Tech Saksham

Case Study Report

Data Analytics with Power BI

Analysis of Commercial Electricity consumption in Indian state

"APC Mahalaxmi College for women "

NM ID	NAME
D5A0647791396E4BF444 C79BBEF11243	S.Sopana

Trainer Name :R.Umamaheswari

Master Trainer:R.Umamaheswari

ABSTRACT

This study employs data analytics techniques to investigate commercial electricity consumption patterns within an Indian state. Utilizing data sourced from cloud/web repositories, we explore various factors influencing commercial electricity usage, such as economic indicators, seasonal variations, and regulatory policies. Through descriptive and predictive analytics, we aim to discern consumption trends, identify anomalies, and propose insights to inform policy decisions and promote sustainable energy practices. This analysis contributes to a deeper understanding of commercial electricity usage dynamics in the Indian context, offering valuable implications for energy management strategies and resource allocation.

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CHAPTER 1

INTRODUCTION

- **Problem Statement**

The analysis aims to investigate commercial electricity consumption patterns within a specific Indian state by leveraging data analytics techniques applied to cloud-based or web-accessible datasets. The goal is to identify key trends, peak usage periods, factors influencing consumption fluctuations, and potential areas for optimization or efficiency improvements. By scrutinizing historical consumption data alongside external factors such as economic indicators, population growth, and industrial activities, the analysis seeks to provide actionable insights for policymakers, utility providers, and commercial stakeholders to enhance energy management strategies, foster sustainable development, and mitigate potential challenges related to electricity supply and demand imbalance within the state.

- **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. Beginning with data collection from reputable sources such as government agencies and utility providers, the data will be preprocessed to ensure accuracy and uniformity. Exploratory data analysis will uncover patterns and trends, while time series analysis will reveal seasonality and forecast future consumption. Segmentation and clustering will identify distinct consumer groups, and predictive modeling will provide insights into consumption patterns. 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**
- **Enchance Resource Management :** Data analytics enables precise monitoring and allocation of electricity resources, facilitating targeted investments and interventions to meet varying demand across different commercial sectors. This optimizes resource utilization and minimizes wastage, leading to cost savings and improved service reliability.

- **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**

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 :** Utilize web scraping or API services to gather electricity consumption data from various commercial establishments across different sectors in the Indian state. 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 :** Utilize machine learning algorithms such as regression analysis or time series forecasting to predict future trends in commercial electricity consumption based on historical data. This can help policymakers, utility companies, and businesses in the state to plan and allocate resources more effectively, optimize energy usage, and develop strategies for sustainability and cost reduction.

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** .

