Tech Saksham

Case Study Report

Data Analytics with Power BI

“Analysis of Commercial Electricity Consumption in Indian States”

“A.P.C.Mahalaxmi College for Women ”

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ABSTRACT

This work explains how to analyze the aggregate electricity consumption of many consumers, and extract key components such as heating, ventilation and air conditioning (HVAC), residential lighting, and street lighting consumption from the total consumption. To avoid explicit modeling of dependencies on time of day and on working versus non-working days, least-squares fitting for outside temperature and natural illumination dependency proceeds independently for each hour of the day. Cubic polynomials model dependencies on Steadman apparent temperature and on log-scale illumination, but spline surfaces are best when considering these variables jointly. The primary focus is on residential consumption, but the same techniques can be used for studying street lighting, commercial and industrial consumption.

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CHAPTER 1

INTRODUCTION

1.1 Problem Statement

Large-scale power systems are normally composed of interconnectedsubsystems or simply control areas. The connection between the control areas isdone using tie lines. Each area has its own generator or group of generators andit is responsible for its own load and scheduled interchanges with neighboringareas. Any power system works under the condition that Generation plusTransmission losses must equal to the connected load at rated frequency.Because loading of a given power system is never constant and varies time bytime and, therefore, to ensure the quality of power supply, to increase systemperformance and stability for the satisfactory and stable operation of power system with sudden area load changes, a load frequency controller is needed tomaintain the system frequency at the desired nominal value.

1.2 Proposed Solution

. In addition to energy storage systems and distributed generators, many methods can be used to solve power quality problems. Using the right interface devices, the load can be isolated from network-related anomalies. In addition, a number of power-up devices have been developed to protect the components included in the system from the adverse effects of power failures. These developed devices play a crucial role in developing an effective power quality strategy.

1.3 Feature

The analysis of the load composition and characteristics of the power system is an important aspect of the power market analysis work, and it is also an important basis for power supply planning, peaking

planning and power balance analysis. Commercial and public building power loads are an important part of the power system load

1.4 Advantages

Commercial power load mainly refers to the sum of the electrical loads of various electrical equipment in commercial buildings. According to the functional classification, commercial buildings mainly include the following types: more than ten types of functions such as shopping malls, office buildings and hotels. Its main load includes: air conditioning, lighting, elevators, ventilation equipment, water heaters, office appliances, cooking appliances and so on**.**

1.5.scope

Their main loads include: lighting, ventilation, and office appliances. In the past, due to the insufficiently developed acquisition, measurement, and storage technologies, it was not possible to accurately collect electricity load conditions for various types of buildings. In recent years, with the rapid development of computer technology, various areas of the electricity consumption information collection system have been widely used.

CHAPTER 2

SERVICES AND TOOLS REQUIRED

2.1 Services Used

shows the daily average temperature and daily maximum load of a warehouse on working days and non-working days. It can be seen that on the working day, when the average temperature on the day is between 5-20 degrees Celsius, the temperature has no effect on the daily maximum load. When the average temperature on the day is greater than 20 degrees Celsius, the temperature and daily maximum load show a linear and increasing relationship. On non-working days, between 0-20 degrees Celsius, part of daily maximum load has no relation with temperature change, and some daily maximum load has a linearly decreasing relationship with temperature

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.

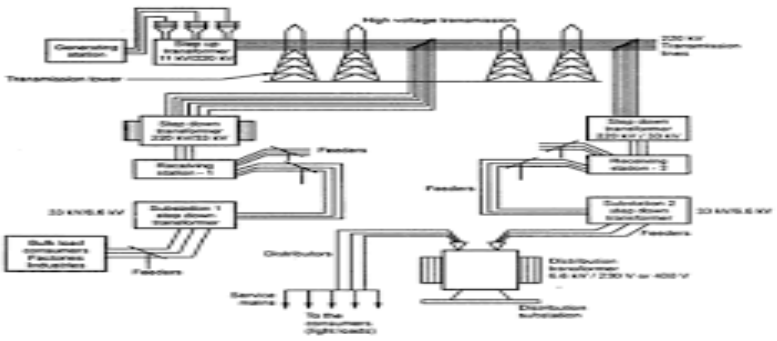
- **PowerBI Service**: This is an online SaaS (Software as a Service) service that you use to publish reports, create new dashboards, and share insights.

