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IJIEMR Transactions, online available on 10th Apr 2023. Link :http://www.ijiemr.org/downloads.php?vol=Volume-12&issue=Issue 04

10.48047/IJIEMR/V12/ISSUE 04/72

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Volume 12, ISSUE 04, Pages: 588-595

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BIG DATA ANALYTICS AND VISUALISATION OF ELECTRICAL ENERGY TARIFF FOR DIFFERENT UNITS

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Abstract

In summary, the paper aims to analyze the impact of energy subsidies on energy usage and consumption patterns in the residential sector through information visualization techniques. The data from four units each rating 50kW from the solar panels of VVIT institute has been considered. Power generation of four units during three years has been observed and tariff data has been collected. This data was converted into an excel spreadsheet and the "POWER BI" tool has been used for visualization. The data was then turned out into a coherent graphical format showing peak and lower consumptions of four units by utilizing the software services provided by power bi. Thus, the analysis of the power generation of four units and the total tariff rated for their generation is depicted by bar graphs.The analysis also showed that there was an increase in energy consumption among those receiving subsidies, particularly As the need for heating and cooling increases in the winter and summer increased.Overall, the use of information visualization techniques can help to gain deep insights into energy usage and consumption patterns in the residential sector and support decision-making for promoting sustainability. The consumption of individual units and their categorization in terms of minimum & maximum lines has been summarized.

Keywords: Tariff, Information visualization, Grid, sustainability

I. Introduction

Big Data refers to extremely large and complex data sets that traditional data processing software cannot handle. The term has been in use since the early 1990s, and over the course of centuries, people have been trying to use data analysis and analytics techniques to support their decision-making process[1&2]. However, in the last two decades, the volume and speed with which data generated was changed beyond measures of human comprehension, and the need to process these increasingly larger (and unstructured) data sets is how traditional data analysis transformed into 'Big Data' in the last decade.Big data analytics

refers to finding hidden patterns, correlations, and insights in massive, complicated data sets that may be leveraged to improve business choices.It involves using advanced analytical techniques and tools to analyze vast amounts of data from different sources such as social media, websites, sensors, and other digital platforms.Visualization, on the other hand, refers to the graphical representation of data and information. It involves creating visualizations such as charts, graphs, and dashboards to communicate insights and findings to stakeholders.Big data analytics and visualization work hand in hand to make sense of large data sets. By using visualizations, analysts can convey complex information in a clear and intuitive manner, which helps stakeholders to better understand the insights and findings from big data analytics. Furthermore, data visualization enables stakeholders to identify trends, patterns, and outliers, which can be used to make informed decisions[3].

Some specific reasons for Big Data importance are Big Data tools like Apache Hadoop and Spark can facilitate more effective data management and storage for enterprises. and cost-effectively.Real-time data analytics allows businesses to collect and analyze data quickly, which can help them make informed decisions faster. Big Data analysis helps businesses understand market conditions and customer behavior, which can inform product development, marketing strategies, and more [4&5]. The power generation of four units was analyzed along with their tariff using the POWER BI tool. The document is structured as shown below. In section II the analysis of four units of tariff through power bi software is provided. Section III provides a description of the Energy tariff. Before the article is ended in section V, section IV presents the results and analysis on four units.

II. Power BI

The Editing view as shown in Fig.1. in the Power BI service allows users with appropriate permissions to modify the report design, including adding or removing visuals, changing the layout, updating data sources, and more.

Fig.1. Power Bi Outline

In Fig.1. users can also access the report canvas, which is where you design the visuals, add data, and create relationships between different data sources.The reading view, on the other hand, is a view-only mode where report consumers can view the report and interact with the visuals, such as filtering, sorting, and drilling down to explore the data in more detail. They can also create bookmarks to save specific views and share them with others. However, in the

reading view, consumers cannot modify the report layout or change the data sources.Overall, the Power BI service provides a collaborative environment for report creation and distribution with different levels of access and permissions for report authors, contributors, and consumers.The report editor panes are used to manage the data that underlies the visuals. The choices you make in the report canvas affect the material that is presented in the report editor panes when you pick a certain graphic. You may examine, set, and alter persistent filters for your reports at the page, report, drill through, and visual levels using the Filters pane.The Visualizations pane is used to control the appearance of your visualizations, including type, colors, filtering, and formatting. The Fields pane lists all the available tables in the data model, and when you expand a table, you see the fields in that table.

