

Exploring the Impact of Weather on Electricity Consumption

An Insights Article Based on BBPS Data Analysis

UNDERSTANDING IS THE WAY SUSTAINABILITY IS THE GOAL

This article examines the relationship between weather patterns and electricity consumption in Delhi, using data from the Bharat Bill Payment System (BBPS) and historical temperature records.

By analyzing the electricity usage of 2,28,685 consistent BBPS customers throughout 2023, we aim to identify trends and correlations that can inform energy management strategies and policy decisions.

Delhi's diverse climatic conditions, significant air pollution, and the highest number of BBPS users make it an ideal case study.

Our findings highlight the impact of swinging summers, shifting monsoon peaks, and the growing purchasing power of an average household on electricity consumption patterns in the city.

»»» Dive in – and unlock the knowledge to shape a greener future!

This article leverages data from the Bharat Bill Payment System (BBPS) and temperature records from AccuWeather to uncover insights that can inform energy management strategies and policy decisions.

Why Delhi Was Selected for This Analysis ?

Delhi experiences a diverse range of climatic conditions throughout the year, with different seasons influencing electricity consumption patterns. Additionally, the city grapples with significant air pollution, which further affects electricity usage.

Notably, Delhi has the highest number of consistent customers who pay their electricity bills using BBPS.

Data selection – BBPS

We analyzed the data of customers in Delhi who paid electricity bills using BBPS every month in 2023. This selection helps to avoid data asymmetry or variation in usage patterns from new or inconsistent users.

There are 2,28,685 customers who paid their electricity bill using BBPS every month. The median of these electricity bill values each month is considered as the bill amount by an average household.

Insights based on BBPS Data Analysis

This bill value is converted to the number of units consumed using the Tariff Orders from the Delhi Electricity Regulatory Commission (DERC).

A bill of the current month reflects consumption in the previous month, hence, the units so derived are pegged against the previous month temperatures.

For example, an electricity bill paid in Feb-2023 reflects Jan-2023 consumption, so Jan-2023 temperatures are correlated with the Feb-2023 billed units.

For long-term analysis from 2021 to 2023, we considered 11,791 customers who paid bills consistently every month from February 2021 to January 2024.

Temperature Data

Monthly minimum and maximum temperatures for the year of 2023 were sourced from AccuWeather for analysis.

In August 2023, the country experienced its lowest August rainfall since 1901, resulting in hot weather conditions. According to data published by Grid-India, the country's electricity consumption was recorded at 152 BU in August 2023, an increase of 16% year-on-year.

- Indian Energy Exchange

Electricity Consumption vs Temperatures in 2023

As seen in chart 1, the highest power consumption of 927 units* occurred in the month of August-2023. The month of March-2023 saw the lowest electricity consumption of 336 units*.

We observe that there is heavy correlation between temperatures and electricity unit consumption in Delhi. All seasons in Delhi have an immediate effect on the units.