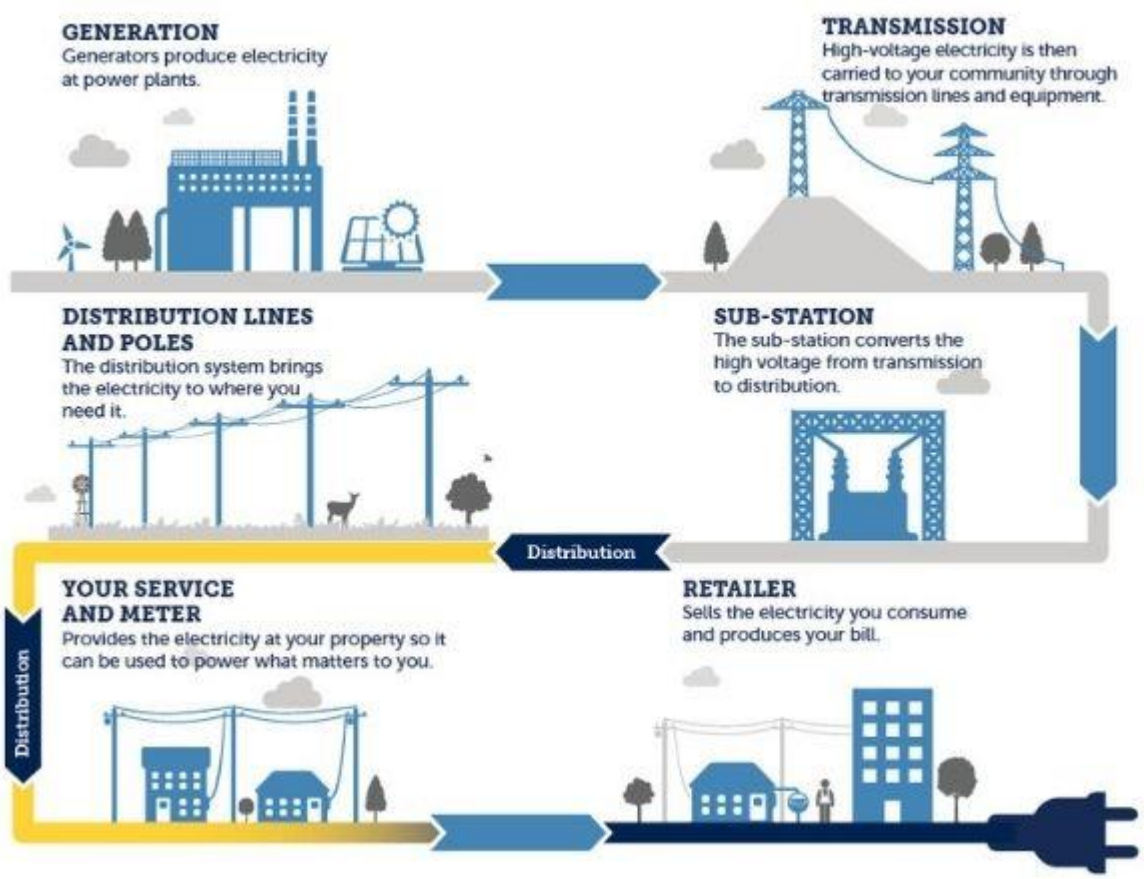
- **PowerBi service : This is an online SaaS service that you use to publish reports ,create new dashboards, and share insights.**

- Powerbi Mobile :This is a mobile application that you can use to accesss your reports and dashboards on the go

CHAPTER 3

PROJECT ARCHITECTURE

3.1 Architecture



Data Analytics Architecture for Commercial Electricity Consumption in Indian State:

- **Data collection :** Gather data from cloud/web sources including government databases, utility companies, and IoT devices.

- **Data Preprocessing :** Cleanse and preprocess the data to handle missing values, outliers, and inconsistencies.

- **Data Storage :** Store the processed data in a scalable and efficient data storage system such as a data warehouse or data lake.

- **Data integration :** Integrate data from multiple sources to create a comprehensive dataset for analysis.

- **Analysis and Modeling :** Utilize machine learning and statistical techniques to analyze the data and build predictive models.

- **Visualization :** Create visualizations such as charts, graphs, and maps to present insights and trends in electricity consumption.

- **Interpretation :** Interpret the results of the analysis to understand patterns, identify consumption drivers, and inform decision-making.