Fig.2. Power Bi Visualization

The steps to prepare the data in Power BI Desktop are as follows:

In Power BI Desktop as shown in Fig.2. select Get Data in the Home ribbon.Choose the source of your data, either the sample dataset or your downloaded Excel workbook.In Navigator, select the range of data you want to use, and click Edit.In Query Editor, you can transform your data using a variety of tools, such as removing columns, filtering rows, renaming columns, and creating calculated columns.As you make transformations, they are added to the list of The Query Settings pane on the right side of the screen displays the Applied Steps. By choosing Preview from the Home ribbon, you may also examine a preview of your data at any moment.Once you have transformed your data, click Close & Apply to load the data into Power BI Desktop.By preparing your data before loading it into Power BI, you can ensure that your visualizations will be accurate and easy to read. You can also save time by cleaning and formatting your data in Power BI instead of using external tools [6].

III. Energy Tariff

Very one on this world wants more than they now possess, whether consciously or unconsciously. Individuals put up a lot of effort to realise their goals, and after achieving the earlier ones, they go on to create new ones. But, everything has a cost. It's not always simple to grow. Due to the presence of branded items in the market, small firms cannot thrive.To protect such people and also to reduce such imports, the tariff is imposed by the government.

The DISCOMs have proposed to continue with the some categories as being approved by the Commission since

FY2019-20. They proposed modifications in the existing structure for certain categories of consumers for FY2022-23 in order to rationalize the tariff structure as detailed.

The DISCOMs proposed to merge minor and major sub-groups under LT supply. The existing and proposed tariffs for FY 2022-23 are given in the table 1.

Table 1: Existing and proposed tariffs for FY 2022-2023.

LT	Existing tariff (Rs per kW or Rs. per unit)			Proposed Tariff (Rs per kW or Rs. per unit)		
II	COMMERCIAL & OTHERS			COMMERCIAL & OTHERS		
	(A): Commercial	Fixed charges	Energy charges	(A): Commercial	Fixed charges	Energy charges
	(i) Minor 0-50 Unit	55/kW	5.40	0-50 Units	75/kW	5.40
	(ii)Major50-60	75/kW	6.90			

The DISCOMs proposed to merge minor and major sub-groups under LT supply. The existing and proposed tariffs for FY 2022-23 are given in the table 2.

Table 2: Existing and Proposed tariffs for FY 2022-2023.

LT	Existing tariff (Rs per kW or Rs per unit)			Proposed Tariff (Rs per kW or Rs per unit)		
IV	INSTITUTIONAL			INSTITUTIONAL		
	(C): Religious Places	Fixed charges	Energy charges	(C): Religious Places	Fixed charges	Energy charges
	(i) ≤ 2 kW	30/kW	4.80	(C): Religious Places	30/kW	5.00
	(ii) > 2 kW	30/kW	5.00			

The tariff rates for commercial, domestic, and industrial use can vary by country and can depend on many factors such as the type of product, the origin of the product, and the intended use of the product.

However, as a general concept, tariffs for commercial use are typically higher than those for domestic use. This is because commercial importers often import goods for personal use usually do so in smaller quantities and are not making a profit.

Industrial tariffs can also vary significantly depending on the country and product, but they are generally higher than both commercial and domestic tariffs. This is because industrial goods often require more processing and have a higher value than consumer goods.

It's always best to check with the relevant government agencies or trade organizations to get the most up-to-date information on specific tariff rates [7&8].

IV.Results and Analysis

The data from four units each rating 50kW from the solar panels of VVIT institute was taken.Power consumption of four units during three years was observed and tariff data was collected.This data was converted into an excel spreadsheet and the "POWER BI" tool was used for visualization.The data was then turned out into a coherent graphical format showing peak and lower consumption's of four units by utilizing the software services provided by power bi. Thus, the analysis of power generation of four units and the total tariff rated for their generation is depicted by bar graphs as shown in Fig.3. to Fig.6.The total consumption and the total tariff made by all the four units of rating 200kW is as shown in the Fig.7 and Fig.8.

Table 3Consists the data for power generation of unit-1 in the year 2022. The data from above table shows gradual

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decrease as well as increase in the generation of power from the starting of year to the end.

Table 3: Power generation of unit 1

Month	**Power generation(Kwh)**
2022-01	5077.22
2022-02	5323.37
2022-03	6163.18
2022-04	5460.04
2022-05	4851.45
2022-06	4518.24
2022-07	3771.76
2022-08	5395.74
2022-09	4898.47
2022-10	5050.58
2022-11	4726.89
2022-12	4556.52

