# PLUGGING INTO THE FUTURE: AN EXPLORATION OF ELECTRICITY CONSUMPTION PATTERNS

# 1. INTRODUCTION

## 1.1 Overview

India is the world's third-largest producer and third-largest consumer of electricity. The national electric grid in India has an installed capacity of 370.106 GW as of 31 March 2020. Renewable power plants, which also include large hydroelectric plants, constitute 35.86% of India's total installed capacity. During the fiscal year (FY) 2019–20, the total electricity generation in the country was 1,598 TWh, of which 1,383.5 TWh generated by utilities. The gross electricity consumption per capita in FY2019 was 1,208 kWh.

In 2015-16, electric energy consumption in agriculture was recorded as being the highest (17.89%) worldwide. The per capita electricity consumption is low compared to most other countries despite India having a low electricity tariff.

In light of the recent COVID-19 situation, when everyone has been under lockdown for the months of March to June the impacts of the lockdown on economic activities have been faced by every sector in a positive or a negative way.

The dataset is exhaustive in its demonstration of energy consumption state wise.

## 1.2 Purpose

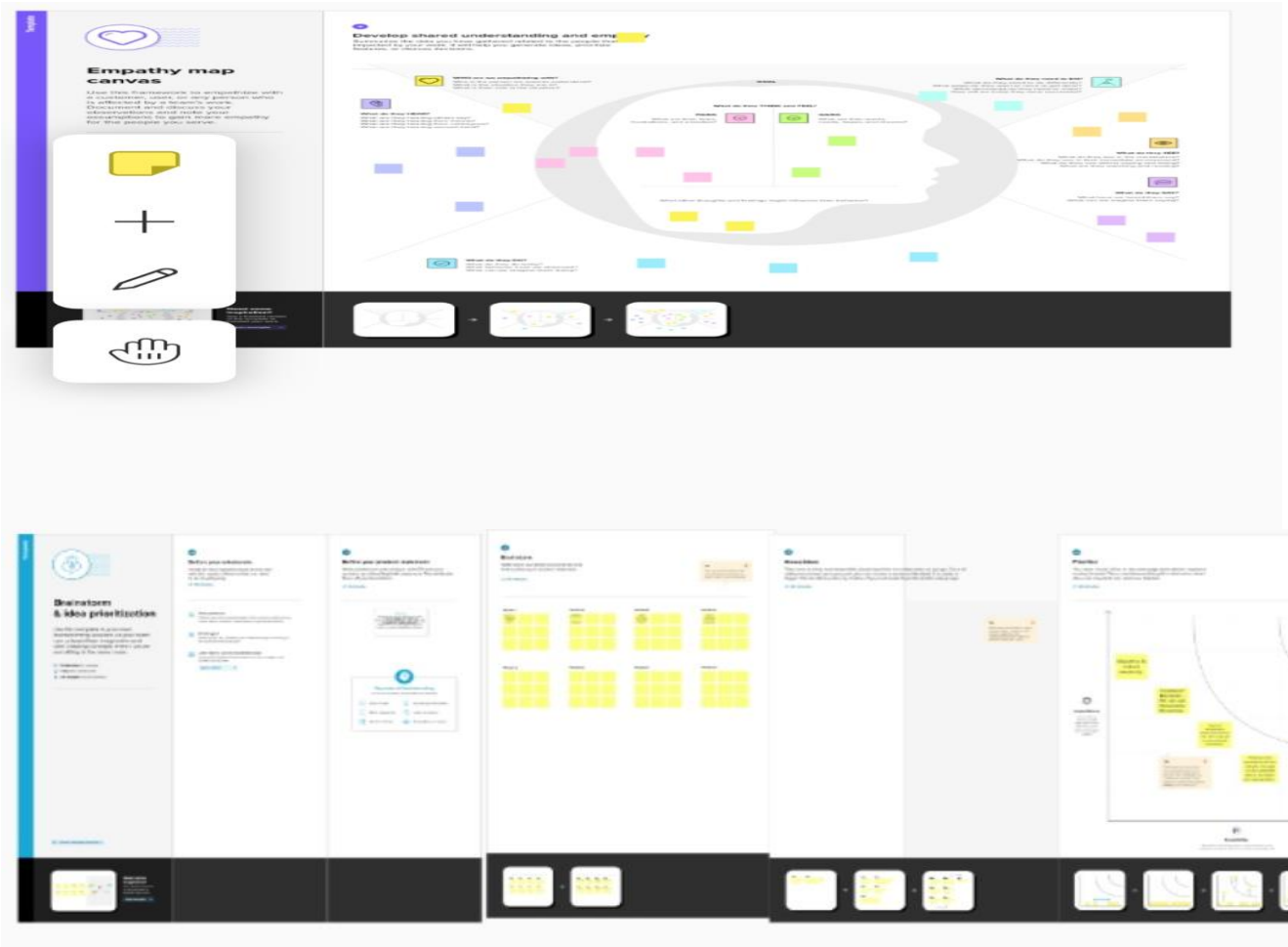
Annual electricity consumption per capita serves as **an important measure of a country's electric power development**. Generally, Electricity consumption grows faster when the in industrialization process develops quickly and goes down rapidly when industrialization is completed or near completion.