- **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



Solar Energy Integration: The Edge boasts a large rooftop solar panel array that generates a significant portion of the building's energy needs.
Smart Building Technologies: The Edge incorporates intelligent building systems that optimize energy use.
Energy Storage: While not extensively detailed in public records, The Edge likely incorporates energy storage systems, such as batteries, to store excess energy generated by the solar panels.
Smart Metering and Monitoring: Smart metering technologies are likely utilized to monitor energy consumption in real time.

1. **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.
2. **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.

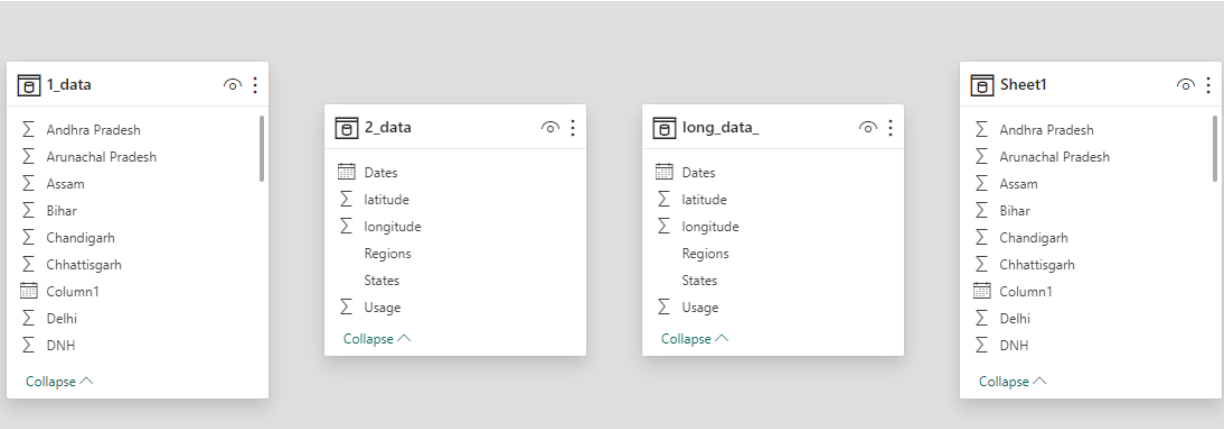
CHAPTER 4

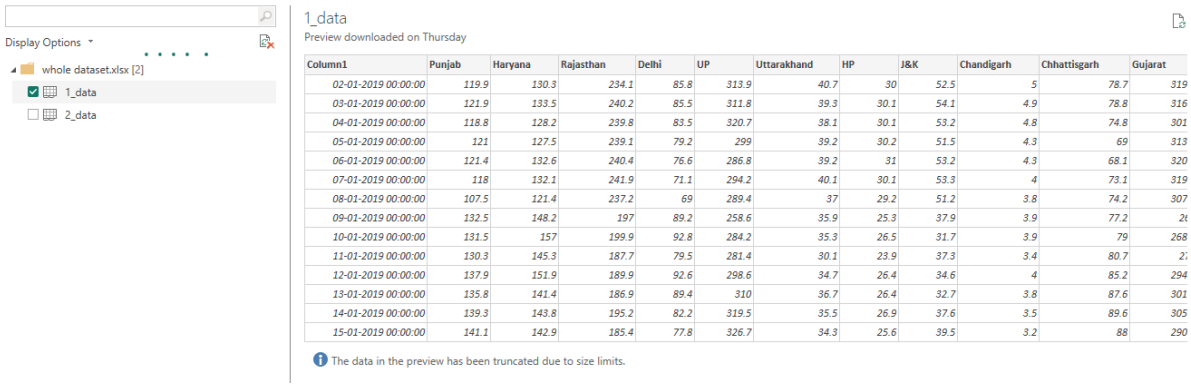
MODELING AND RESULT

Manage relationship

On longer timescales, challenges related to VRES integration include identifying pathways to a renewable and emission free energy system, assessing different scenarios and testing the effect of various policies. For example by assessing the impact of a carbon tax, the future evolution of electricity and fuel prices or how much the demand of energy is going to increase due to population growth and increased standard of living. Due to the long investment cycles in the energy sector, such analyses usually cover a time span of several decades [9]. Technological possibilities for more geographically distributed energy production and better control systems

