Consumption in Indian States: Gather comprehensive data on commercial electricity consumption from reliable sources such as government agencies, utilities, and research institutions. This includes historical consumption data, sectoral breakdowns, demographic information, economic indicators, and policy documents. Cleanse the collected data to remove errors, inconsistencies, and missing values. Integrate datasets from different sources to create a unified database suitable for analysis. Conduct descriptive analysis to understand the overall trends, patterns, and

variations in commercial electricity consumption across Indian states. This includes calculating summary statistics, visualizing data through charts and graphs, and identifying outliers or anomalies. Analyze temporal trends in commercial electricity consumption over different time periods, such as daily, monthly, seasonal, and annual patterns. Identify peak demand periods, seasonal variations, and long-term trends to inform infrastructure planning and demand forecasting. Perform sectoral analysis to assess electricity consumption patterns in various sectors, including manufacturing, services, agriculture, and transportation. Identify sector-specific drivers of electricity demand, such as industrial activity, commercial operations, and technological advancements.

### **1.3 Feature**

Analyzing commercial electricity consumption in Indian states requires various features to understand trends and patterns. Here are some essential features for analysis: Aggregate commercial electricity consumption data for each state provides an overall view of energy demand. Breakdown of commercial electricity usage by sectors such as manufacturing, services, agriculture, etc., helps identify which sectors are the largest consumers. Historical electricity consumption data over time helps in identifying trends, seasonal variations, and any long-term changes in consumption patterns. Industrial output data helps in understanding the correlation between economic activity and electricity demand in the commercial sector.

### **1.4 Advantages**

Analyzing commercial electricity consumption in Indian states offers several advantages: Understanding consumption patterns helps in allocating resources for infrastructure development, ensuring adequate electricity supply to meet demand. Data analysis informs policymakers about the effectiveness of existing policies and guides the formulation of new strategies to promote energy efficiency and sustainability. Accurate analysis facilitates better forecasting of electricity demand, enabling utilities to plan for future requirements and avoid supply-demand imbalances. Analysis guides infrastructure planning, including the expansion of transmission and distribution networks, to meet growing commercial

electricity demands effectively. Detailed analysis by sectors (e.g., manufacturing, services) provides insights into specific industry needs, facilitating tailored solutions and sector-specific policies. Analysis fosters capacity building within the energy sector by promoting research, data analytics skills, and technological innovation to address evolving energy challenges effectively.

## **1.5 Scope**

The scope for analyzing commercial electricity consumption in Indian states is broad and multifaceted, offering numerous opportunities for research, policy development, and business optimization. Here are some key aspects of the scope: With the increasing availability of data through government agencies, utilities, and research institutions, there is a vast scope for analyzing historical consumption trends, forecasting future demand, and identifying patterns across different commercial sectors and regions within states. Analysis can focus on identifying opportunities for improving energy efficiency and promoting conservation practices among commercial consumers. This includes assessing the effectiveness of energy efficiency programs, evaluating the impact of technological advancements, and identifying barriers to adoption. Commercial electricity consumption spans various sectors such as manufacturing, services, agriculture, and transportation. There is scope for sector-specific analysis to understand the unique drivers of electricity demand, develop targeted interventions, and support sectoral growth in alignment with national development goals. Understanding consumption patterns enables utilities and policymakers to plan infrastructure investments strategically, including the expansion of generation capacity, transmission and distribution networks, and deployment of smart grid technologies. There is scope for implementing demand-side management (DSM) programs to optimize electricity consumption, reduce peak demand, and enhance system efficiency. Analysis can explore the role of technological innovation in shaping electricity consumption patterns, such as the adoption of energy-efficient appliances, smart meters, IoT devices, and renewable energy technologies. There is scope for assessing the impact of innovation on consumer behavior, market dynamics, and regulatory frameworks.

# CHAPTER 2

## SERVICES AND TOOLS REQUIRED

### 2.1 Services Used

Several services and tools can be used for the analysis of commercial electricity consumption in Indian states. Government Data Portals: Platforms like the Ministry of Power's National Power Portal provide access to electricity consumption data and related information.

**Data Aggregation Services:** Companies like DataGov and data.gov.in aggregate datasets from various government sources for easy access and analysis. Tableau: A powerful data visualization tool that allows users to create interactive dashboards and visualizations to explore and present electricity consumption data effectively.