Analysing Electricity Consumption in India from Jan 2019 till 5th December 2020. This dataset contains a record of Electricity consumption in each states of India, here we are going to analyse State wise , Region wise and Overall Electricity consumption in India.

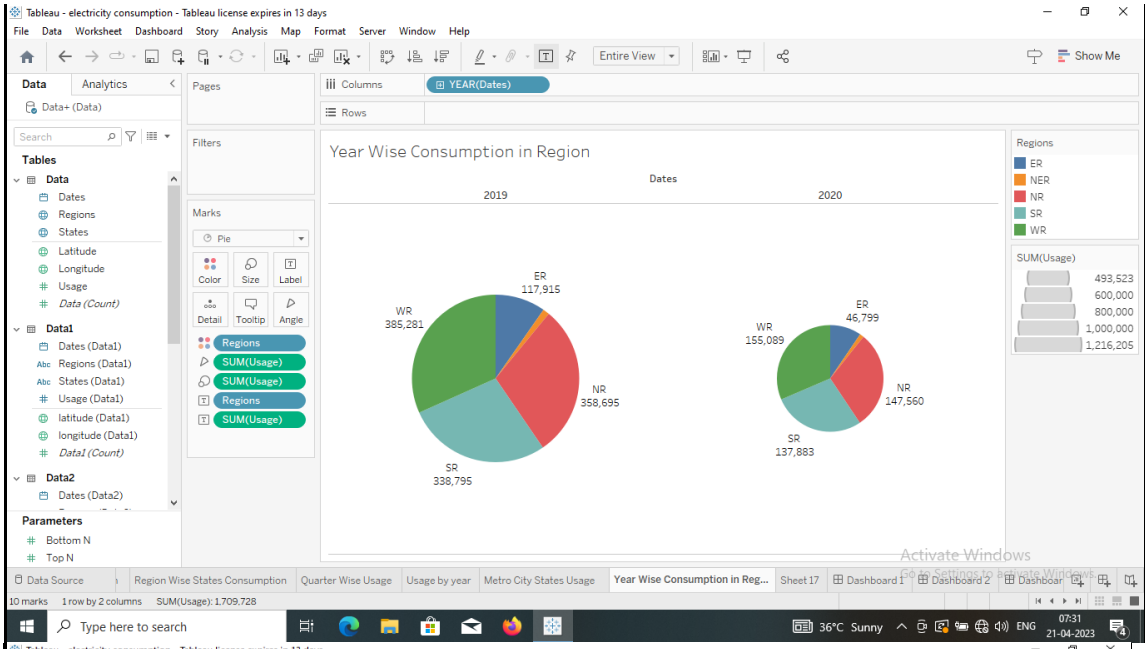
# 2. PROBLEM DEFINITION & DESIGN THINKING

