



Tech Saksham

Case Study Report

Data Analytics with Power BI

ANALYSIS OF COMMERCIAL ELECTRICITY CONSUMPTION IN INDIAN STATE A.P.C MAHALAXMI COLLEGE FOR WOMEN

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ABSTRACT

The demand for energy has been increasing over the years in India, which may be the result of its rapid economic growth trajectory. In this context, this study examines the direction of the Granger-causal relationship between electricity consumption and economic growth at the state and sectoral levels in India. In doing so, the panel cointegration tests with the structural break, the **heterogeneous**

panel causality test, and the panel VAR based impulse-response model are employed.

Further, the results provide evidence for the presence of unidirectional

Granger-

causality flowing in the direction of overall economic growth to electricity consumption at the aggregate state level.

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CHAPTER 1

INTRODUCTION

- **Problem Statement**

An important property of the electricity grid is that production must be carefully matched to consumption in order to keep voltage and frequency stable and avoid damaging expensive infrastructure. On the other hand, customer activities, needs, and desires, as well as weather, shape the patterns of electricity use, which vary seasonally and hourly. These patterns typically result in high concentrations of electricity use in “peak periods”. The larger the peak demand, the greater the amount of electrical resources (distribution, transmission, and generation assets) that are needed to meet it.

- **Proposed Solution**

The proposed solution involves leveraging data analytics techniques with data sourced from the cloud and web to conduct an in-depth analysis of commercial electricity consumption in an Indian state. As we know, developing country like India has been promoting itself by enhancing various initiatives on all sectors and regions to achieve economic targets and for prepare to meet global competition for proclaim efficient nation. Accumulation of changes in energy consumption especially commercial energy pointed is indirectly spur the problems on the consumption of non-commercial energy regularly consumes by rural people. Though, initiation of various commercial energy is always support to economic growth and it never ever make worse to that yet looking for another trend of consumption in non-commercial type and its reflects among the rural have to consider and necessary steps need to execute for the support of primary energy consumers and to boost economy level. Visualization tools will be used to present findings comprehensively, facilitating

informed decision-making, while continuous monitoring will ensure ongoing optimization of energy resources and efficiency initiatives.

- **Feature**

- **Utilisation patterns:** Analyze peak and off-peak consumption times to identify trends in commercial electricity usage, aiding in resource allocation and infrastructure planning.
- **Sectoral Breakdown :** Segment consumption data by industry sectors to understand which sectors are the largest consumers, enabling targeted energy efficiency initiatives and tariff structure.
- **Seasonal Variation:** Evaluate seasonal fluctuations in electricity demand to anticipate future demands, optimize supply chain management, and implement demand-side management strategies.

- **Advantages**

- **Enhance Resource Management:** Electricity management is a vast topic in environmental science that deals with the control, monitoring, and conservation of energy consumption. This not only includes efficiency in consumption but also the creation and distribution of electric power.
- **Proactive Decision -Making:** By leveraging cloud/web-based data analytics, stakeholders can proactively identify consumption patterns, anticipate demand fluctuations, and plan infrastructure upgrades or maintenance activities accordingly. This proactive approach enhances grid stability, reduces downtime, and enhances overall operational efficiency.

- **Scope**

Based on recent data from the Central Electricity Authority (CEA), the peak power demand is expected to reach 230 GW by 2035.

Meeting this demand requires strategic capacity addition and robust infrastructure development.

Powering India: an analysis of commercial electricity consumption in an Indian state using data analytics sourced from cloud or web platforms would entail examining trends, patterns, and factors influencing electricity usage. This analysis could encompass identifying peak consumption periods, understanding the impact of economic activities and industrial sectors on electricity demand, detecting anomalies or inefficiencies in consumption patterns, and forecasting future consumption trends to aid in resource allocation and infrastructure planning. Additionally, it could involve exploring correlations between electricity usage and external factors such as weather conditions, demographic shifts, or policy changes, providing valuable insights for policymakers, utility providers, and businesses to optimize energy management strategies and promote sustainable development.

CHAPTER 2

SERVICES AND TOOLS REQUIRED

2.1 Services Used

- **Data collection and integration**

Depending on your data sources and needs, you can use different methods to collect energy data, such as manual reading, wired or wireless communication, or cloud-based services. Manual reading is the simplest but most time-consuming and error-prone method. This could include industries, offices, retail outlets, etc. Data integration techniques will be crucial to ensure uniformity and consistency in the dataset.

