Tech Saksham

Case Study Report

Data Analytics with Power BI

"Analysis of Commercial Electricity Consumption in Indian State"

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ABSTRACT

India's energy sector is one of the most critcal components of an infrastructure that affects India's economic growth and there fore is also one of the largest industries in India. India has the 5th largest electricity generating capacity and is the 6th largest energy consumer amounting for around 3.4% of global energy consumption. India's energy demand has grown at 3.6% pa over thevpast 30 years. The consumption of the energy is directly proportional to the progress of manpower with ever growing population, improvement in the living standard of the humanity and industrialization of the devloping contries. Very recently smart grid technology can attribute important role in energy scenario. Smart gird refers to electic power system that enhances gird reliability and efficiency by automatically responding to system disturbances. This paper discusses the new communication infrastructure and scheme designed to integrating and scheme designed integrate data.

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CHAPTER 1

INTRODUCTION

1.1 Problem Statement

In general, industrial and commerical consumers subsidize domestic and agricultural consumers. Government give awayas such as free electricity for farmers, created partly to curry political favor, have depeleted the cash resrves of state-run electricity-distribution system and led to debts of 2.5 trillion. This has financially crippled the distribution network, and its ability to pay to purchase power in the absence of sobsidies from state governments. This situation has been worsened by state government department that do not pay their electricity bills.

1.2 Proposed Solution

Consumption trends of natural gas shows from 2008 onwards fluctuate status but 2011th result brought high 51.25 consumption ratia the reason for to petroleum and coal price. While these price increase demand for natural gas also will be increased because country India has lack of sources to produce for fullfill its demestic needs. For decline its consumption only because of necassities of alternative energy like coal, LPG and kerosene.

1.3 Feature

- **Real-Time Analysis: The dashboard will provide real-time analysis of customer data.**
- **Customer Segmentation: It will segment customers based on various parameters like , states, regions, latitude,etc.**
- **Trend Analysis: The dashboard will identify and display trends in customer behavior.**
- **Predictive Analysis: It will use historical data to predict future customer behavior.**

1.4 Advantages

Energy Savings: Perhas the most obvious benefit of a commercial energy consumption analysis lies in itss potential to protect your bottom line. By analyzing a building's energy from the inside out, using the latest technologies and innovative soltuions, a comprehensive energy analysis can significantly reduce utility bills. Brand Values: Beyond monetary savings and operational inprovements, "green" buildings with energy efficient practices can help to improve brand recognition and customer/employee loyalty. The intangible benefits of a sustainable business image can also improve indoor air quality, ultimattely improving buildig occupant comfort levels and productivity.

1.5 Scope

India seeks greater energy efficiency and there is a growing market for technology and services that can help deliver it. Energy is one India's most dynamic consumptions and opportunities will evolve rapidly in renewables, energy technologies and power infrastructure. Energy conversation can be achieved in two different ways that include reducing the amount of primary energy consumed to supply the useful energy requrement (energy efficiency), and Reducing the end point use of nonessential energy.

CHAPTER 2

SERVICES AND TOOLS REQUIRED

2.1 Services Used

- **Data Collection and Storage Services: Electricity 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:

- **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:

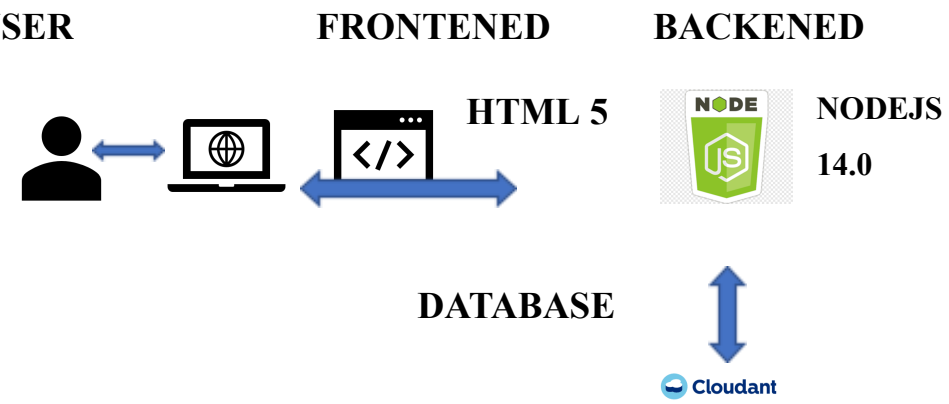
- **PowerBI Desktop: This is a Windows application that you can use to create reports and publish them to PowerBI.**

- **PowerBI Service: This is an online SaaS (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



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.