## 2.1 Empathy Map

### 2.2 **Ideation & Brainstormi**



# 3. RESULT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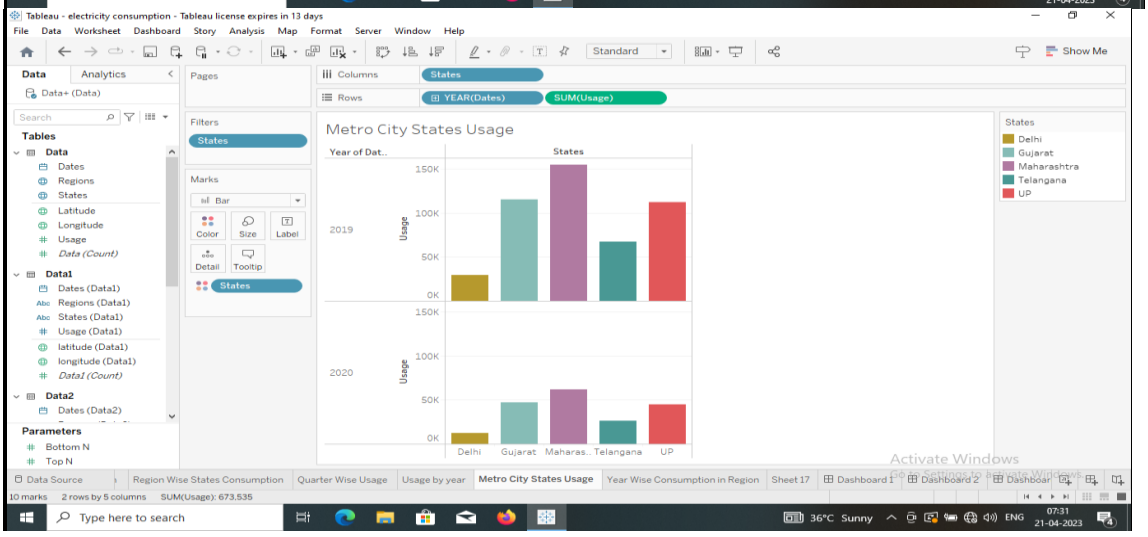