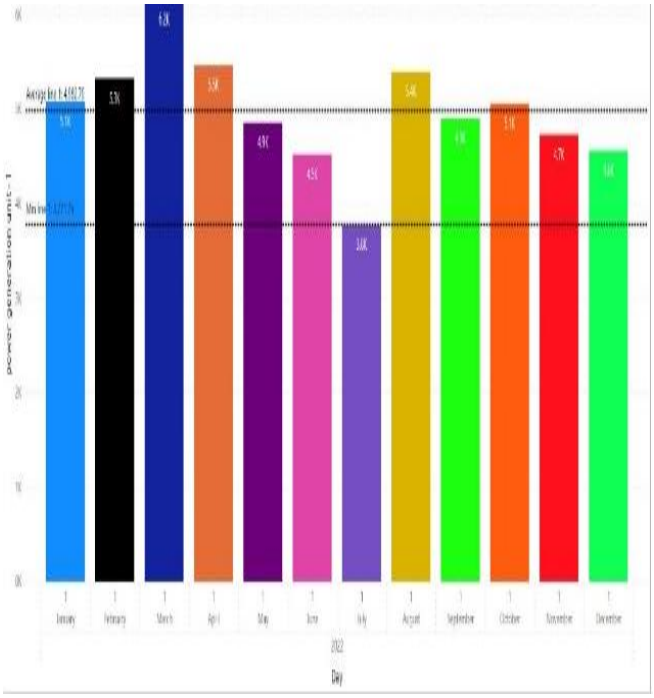

Fig .3. Power generation of unit-I

The analyzation of this data has been done and shown in graphical manner as shown in the Fig.3.The graphical representation for the analyzation of power generation data of units can be seen from the Fig.3. Here, the graph was taken by considering the various months in x-axis, whereas taking unit I power-generation in y-axis. The conclusion for the peak to lower level generation was made from the graph as follows. The dotted line in the Fig.3. depicts the maximum, average & minimum generations of unit-I. To bring final analysis, it can be seen that, the maximum generation is observed in the month of 'March'. The middle line indicates the average consumption that can be seen in the months of February, August, October. The third line specifies the minimum consumption that is observed to be there in the month of July.

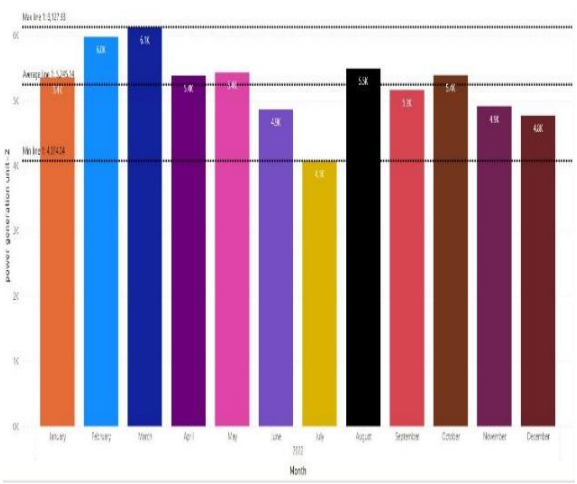

Fig .4. Power generation of unit-II

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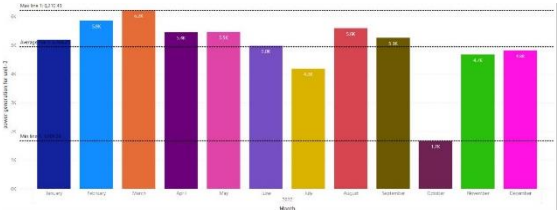

Fig .5. Power generation of unit-III

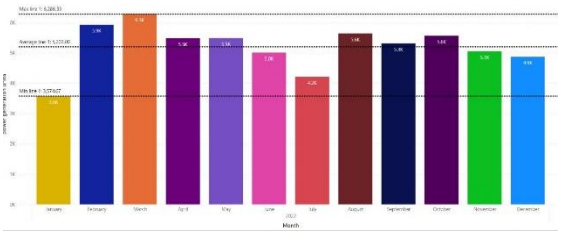

Fig .6. Power generation of unit-IV

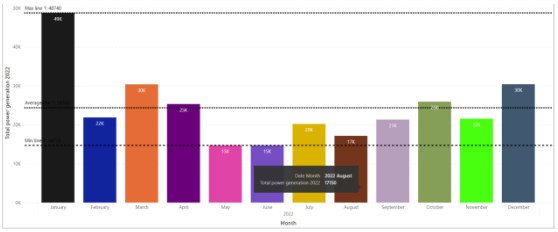

Fig .7. Total Power Generation for 2022 Year.

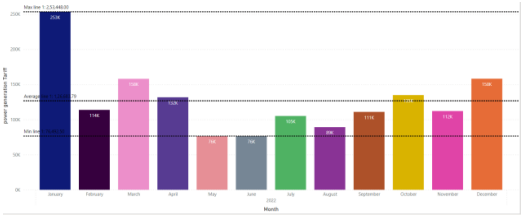

Fig .8. Tariff for the year 2022

Similarly the graphical representation for power generations of unit-II, unit-III,unit-1V are shown in Fig 4,5,&6 respectively.The Figures 7&8 represents the bar graph that was taken for the year 2022 in regardance of tariff rated for total power generation of four units in the year 2022. The dotted line was used to indicate maximum to minimum tariff rating about 200kW total power generation forfour units.The maximum tariff was seen in the month of January, whereas minimum tariff was observed in the month of June. The middle line represents the average range of tariff rated throughout the year.