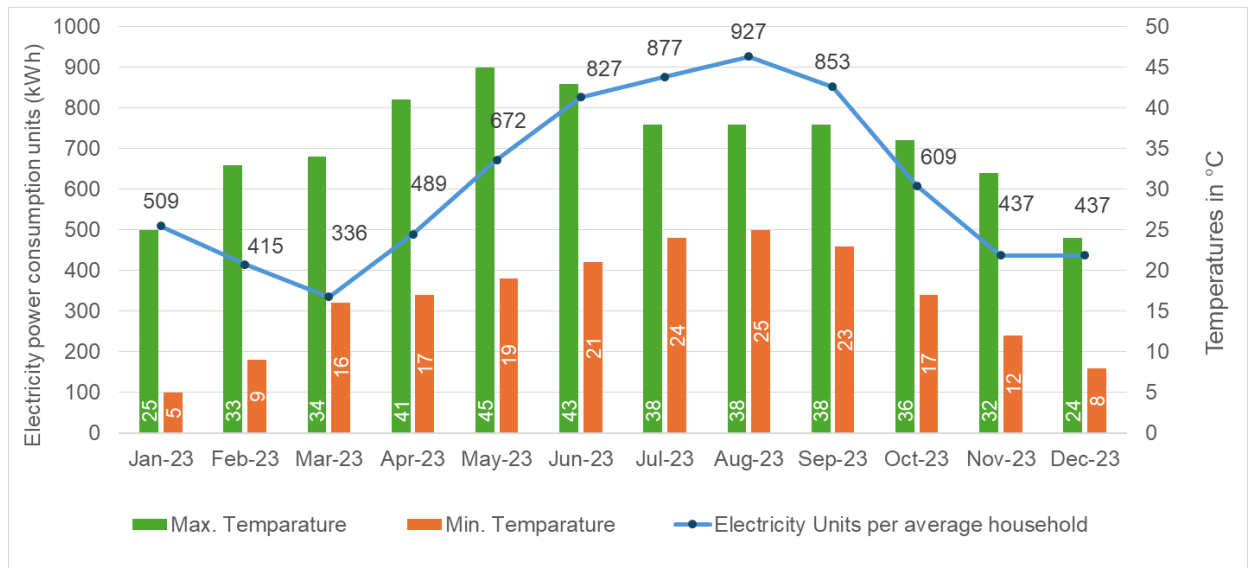


Chart 1 : Monthly minimum & maximum temperatures vs Electricity Consumption

* Highest and lowest power consumption values based on the conversion of median of 2.28 lakh BBPS consistent users' electricity bill payments into units.

In Delhi, after a record-breaking sales of 17.4 lakh air-conditioners in April 2022, the industry witnessed a shocking 26% slump in April 2023, with sales of ACs, refrigerators, and other seasonal devices taking a hit.

- Times of India & Patriot

2021 vs 2022 vs 2023: Trends in Electricity Consumption

The average number of units* consumed per household per month were:

- 2021: 543.67 units
- 2022: 629.36 units
- 2023: 615.75 units

There was a 15.7% increase in average electricity consumption from 2021 to 2022, reflecting the impact of extreme temperatures and increased purchasing power among consumers. Conversely, there was a 2.1% decline in consumption from 2022 to 2023, attributed to the cooler summer of 2023.

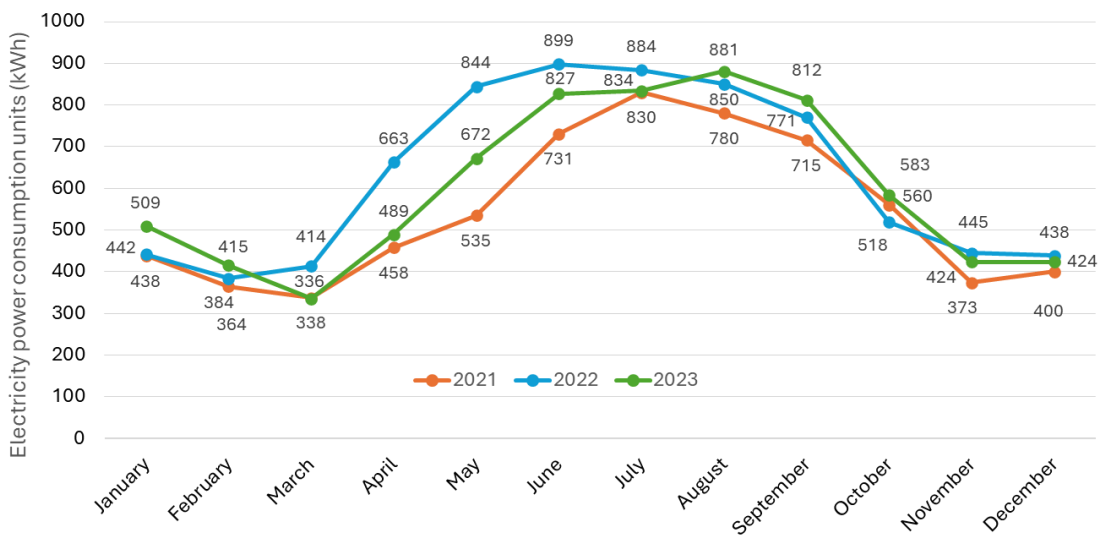


Chart 2: Electricity Consumption Snapshot: 2021 vs 2022 vs 2023

* Power consumption values based on the conversion of median of 11,791 BBPS consistent users' electricity bill payments across three years (2021-2023) into electricity units.