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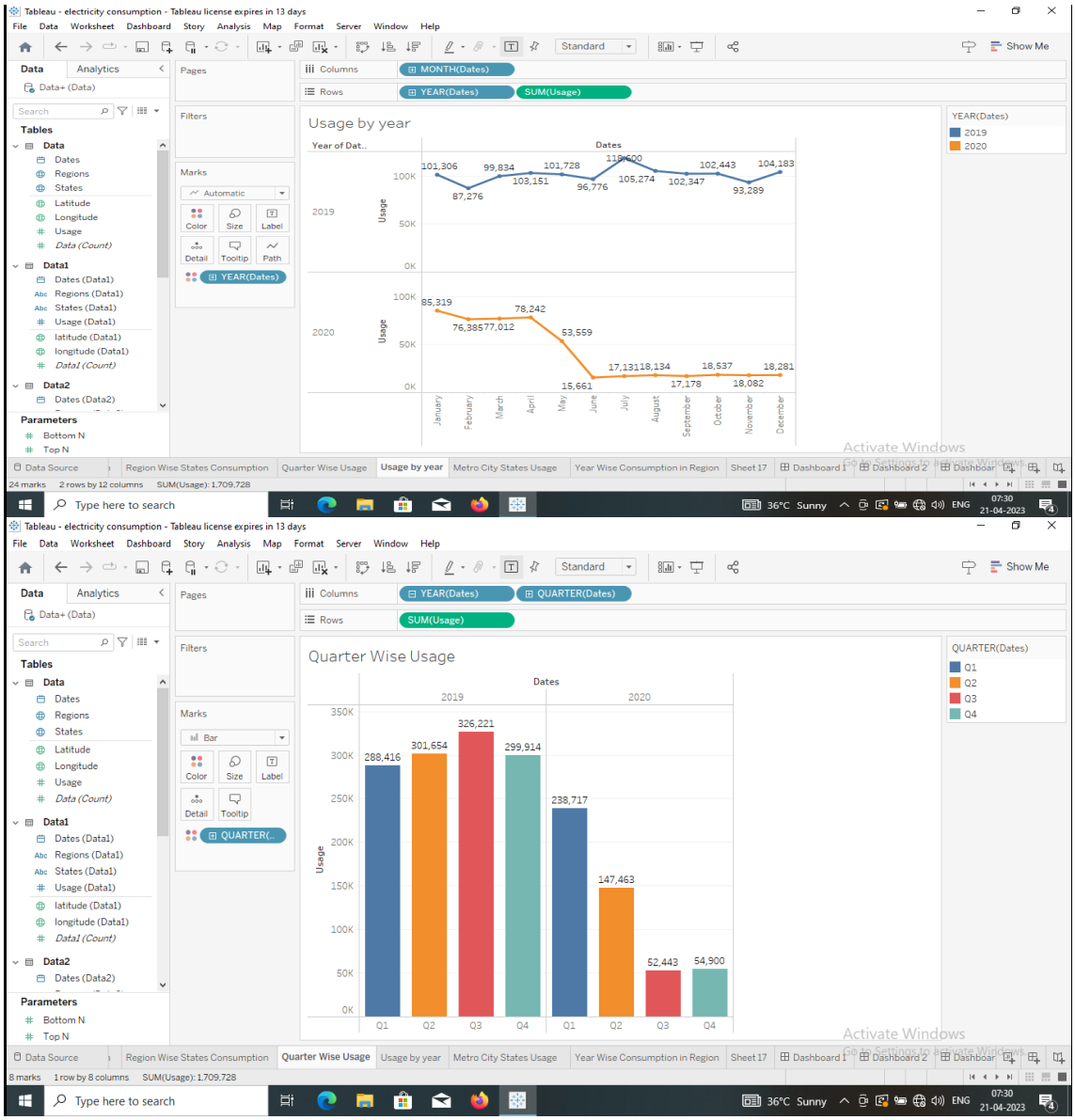
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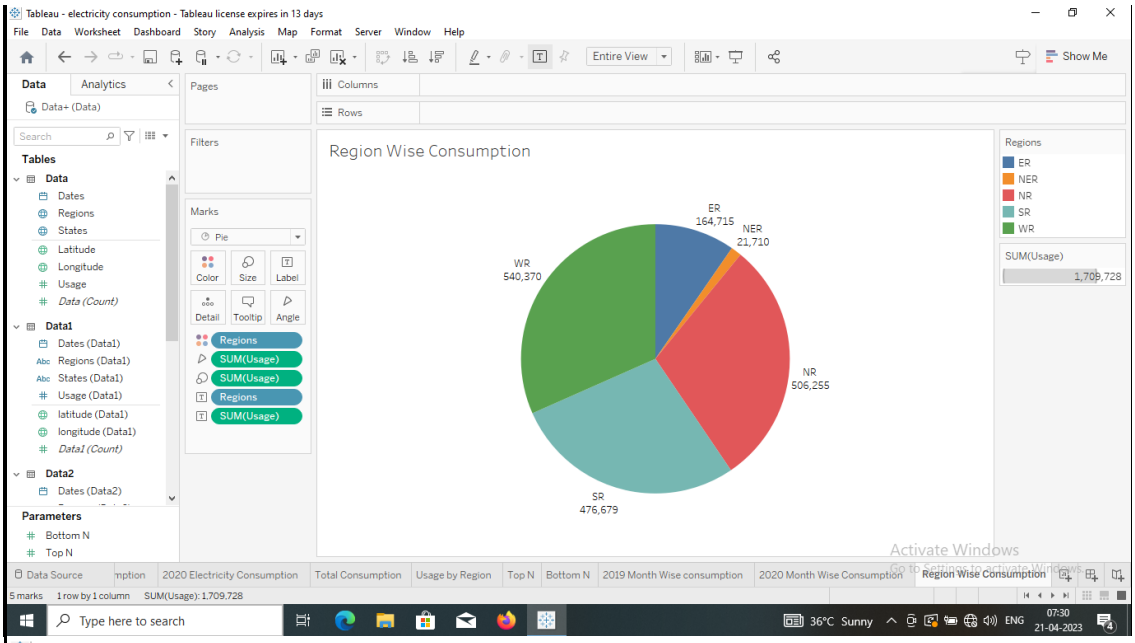