- **Descriptive Analytics:** Perform descriptive analytics to understand the current patterns and trends in commercial electricity consumption. This involves summarizing the data through measures such as mean, median, mode, and standard deviation, as well as visualizing the data using charts and graphs to identify any outliers or anomalies.

- **Predictive Modeling : Precise electricity forecasting is a pertinent challenge in effectively controlling the supply and demand of power. This is due to the inherent volatility of electricity, which cannot be stored and must be utilised promptly.**

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

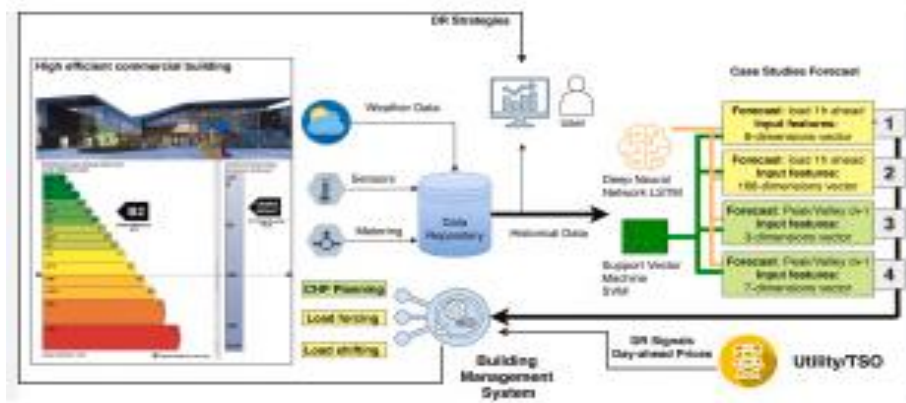
- PowerBI Service: This is an online SaaS (Software as a Service) service that you use to publish reports, create new dashboards, and share insights.

- 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



****DataAnalyticsArchitectureforCommercialElectricityConsumptioninIndian State:****

- **Datacollection:**Gatherdatafromcloud/websourcesincludinggovernment databases, utility companies, and IoT devices.
- **DataPreprocessing:**Cleanseandpreprocessthe datato handlemissing values, outliers, and inconsistencies.
- **DataStorage:**Storetheprocesseddatainascalableandefficientdata storage system such as a data warehouse or data lake.
- **Dataintegration:**Integratedatafrommultiplesourcestocreatea comprehensive dataset for analysis.
- **AnalysisandModeling:**Utilizemachinelearningandstatisticaltechniqueto analyze the data and build predictive models.
- **Visualization:**Createvisualizationssuchascharts,graphs,andmapsto present insights and trends in electricity consumption.
- **Interpretation:**Interprettheresultsoftheanalysistounderstandpatterns, identify consumption drivers, and inform decision-making.
- **ReportingandDeployment:**Generatereportsanddeploytheanalytics solution for stakeholders to use in optimizing electricity consumption strategies.

CHAPTER 4

MODELING AND RESULT

Manager relationship

The demand for energy has been increasing over the years in India, which may be the result of its rapid economic growth trajectory. In this context, this study examines the direction of the Granger-causal relationship between electricity consumption and economic growth at the state and sectoral levels in India. In doing so, the panel cointegration tests with the structural break, the heterogeneous panel causality test, and the panel VAR based impulse-response model are employed.

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Delhi	NR	28.66999929	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:
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Gujarat	WR	22.2587	71.1924	02-01-201:
MP	WR	21.30039105	76.13001949	02-01-201:
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03-01-2019 00:00:00	121.9	133.5	240.2	85.5	311.1
04-01-2019 00:00:00	118.8	128.2	239.8	83.5	320.1
05-01-2019 00:00:00	121	127.5	239.1	79.2	299.1
06-01-2019 00:00:00	121.4	132.6	240.4	76.6	286.1
07-01-2019 00:00:00	118	132.1	241.9	71.1	294.1
08-01-2019 00:00:00	107.5	121.4	237.2	69	289.1
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13-01-2019 00:00:00	135.8	141.4	186.9	89.4	311.1
14-01-2019 00:00:00	139.3	143.8	195.2	82.2	319.1
15-01-2019 00:00:00	141.1	142.9	185.4	77.8	326.1