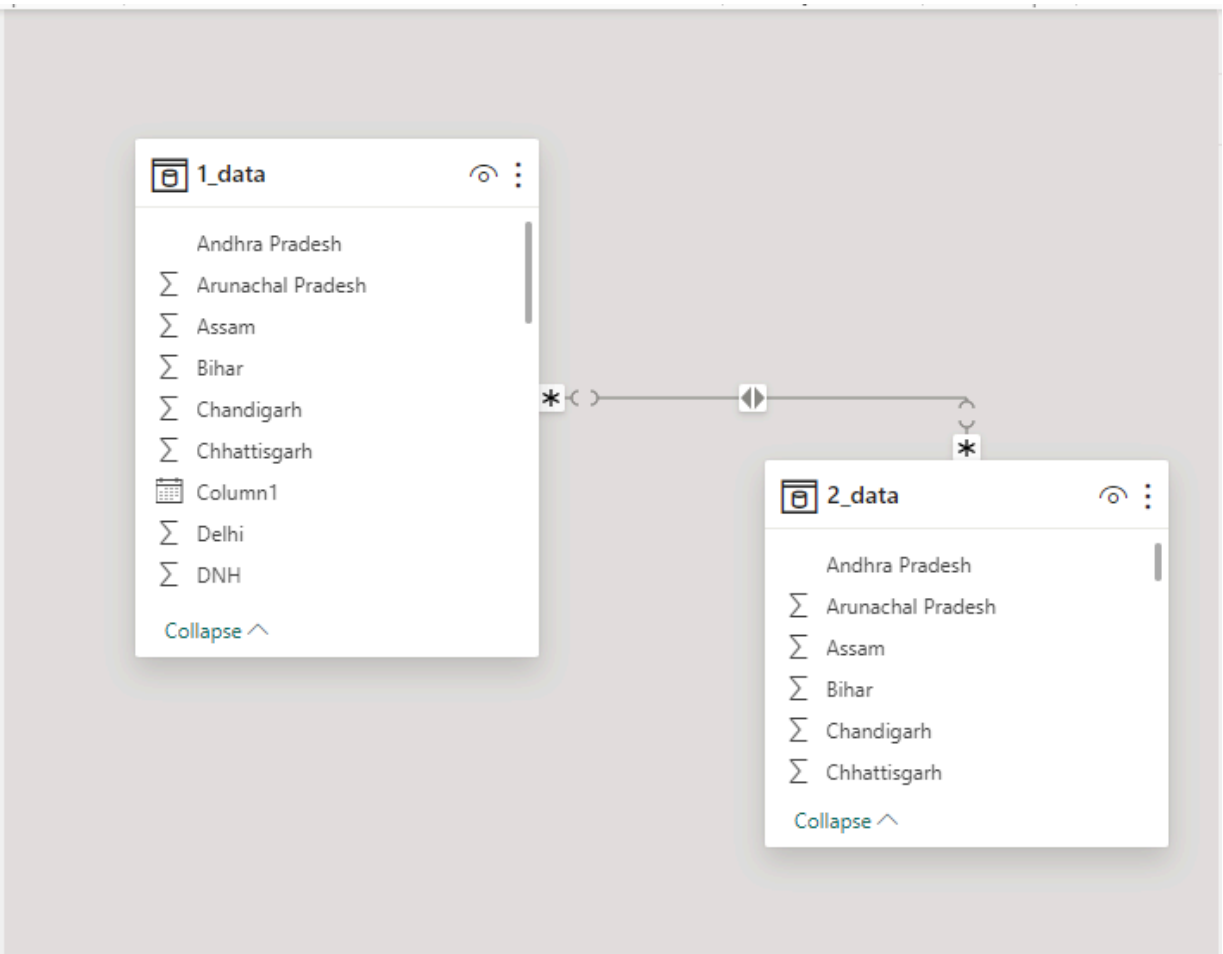
CHAPTER 4

MODELING AND RESULT

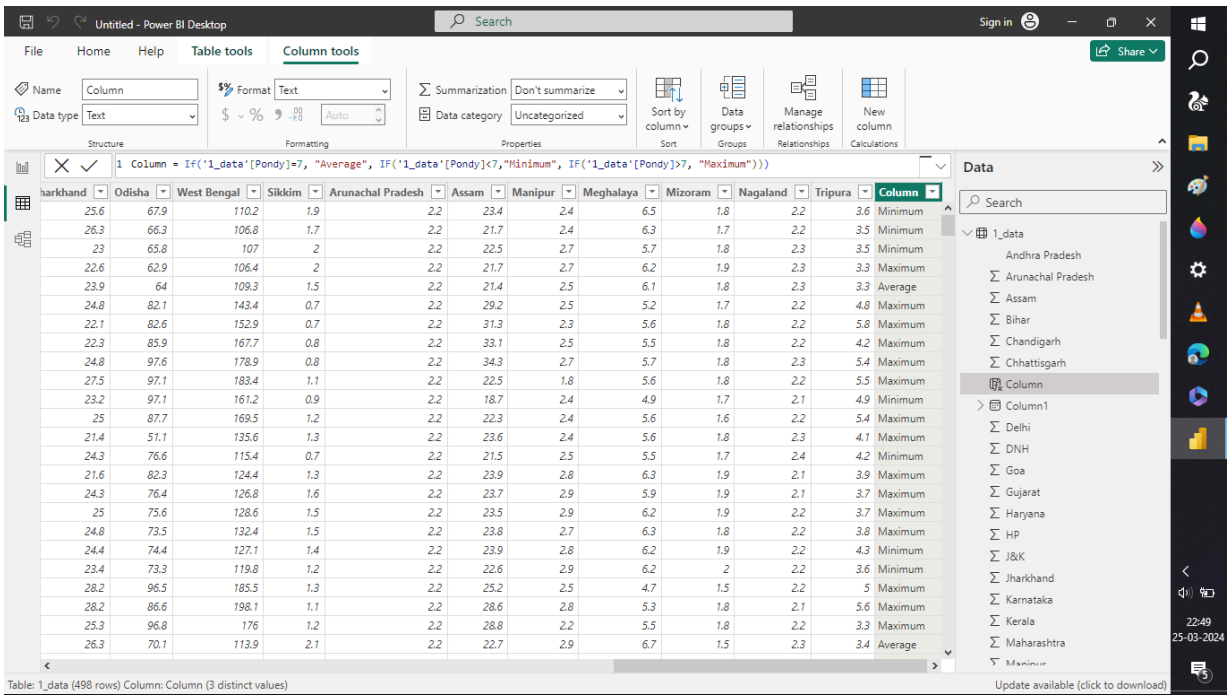
Manage relationship

The "long data" file will be used as the main connector as it contains most key identifier (states, regions) which can be use to relates the 2 data files

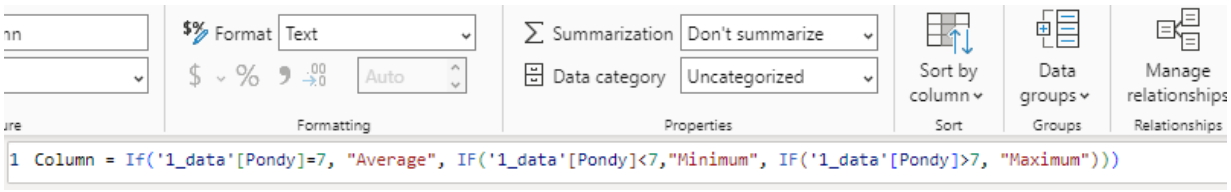
together. The State data file is use to link the client profile geographically with states.



In the above map there is a relationship between the states like Arunachal Pradesh and Bihar,etc.