suggest that the development of energy production, storage and distribution systems in the near future may depend more on consumer or prosumer preferences and multi-level governance in addition to planning and optimisation on a national level. Business opportunities arising from periodically low electricity prices can stimulate new technologies and reduce curtailment. It is suggested that such factors may be relevant to include in scenario from periodically low electricity prices can stimulate new technologies and reduce curtailment. It is suggested that such factor





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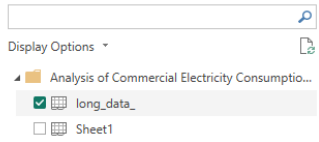
03-01-2019 00:00:00	121.9	133.5	240.2	85.5	311.8	39.3	30.1	54.1	4.9	78.8	316
04-01-2019 00:00:00	118.8	128.2	239.8	83.5	320.7	38.1	30.1	53.2	4.8	74.8	301
05-01-2019 00:00:00	121	127.5	239.1	79.2	299	39.2	30.2	51.5	4.3	69	313
06-01-2019 00:00:00	121.4	132.6	240.4	76.6	286.8	39.2	31	53.2	4.3	68.1	320
07-01-2019 00:00:00	118	132.1	241.9	71.1	294.2	40.1	30.1	53.3	4	73.1	319
08-01-2019 00:00:00	107.5	121.4	237.2	69	289.4	37	29.2	51.2	3.8	74.2	307
09-01-2019 00:00:00	132.5	148.2	197	89.2	258.6	35.9	25.3	37.9	3.9	77.2	2(
10-01-2019 00:00:00	131.5	157	199.9	92.8	284.2	35.3	26.5	31.7	3.9	79	268
11-01-2019 00:00:00	130.3	145.3	187.7	79.5	281.4	30.1	23.9	37.3	3.4	80.7	2:
12-01-2019 00:00:00	137.9	151.9	189.9	92.6	298.6	34.7	26.4	34.6	4	85.2	294
13-01-2019 00:00:00	135.8	141.4	186.9	89.4	310	36.7	26.4	32.7	3.8	87.6	301
14-01-2019 00:00:00	139.3	143.8	195.2	82.2	319.5	35.5	26.9	37.6	3.5	89.6	305
15-01-2019 00:00:00	141.1	142.9	185.4	77.8	326.7	34.3	25.6	39.5	3.2	88	290



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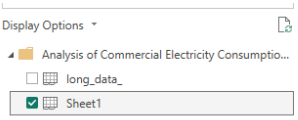
Preview downloaded on Thursday