The last time Delhi recorded a lower maximum in April was on April 1, 2023, at 28.4°C. This is Delhi's lowest maximum in 13 years, IMD data available since 2011 showed. The next lowest temperature was 29°C on April 17, 2019.

- Hindustan Times

Swinging Summers

Delhi experienced a remarkably cool summer in 2023. Second half of April saw the maximum temperature reaching only 28.7°C, 10°C cooler than the average maximum temperature for the same time every year.

May-2023 recorded an average maximum temperature of 36.8°C, the lowest since 1987, due to excess rainfall.

Thus, a 17.4% reduction in electricity consumption during summer* months of 2023 compared to 2022 is observed. Despite these cooler conditions, consumption is still 15.3% higher than in 2021.

This paradoxical trend can be attributed to the shift in consumer behavior highlighting the growing affordability of cooling solutions and the habitual repeat use of power-intensive devices.

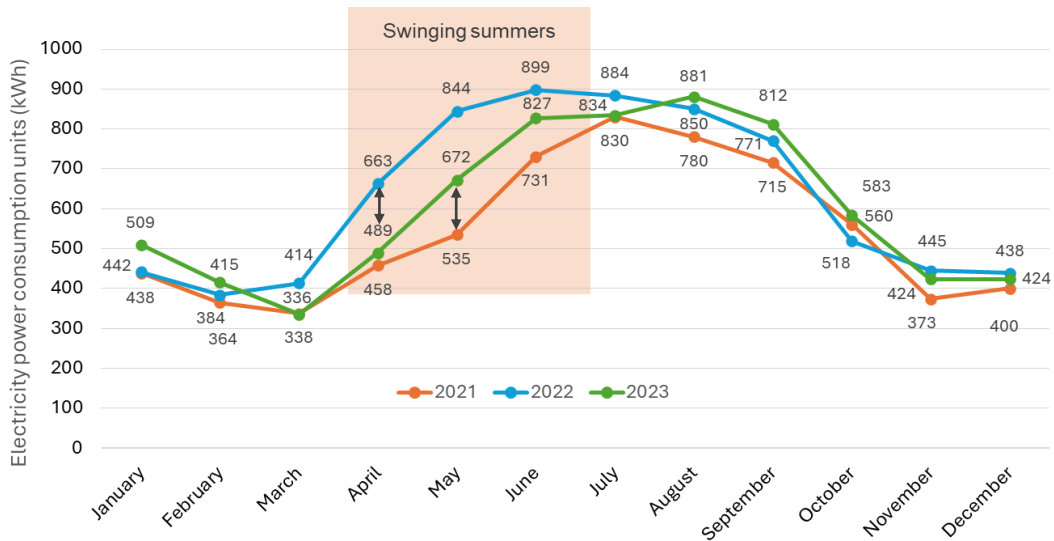


Chart 3: Swinging summers: Electricity Consumption Snapshot: 2021 vs 2022 vs 2023

* April, May, June are considered as summer season for this analysis.

The June to September monsoon season has been 0.3-0.4 degrees Celsius hotter than pre-monsoon seasons in the decade from 2012 to 2022, according to a new Centre for Science and Environment (CSE) analysis based on India Meteorological Department (IMD)'s long-term data.

- Hindustan Times

Shifting Monsoon Peaks

Delhi's electricity consumption pattern is undergoing a significant change, with peak power consumption shifting from July to August during the monsoon season*.

The monsoons have been becoming warmer and arriving later than usual in recent years, with July seeing delayed and extreme rainfall spells followed by drier and hotter Augusts.

July 2022 & 2023 received >204.4 mm of rainfall followed by warmer Augusts marked with sparse rainfalls in the range of 41.6-91.8 mm. August-2023 recorded the country's lowest rainfall since 1901.