**Power BI:** Microsoft's Power BI enables users to create customizable reports and dashboards, integrating data from multiple sources for comprehensive analysis. IBM SPSS Statistics: A software package for statistical analysis that offers advanced analytics tools for exploring data and identifying patterns in electricity consumption trends. Amazon Web Services (AWS) and Google Cloud Platform (GCP) offer scalable computing resources and data storage solutions, facilitating the analysis of large datasets and the deployment of machine learning models for electricity consumption analysis.

### 2.2 Tools and Software Used

#### Tools:

**Energy Management Software:** Specialized software platforms designed to track, analyze, and optimize energy usage. These tools often provide real-time monitoring, historical data analysis, and reporting functionalities.

**Smart Meters:** Advanced electricity meters that collect detailed consumption data at regular intervals. Smart meters enable granular analysis of energy usage patterns and can help identify areas for improvement.

**Data Logging Devices:** Devices that collect and store data from electricity meters, sensors, and other monitoring equipment. Data loggers are used to capture detailed information over time for analysis.

## **Software Requirements:**

**Visualization Tools:** Choose software for creating visualizations and dashboards to present insights from electricity consumption data. Options include: Tableau, Power BI, or Qlik for interactive dashboards and visual analytics.

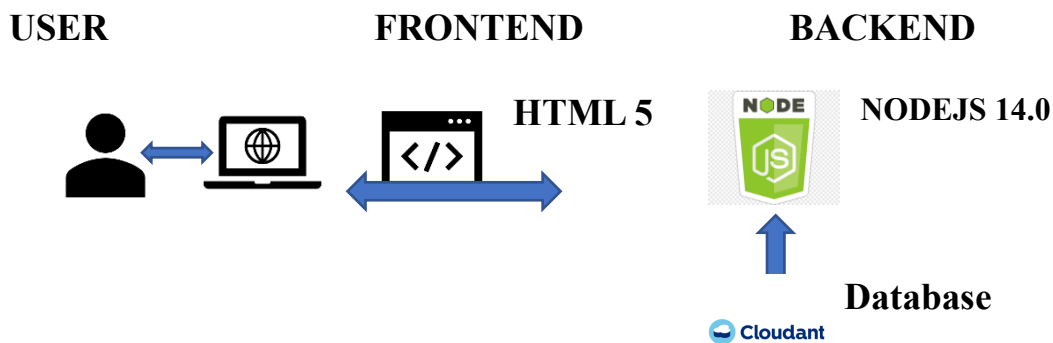
Data visualization libraries in Python (matplotlib, seaborn) or R (ggplot2) for custom visualizations and plotting.

**Geospatial Analysis Software:** If geographic analysis is required, consider using GIS software such as ArcGIS or QGIS to analyze spatial patterns of electricity consumption.

**Database Management Systems:** Depending on the scale of data and complexity of analysis, you might need a database management system (DBMS) like MySQL, PostgreSQL, or Microsoft SQL Server to store and manage electricity consumption data efficiently



## CHAPTER 3



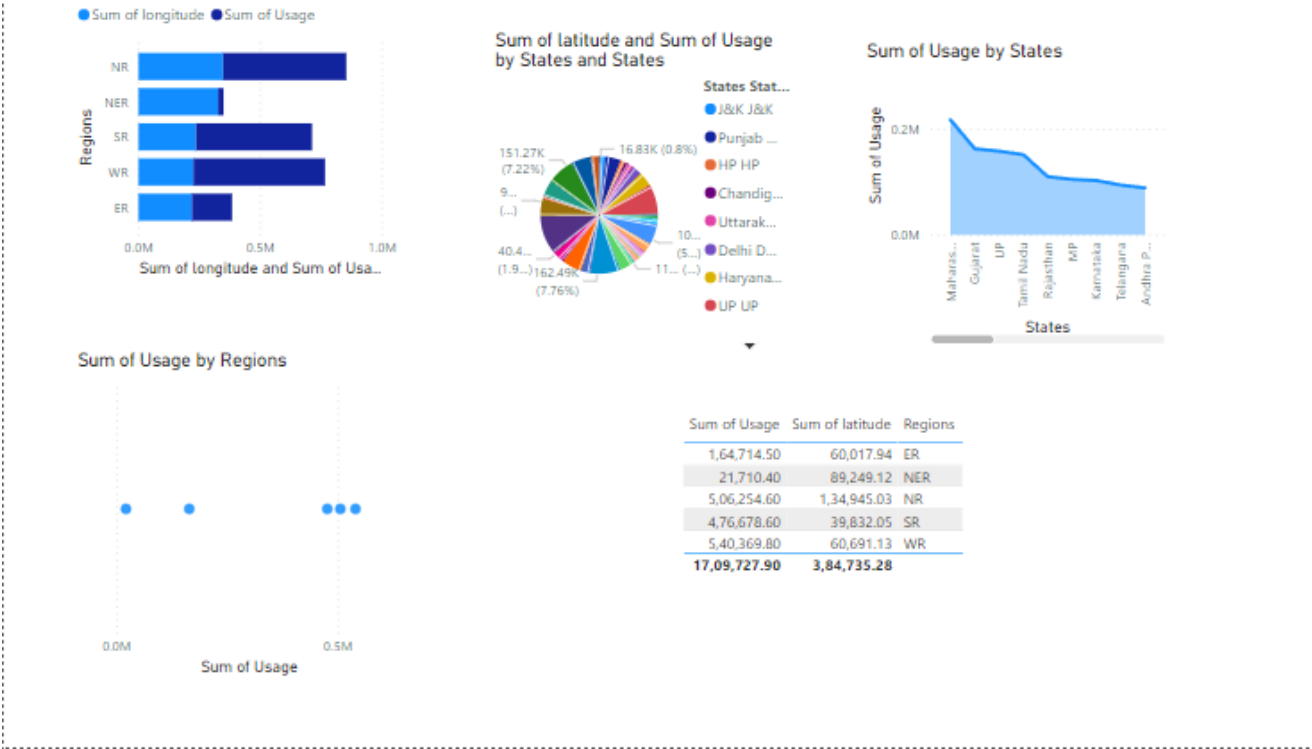
Here's a high-level architecture for the project:

1. **Data Collection:** Real-time customer data is collected from various sources like bank transactions, customer interactions, etc. 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 customer behavior, detecting fraud, etc.
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.

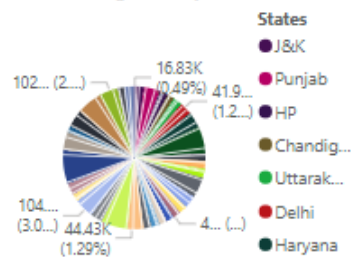
This architecture provides a comprehensive solution for real-time analysis of bank customers. However, it's important to note that the specific architecture may vary depending on the bank's existing infrastructure, specific requirements, and budget. It's also important to ensure that all tools and services comply with relevant data privacy and security regulations.

# DASHBOARD

## ANALYSIS OF COMMERCIAL ELECTRICITY CONSUMPTION IN INDIAN STATES



Sum of latitude, Sum of Usage and  
Sum of longitude by States



Regions	States	Sum of Usage
ER	Bihar	41,829.2
ER	Jharkhand	11,992.8
ER	Odisha	40,473.7
ER	Sikkim	648.6
ER	West Bengal	69,770.2
NER	Arunachal Pradesh	1,060.9
NER	Assam	12,554.9
NER	Manipur	1,254.8
NER	Meghalaya	2,838.8
NER	Mizoram	858.3
NER	Nagaland	1,087.7
<b>Total</b>		<b>17,09,727.9</b>

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- States
- ☐ Andhra Pradesh
  - ☐ Arunachal Pradesh
  - ☐ Assam
  - ☐ Bihar
  - ☐ Chandigarh
  - ☐ Chhattisgarh
  - ☐ Delhi
  - ☐ DNH
  - ☐ Goa
  - ☐ Gujarat
  - ☐ Haryana
  - ☐ HP
  - ☐ J&K
  - ☐ Jharkhand
  - ☐ Karnataka
  - ☐ Kerala
  - ☐ Maharashtra
  - ☐ Manipur
  - ☐ Meghalaya
  - ☐ Mizoram

## CONCLUSION

In conclusion, analyzing commercial electricity consumption is essential for businesses seeking to optimize energy usage, reduce costs, and meet sustainability goals. By leveraging a combination of specialized software tools and techniques, businesses can gain valuable insights into their energy usage patterns, identify areas for improvement, and implement strategies to enhance efficiency. Key components of an effective analysis include energy management software for data tracking and monitoring, data analysis tools for processing and interpreting consumption data visualization platforms for communicating insights effectively, and potentially advanced techniques such as geospatial analysis, machine learning, and energy modeling. By investing in robust analysis capabilities, businesses can drive significant improvements in their energy.

## **FUTURE SCOPE**

The future scope of analyzing commercial electricity consumption in India is vast and dynamic, driven by emerging trends and technological advancements. With the country's ambitious renewable energy targets, there's a growing need to understand the integration of renewables into commercial electricity usage patterns.

## REFERENCE

<https://www.kaggle.com/datasets/twinkle0705/state-wise-power-consumption-in-india>