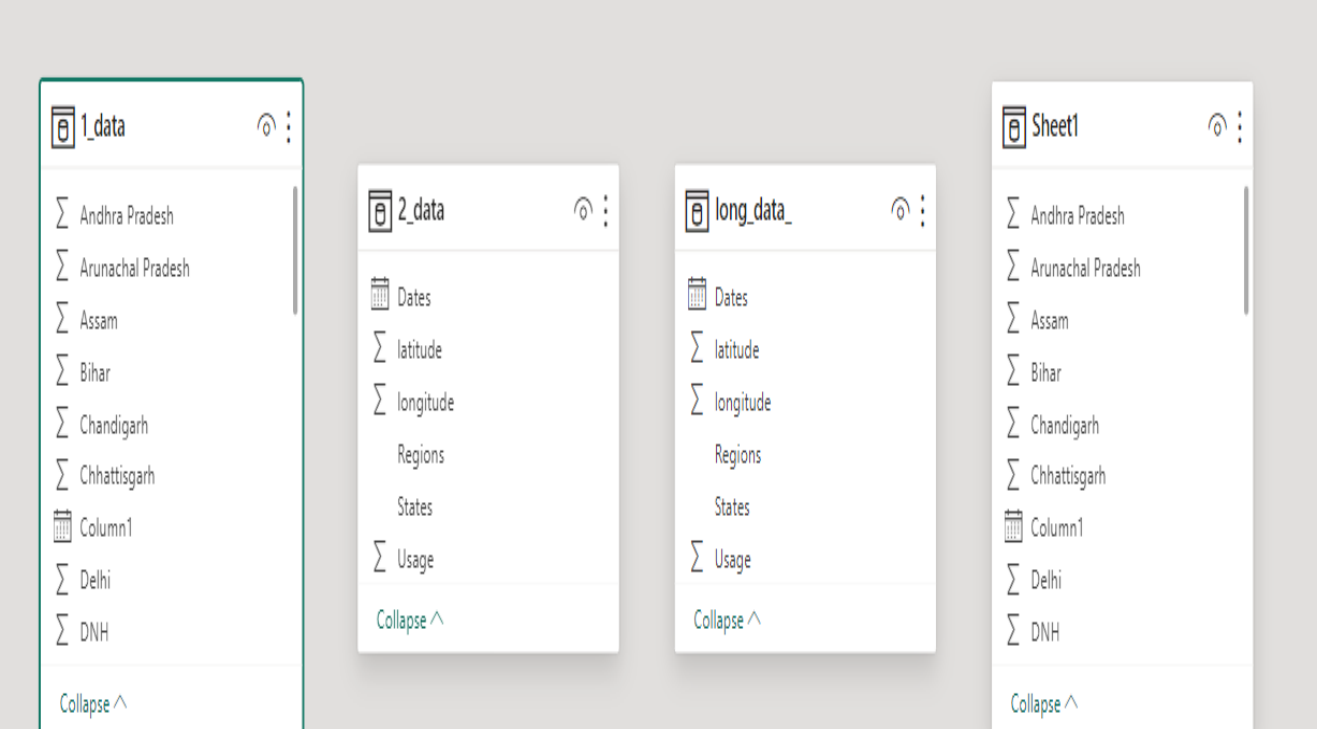
- **Reporting and Deployment :** Generate reports and deploy the analytics solution for stakeholders to use in optimizing electricity consumption strategies.

CHAPTER 4

MODELING AND RESULT

Manage relationship

Analyzing commercial electricity consumption in an Indian state requires leveraging data analytics techinques with datasets sourced from cloud based platforms or web repositories. Firstly, establishing a robust data pipeline is crucial, ensuring seamless extraction , transformation .,and loading processes to handle large volumes of heterogeneous data efficiency



1_data

Column1	Punjab	Haryana	Rajasthan	Delhi	UP	Uttarakhand	HP	J&K	Chandigarh
03-01-2019 00:00:00	121.9	133.5	240.2	85.5	311.8	39.3	30.1	54.1	4
04-01-2019 00:00:00	118.8	128.2	239.8	83.5	320.7	38.1	30.1	53.2	4
05-01-2019 00:00:00	121	127.5	239.1	79.2	299	39.2	30.2	51.5	4

2_data

States	Regions	latitude	longitude	Dates	Usage
UP	NR	27.59998069	78.05000565	02-01-2019 00:00:00	313.9
UP	NR	27.59998069	78.05000565	03-01-2019 00:00:00	311.8
UP	NR	27.59998069	78.05000565	04-01-2019 00:00:00	320.7

2_data

Preview downloaded on Tuesday

States	Regions	latitude	longitude	Dates
Punjab	NR	31.51997398	75.98000281	02-01-201
Haryana	NR	28.45000633	77.01999101	02-01-201
Rajasthan	NR	26.44999921	74.63998124	02-01-201
Delhi	NR	28.6699929	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
Chandigarh	NR	30.71999697	76.78000565	02-01-201
Chhattisgarh	WR	22.09042035	82.15998734	02-01-201
Gujarat	WR	22.2587	71.1924	02-01-201
MP	WR	21.30039105	76.13001949	02-01-201
Maharashtra	WR	19.25023195	73.16017493	02-01-201
Goa	WR	15.491997	73.81800065	02-01-201
DNH	WR	20.26657819	73.0166178	02-01-201
Andhra Pradesh	SR	14.7504291	78.57002559	02-01-201
Telangana	SR	18.1124	79.0193	02-01-201
Karnataka	SR	12.57038129	76.91999711	02-01-201
Kerala	SR	8.900372741	76.56999263	02-01-201