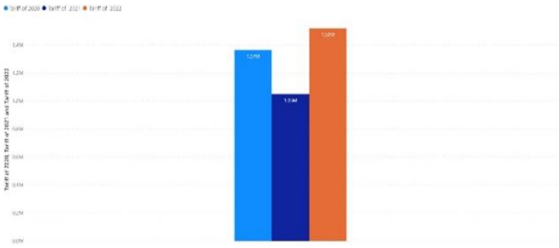

Fig.9. Comparison of power generation for the last three years

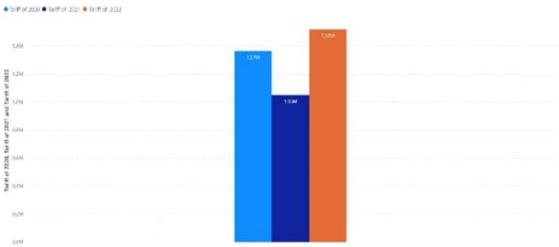

Fig.10. Comparison of tariff for last three years

Fig.9. shows the bargraph that compares the power generation of four units in the last three years.Fig.10indicates the bar graph for the correspomding tariff rated for the four units power generation. Comparison from the above bar graph shows that there is maximum tariff rated for the maximum generation of a unit.similarly the minimum and average tariffs are rated for the corresponding generation of units in last three years.

V.Conclusion

The first part talks about solar generation for analysing urban public building solar data, while the second part discusses tariffs and their use in raising revenue.For the first part, the

contribution of the presented work is a visual analytics that provides an efficient means for analysing urban public building solar data in space and time.The data thus collected from solar panels of VVIT institute were analyzed by using POWER BI software. The analyzation thus gives us a conclusion on maximum & minimum utilization of power generation over the year 2022.The visualization for tariff rating of total power generation made by four units is also depicted through bar graphs which shows a random increase and decrease in tariff in specific months in the year 2022.The report made using the software tool discussed the rate at which electrical energy is sold to consumers in last three years.It concludes with the maximum and minimum variations of tariff for the solar panles of VVIT Institute that consumed the energy in last three years.

References

[1] Wang R, Lu S, Feng W,"A novel improved model for building energy consumption prediction based on model integration",Apply Energy vol.262,pp.1145-61,2020.

[2] Wang Z, Wang Y, Zeng R, Srinivasan RS, AhrentzenS,"Random Forest based hourly buildingA Energyprediction",Energy Build" pp.11–25,2018.

[3] Li Xb CP, Schnier T,"Classification of energy consumption in buildings with outlier Detection",IEEE Trans Ind Electron. Vol.57,no.11,pp.3639–44,2010.

[4] S.E. Bibri,"The IoT for smart sustainable cities of the future: an analytical frame-Work for sensor-based big data applications for environmentasustainability", Sustain. Cities Soc.vol.38, pp.230–253,2018.

[5] Feng, J.Zheng, J.Ren, Y.Liu, "Towards big data analytics and mining for UK traffic accident analysis, visualization & prediction," in ICMLC-2020,12th International Conference on Machine Learning and Computing, Shenzhen, China, February 15–17,ACM, pp. 225–229,2020.

[6] I. Kalamaras, A. Zamichos, A. Salamanis, A. Drosou, D.D. Kehagias, G. Margaritis, S. Papadopoulos, D. Tzovaras, "An interactive visual analytics platform for smart Intelligent transportation systems management", IEEE Trans. Intell. Transp. Syst.vol.19 pp.487–496,2018.

[7] Tian W, Liu Y, Heo Y, Yan D, Li Z, An J,"Relative importance of factors Influencing building energy in urban environment", Energy vol.111,pp.237–50,2016.

[8] Zhang C, Li J, Zhao Y, Li T, Zhang X,"A hybrid deep learning-based method for Short-term building energy load prediction combined with an interpretation Process", Energy Build vol.225,pp.1103-10,2020.

[9] Wesseh, Jr., P.K., Lin,B., "Refined oil import subsidies removal,A

computable general equilimbrium analysis for Ghana" Energy vol.116,pp.1172-1179,2018.

[10] Li, K., Jiang, Z., "The impacts of removing energy subsidies on economy-wide rebound effects,An input output analysis",Energy policy vol.98,pp.62-72,2019.