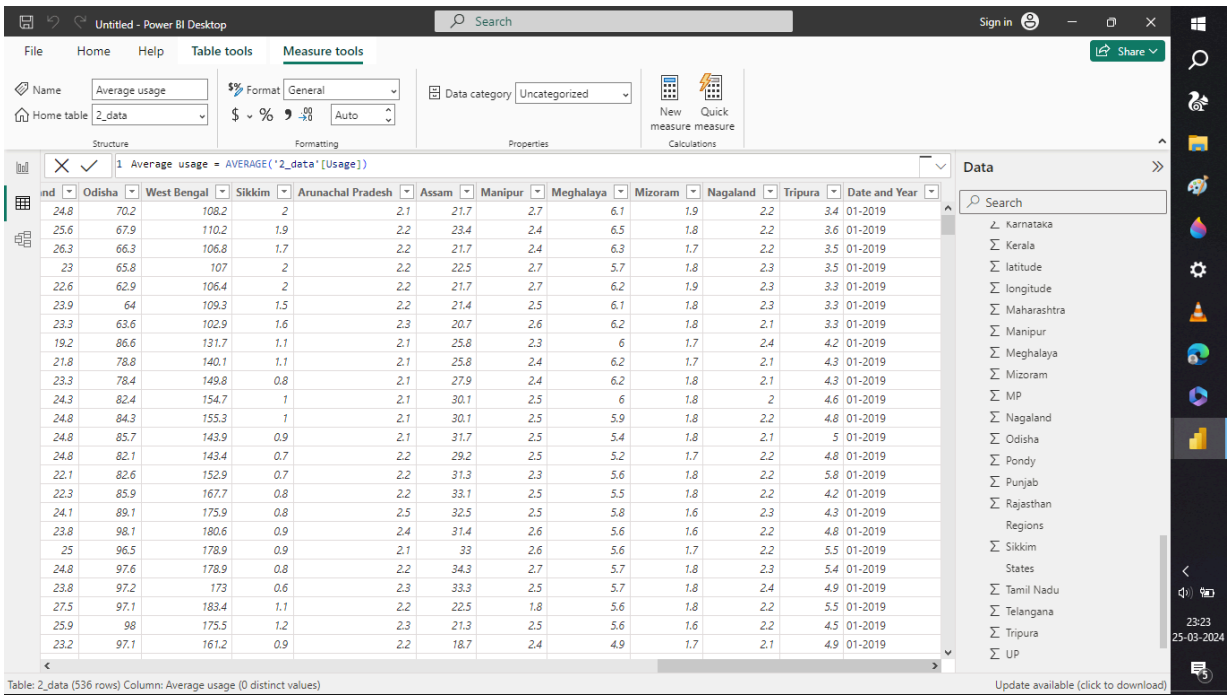


Adding a new column by the state Pondy and for that giving the formula as

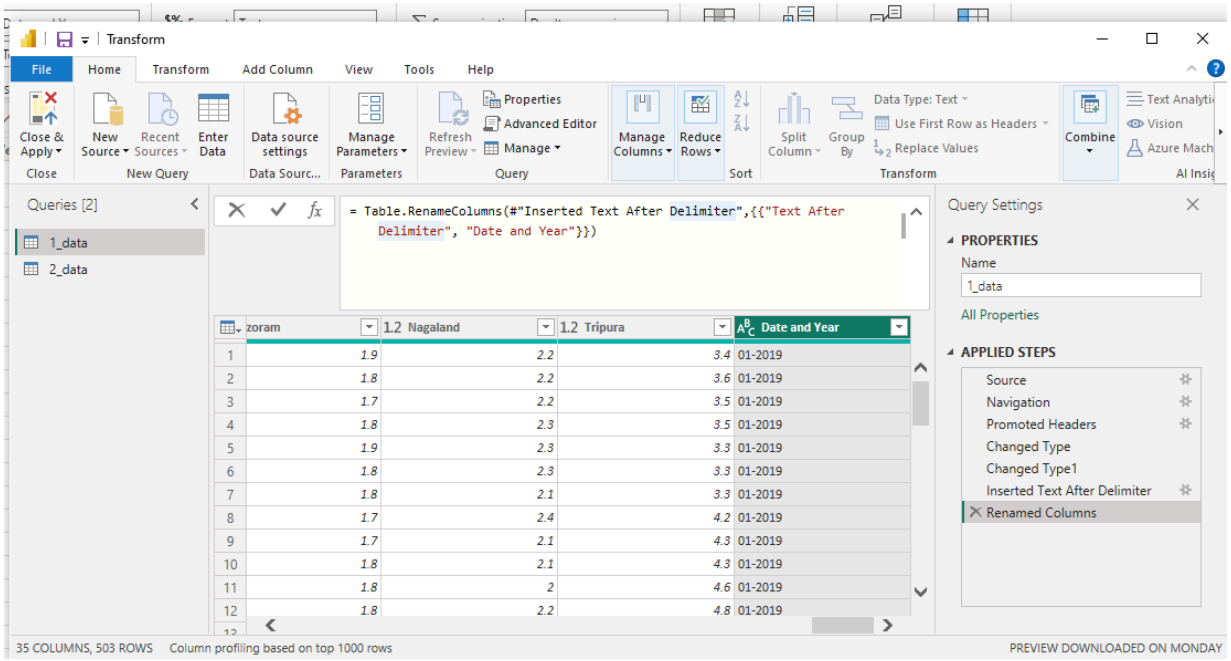


then we get a new column with the new values.