Subsequently, this change in monsoon patterns has led to a 12.9% increase in power consumption in August-2023 compared to August-2021.

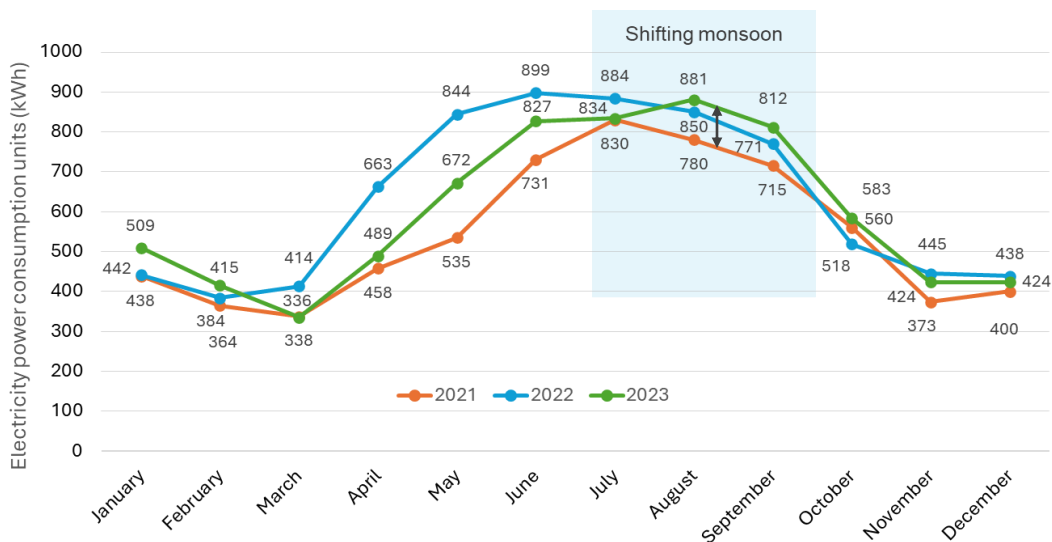


Chart 4: Shifting monsoons: Electricity Consumption Snapshot: 2021 vs 2022 vs 2023

* July, August, September are considered as monsoon season for this analysis.

We know we'll run out of dead dinosaurs to mine for fuel and must use sustainable energy eventually, so why not go renewable now and avoid increasing risk of climate catastrophe? Betting that science is wrong, and oil companies are right is the dumbest experiment in history by far.

- Elon Musk, Founder, Tesla

Managing Increasing Demand Through Renewable Sources

Of the 65 lakh+ electricity subscribers in Delhi, BBPS constitutes 78%, of which, 69% i.e., 37.4 lakh subscribers use BSES discoms*.

These discoms secured A+ in consumer rating for FY 2022-23. 36% of the electric energy distributed by BSES comes from renewable resources.

In FY 2023-24, Solar Power contributed 840 MW, Wind Power contributed 500 MW, Hydro Power contributed 546 MW. The total contribution by renewable energy is expected to rise 63% by FY 2026-27.

Sustainable Energy Strategy

To efficiently manage the increasing power demand in Delhi, especially during peak usage periods influenced by changing weather patterns, a strong strategy focusing on renewable energy sources is required.

A comprehensive sustainable energy strategy starts with energy efficiency. Encouraging energy-efficient appliances and integrating smart grid technology can optimize electricity distribution and reduce overall consumption.

Additionally, initiatives such as time-of-use pricing and automated demand reduction, can help balance demand and prevent grid strain.

Supportive government policies, such as tax benefits and streamlined approvals for renewable projects, coupled with community awareness programs, can accelerate the transition to a sustainable energy future.

Conclusion

This analysis highlights the significant impact of weather patterns on electricity consumption in Delhi. Understanding these trends can lead to more efficient energy utilization and better preparedness for future climatic shifts.

* Discoms are Electricity Distribution Companies

DATA DRIVES BUSINESS GROWTH INSIGHTS POWER BETTER DECISIONS

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