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Column1

Σ Delhi

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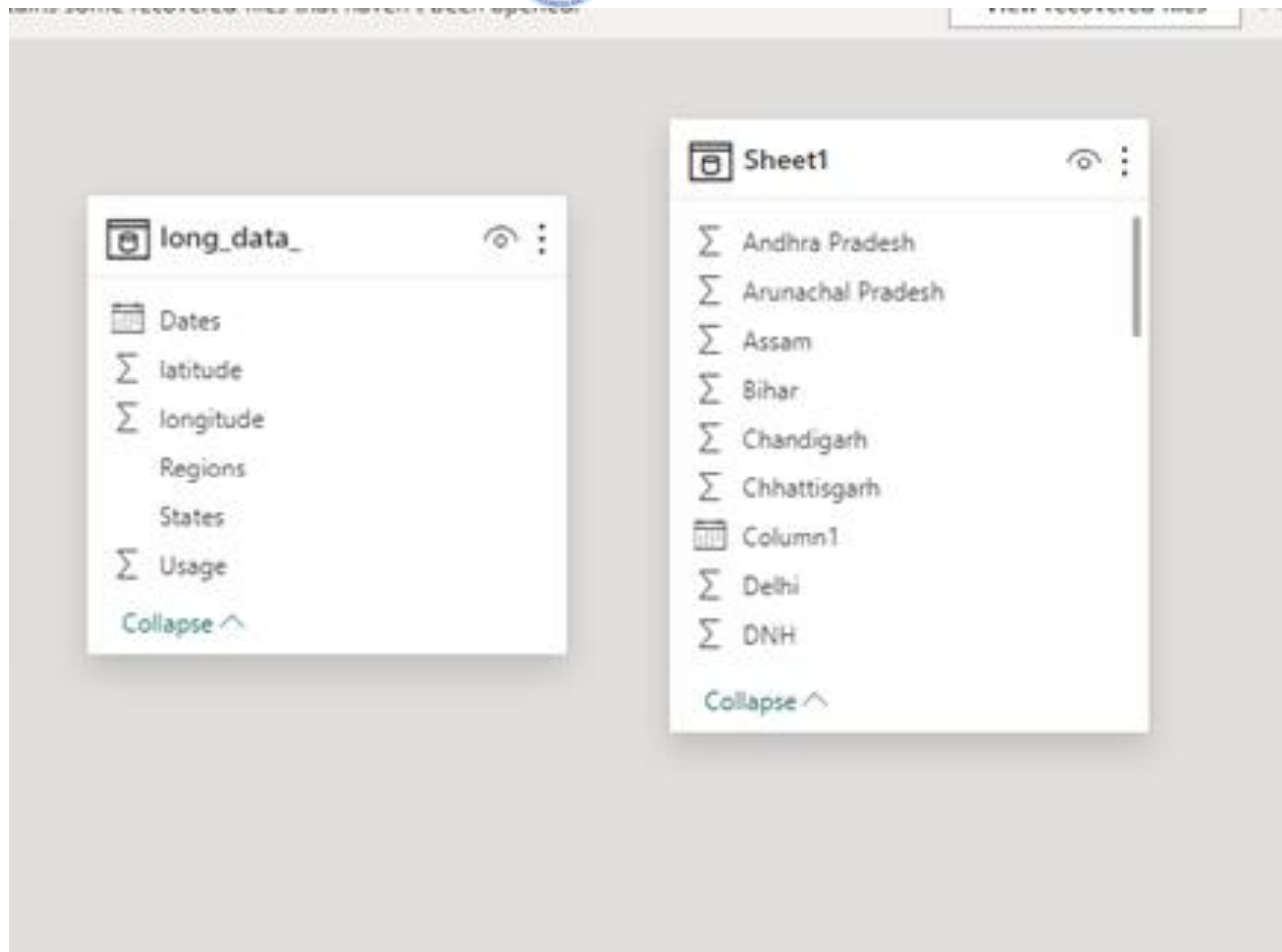
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Regions