1_data

Preview downloaded on Tuesday

Column1	Punjab	Haryana	Rajasthan	Delhi	UP
02-01-2019 00:00:00	119.9	130.3	234.1	85.8	313.9
03-01-2019 00:00:00	121.9	133.5	240.2	85.5	311.8
04-01-2019 00:00:00	118.8	128.2	239.8	83.5	320.7
05-01-2019 00:00:00	121	127.5	239.1	79.2	299
06-01-2019 00:00:00	121.4	132.6	240.4	76.6	286.8
07-01-2019 00:00:00	118	132.1	241.9	71.1	294.2
08-01-2019 00:00:00	107.5	121.4	237.2	69	289.4
09-01-2019 00:00:00	132.5	148.2	197	89.2	258.6
10-01-2019 00:00:00	131.5	157	199.9	92.8	284.2
11-01-2019 00:00:00	130.3	145.3	187.7	79.5	281.4
12-01-2019 00:00:00	137.9	151.9	189.9	92.6	298.6
13-01-2019 00:00:00	135.8	141.4	186.9	89.4	310
14-01-2019 00:00:00	139.3	143.8	195.2	82.2	319.5
15-01-2019 00:00:00	141.1	142.9	185.4	77.8	326.7

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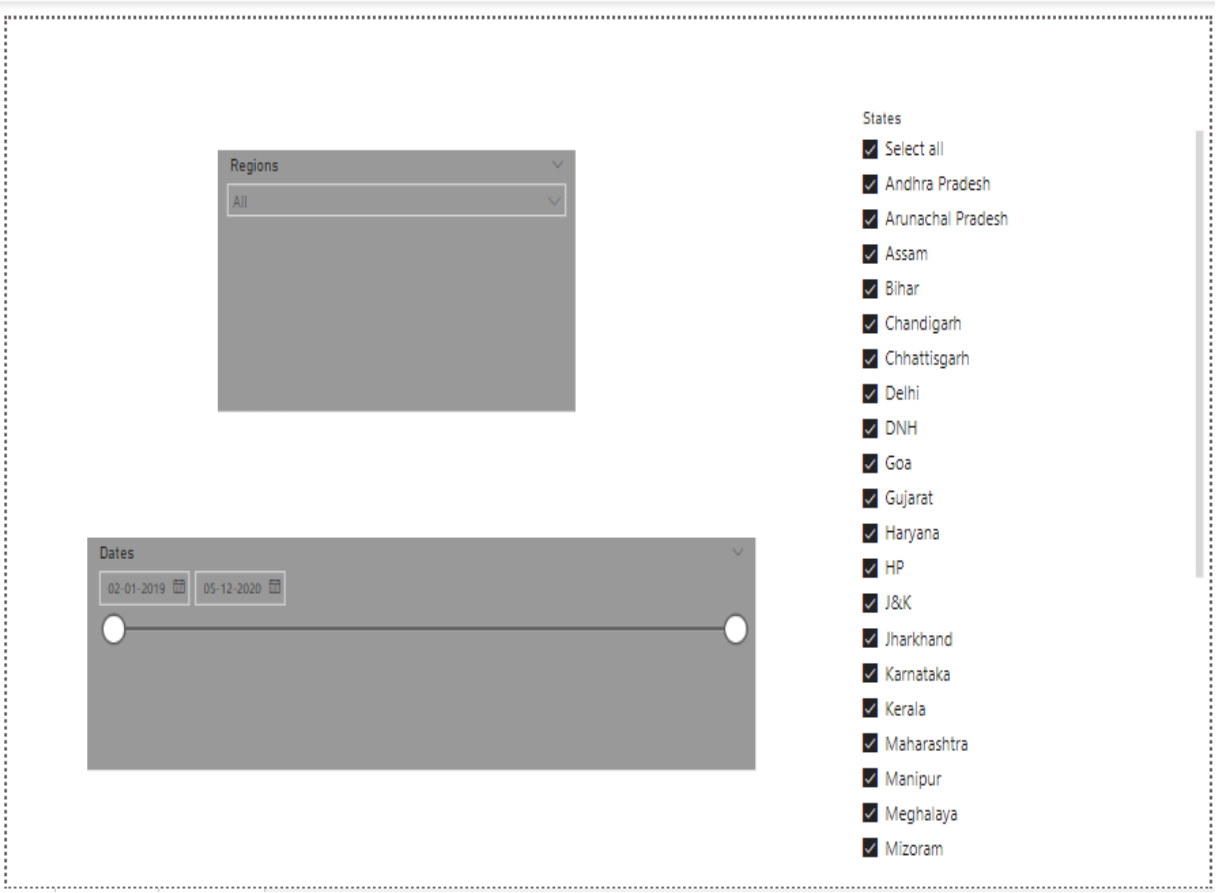
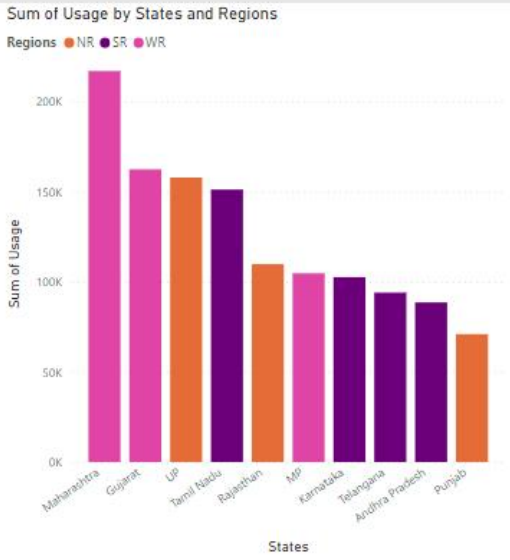
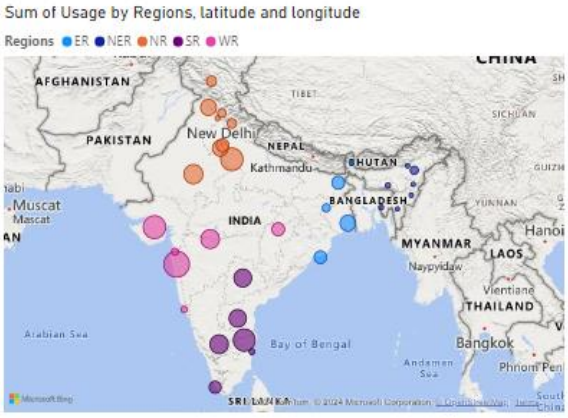
Next employing advanced analytics methodogies such as machine learing algorithms or time series analysis can unveil insights into consumption patterns, peak demand periods, and potential areas for efficiency improvements