Next, we have to change the column with dates and time to dates only in the power query editor. Then we have to extract the date as date and year in the last column.



and the formula for the extraction of the table is given by

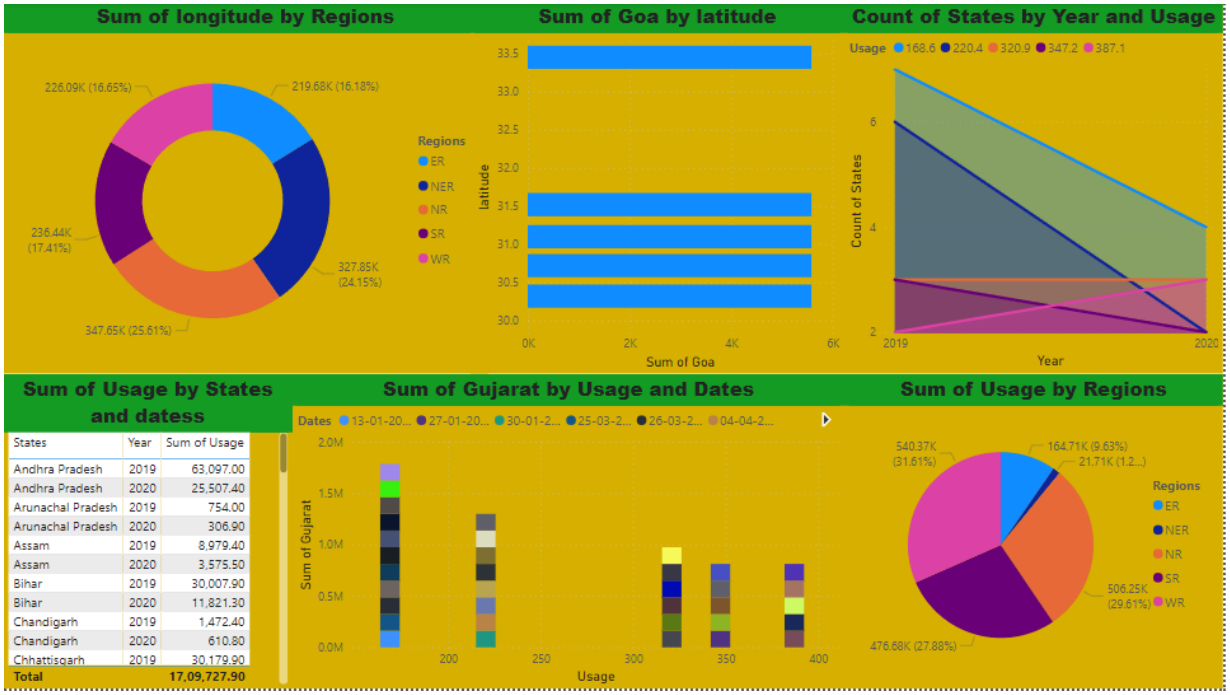


Modeling for Sum of usage data:

For the sum of usage by states graph, we drag the sum of usage data in the x-axis and drag the states data in the y-axis.

Applying the filter to the su of usage for the graph we get the top ten states which has been using most of the electricity.

Dashboard



CONCLUSION

As growth of industries increase power demand increase to limit the demand and cut energy bill get more output with maximum efficiency we need constant change in our consumption power system by adding new energy efficient technology. For that first identify over consumption and study optimum efficient technology with advance payback with great efficiency and reliability. From the careful study, use of different references and the observation obtained, the following salient conclusion can be drawn regarding the overall performance of the proposed work that has been presented in this project. In case study considerable energy saving can be achieved by two ways By reducing the requirement of elctrical energy By reducing the cost of energy with load management techniques without compromising the quality output. Total annual energy saving can be achieved arround 10% of total energy consumption.

FUTURE SCOPE

The future scope of this project is vast. With the advent of advanced analytics and machine learning, PowerBI can be leveraged to predict future trends based on historical data. Integrating these predictive analytics into the project could enable the Electricity Department to anticipate customer needs and proactively offer solutions. Furthermore, PowerBI's capability to integrate with various data sources opens up the possibility of incoporating more diverse datasets for a more holistic view of customers. 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 customer 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 transform the way Electricity Departments interact with their customers, leading to improved customer satisfaction and loyalty.

REFERENCES

https://www.researchgate.net/publication/354401757_A_Study_on_Major_Commercial_Energy_Consumption_in_India

LINKS