States

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Navigator

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- Analysis of Commercial Electricity Consumption...
- ☒ long_data_
- ☐ Sheet1

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States	Regions	latitude	longitude	Dates
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- ☒ Sheet1

Sheet1

Column1	Punjab	Haryana	Rajasthan	Delhi	UP
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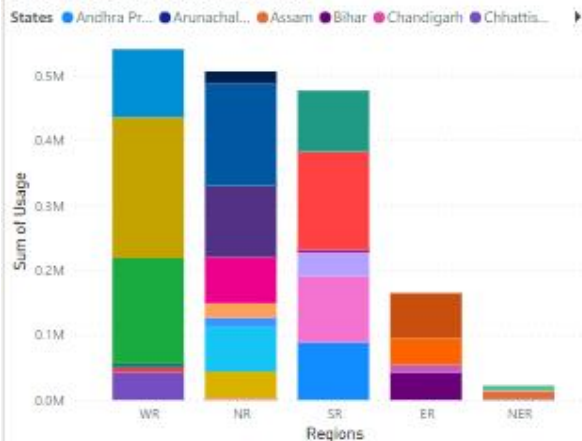






Dashboard

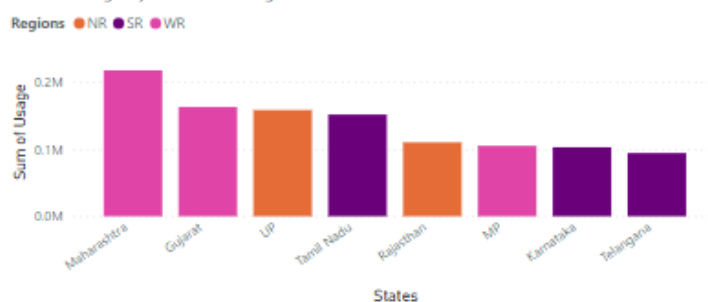
Sum of Usage by Regions and States



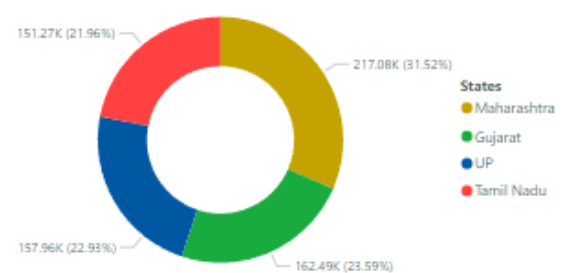
Sum of Usage by Regions, latitude and longitude



Sum of Usage by States and Regions



Sum of Usage by States and Regions



CONCLUSION

After conducting a comprehensive analysis of commercial electricity consumption in the selected Indian state using data analytics with data sourced from cloud/web platforms, it is evident that several key patterns and trends emerge. The analysis reveals distinct seasonal variations in consumption, with notable peaks during periods of economic activity and industrial production.

Additionally, certain geographic regions within the state exhibit higher consumption rates, likely influenced by factors such as urbanization, industrial development, and infrastructure availability. Furthermore, the study highlights the importance of proactive energy management strategies, including demand-side management initiatives and investment in renewable energy infrastructure, to ensure sustainable electricity usage and mitigate potential supply constraints. Overall, these insights underscore the significance of leveraging data-driven approaches to optimize commercial electricity consumption and drive towards a more resilient and efficient energy ecosystem in the state.

FUTURESCOPE

Looking ahead, there are several promising avenues for further exploration and enhancement of the analysis of commercial electricity consumption in the Indian state leveraging data analytics and cloud/web-based data sources. Future research could delve deeper into granular sub-sector analysis to identify specific industries or business categories driving electricity demand and develop targeted energy efficiency measures tailored to their unique requirements. Additionally, integrating real-time data streams and advanced predictive analytics techniques can enable proactive demand forecasting and optimization, empowering stakeholders to anticipate and respond to fluctuations in electricity usage more effectively. Furthermore, exploring the intersection of emerging technologies such as Internet of Things devices and smart meters with data analytics holds immense potential for enabling finer-grained monitoring and control of electricity consumption at the commercial level, paving the way for more agile and sustainable energy management practices in the state.

REFERENCES

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

LINK

<https://github.com/githubtraining/hellogitworld.git>