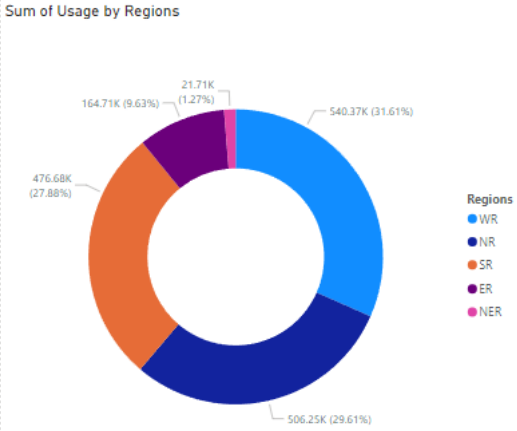
Dashboard

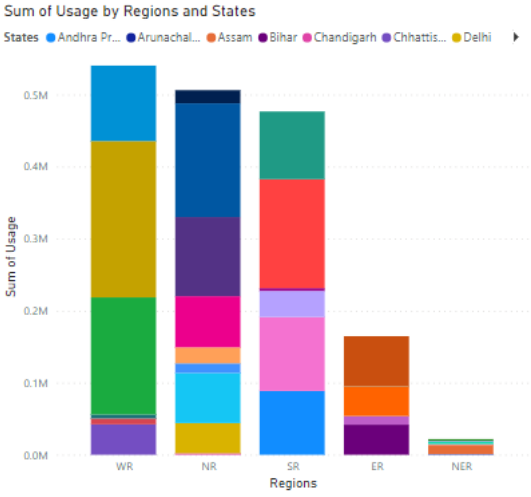


ANALYSIS OF COMMERCIAL ELECTRICITY CONSUMPTION IN INDIAN STATE (DATA ANALYTICS WITH DATA FROM CLOUD /WEB)









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.

FUTURE SCOPE

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 (IoT) 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://en.wikipedia.org/wiki/Electricity_sector_in_India

LINK

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