States	Regions	latitude	longitude	Dates	Usage
Punjab	NR	31.51997398	75.98000281	02-01-2019 00:00:00	119.9
Haryana	NR	28.45000633	77.01999101	02-01-2019 00:00:00	130.3
Rajasthan	NR	26.44999921	74.63998124	02-01-2019 00:00:00	234.1
Delhi	NR	28.6699929	77.23000403	02-01-2019 00:00:00	85.8
UP	NR	27.59998069	78.05000565	02-01-2019 00:00:00	313.9
Uttarakhand	NR	30.32040895	78.05000565	02-01-2019 00:00:00	40.7
HP	NR	31.10002545	77.16659704	02-01-2019 00:00:00	30
J&K	NR	33.45	76.24	02-01-2019 00:00:00	52.5
Chandigarh	NR	30.71999697	76.78000565	02-01-2019 00:00:00	5
Chhattisgarh	WR	22.09042035	82.15998734	02-01-2019 00:00:00	78.7
Gujarat	WR	22.2587	71.1924	02-01-2019 00:00:00	319.5
MP	WR	21.30039105	76.13001949	02-01-2019 00:00:00	253
Maharashtra	WR	19.25023195	73.16017493	02-01-2019 00:00:00	428.6
Goa	WR	15.491997	73.81800065	02-01-2019 00:00:00	12.8
DNH	WR	20.26657819	73.0166178	02-01-2019 00:00:00	18.6
Andhra Pradesh	SR	14.7504291	78.57002559	02-01-2019 00:00:00	164.6
Telangana	SR	18.1124	79.0193	02-01-2019 00:00:00	204.2
Karnataka	SR	12.57038129	76.91999711	02-01-2019 00:00:00	206.3
Kerala	SR	8.900372741	76.56999263	02-01-2019 00:00:00	72.7
Tamil Nadu	SR	12.92038576	79.15004187	02-01-2019 00:00:00	268.3
Pondy	SR	11.93499371	79.83000037	02-01-2019 00:00:00	6.3
Bihar	ER	25.78541445	87.4799727	02-01-2019 00:00:00	82.3
Jharkhand	ER	23.80039349	86.41998572	02-01-2019 00:00:00	24.8
Odisha	ER	19.82042971	85.90001746	02-01-2019 00:00:00	70.2
West Bengal	ER	22.58039044	88.32994665	02-01-2019 00:00:00	108.2



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Column1	Punjab	Haryana	Rajasthan	Delhi	UP	Uttarakhand	HP	J&K	Chandigarh	Chhattisgarh
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15-01-2019 00:00:00	141.1	142.9	185.4	77.8	326.7	34.3	25.6	39.5	3.2	88

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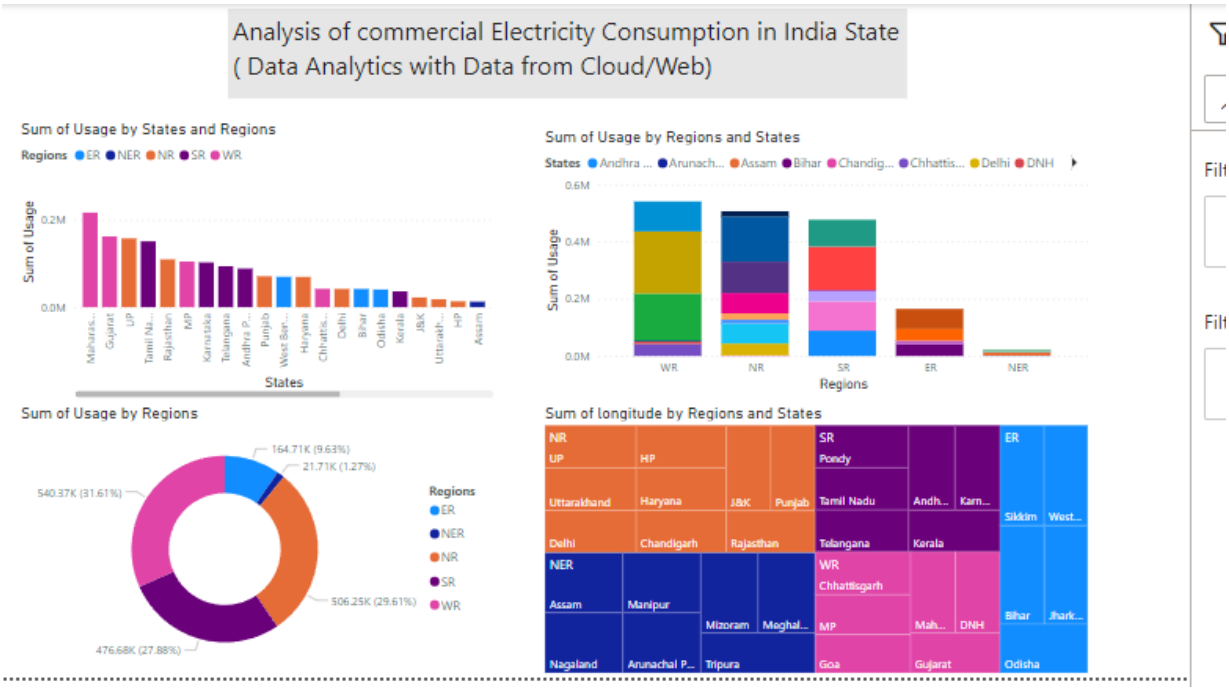
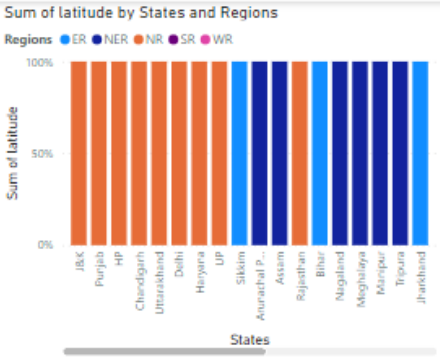
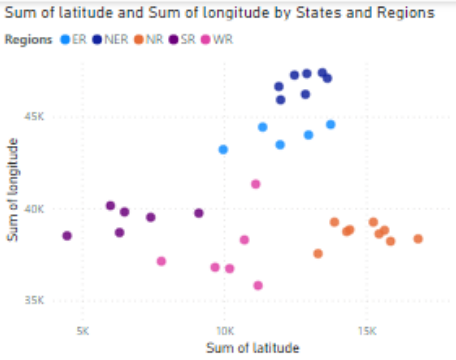
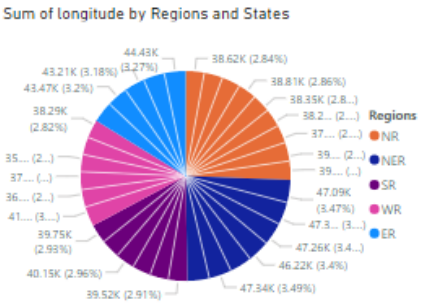
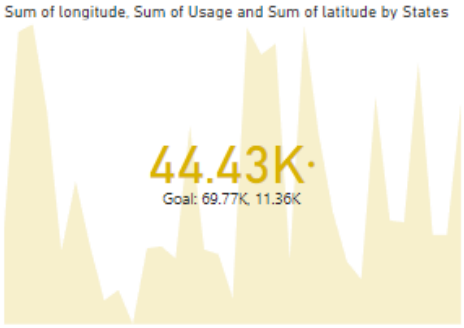
Dashboard











CONCLUSION

The aim of this project was to identify the variables that influence the generation, the consumption and the price of the electricity in United States.

We have seen that the generation of electricity in American states is driven by the number of commercial and industrial customers. Concerning the electricity consumption, it is influenced by the energy production itself and the amount of commercial customers. Our prediction models are quite accurate and confirmed the results of our exploratory data analysis. About our models, we should not forget that lots of variables can explain the electricity consumption and production as we have seen during the eploratory data analysis, but we only used the most significant ones.

For the structure of the electricity production, we have seen that the energy mix varies tremendously from one region to another and from one state to another. We cannot determine whether a mix defines the price per KWh or not. However, power generation using coal and hydropower is correlated with low energy costs. In addition, KWh prices will be higher for states belonging to the following regions

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 bank to anticipate customer needs and proactively offer solutions. Furthermore, PowerBI's capability to integrate with various data sources opens up the possibility of incorporating 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 banks interact with their customers, leading to improved customer satisfaction and loyalty.

REFERENCES

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

LINK

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