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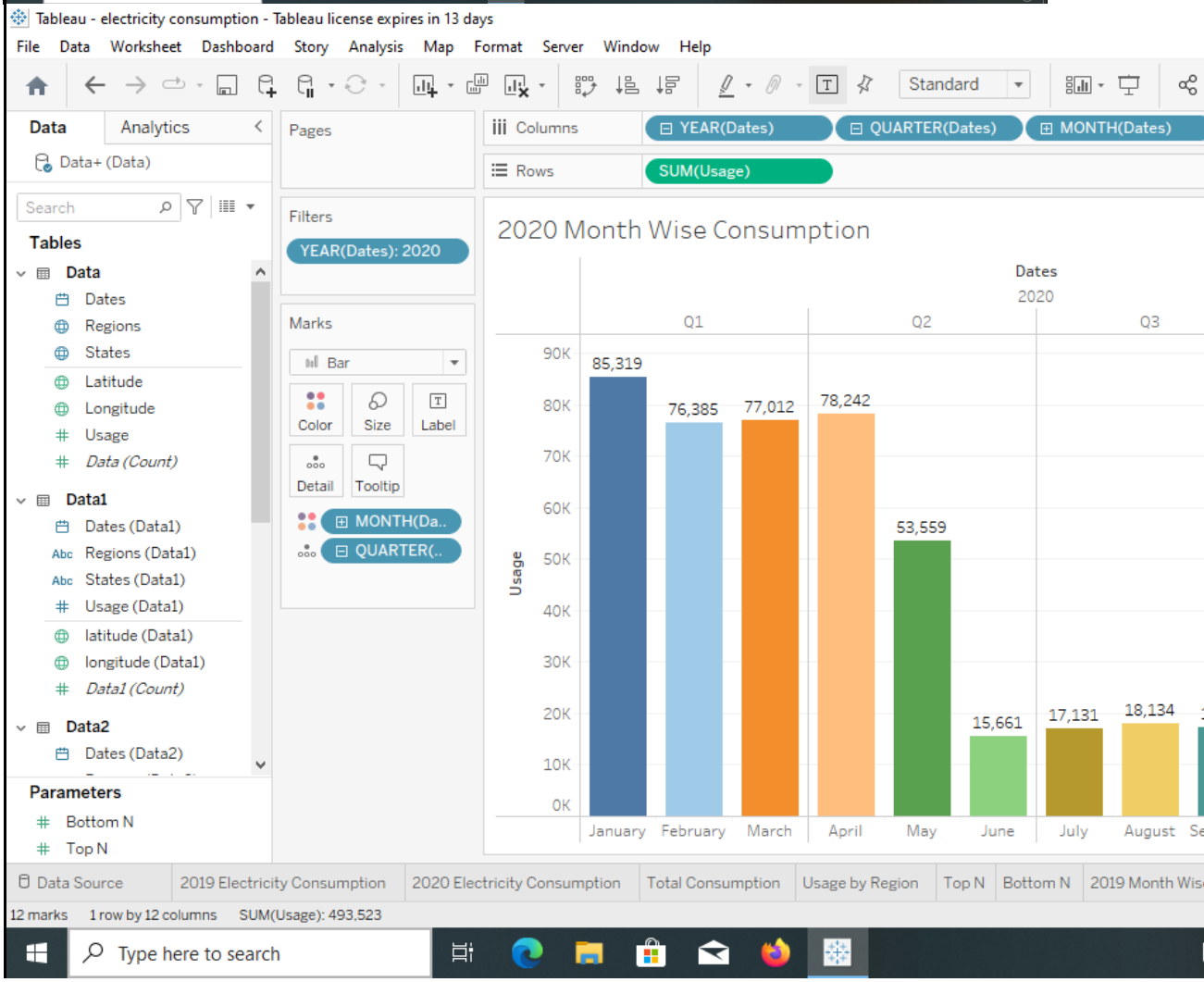
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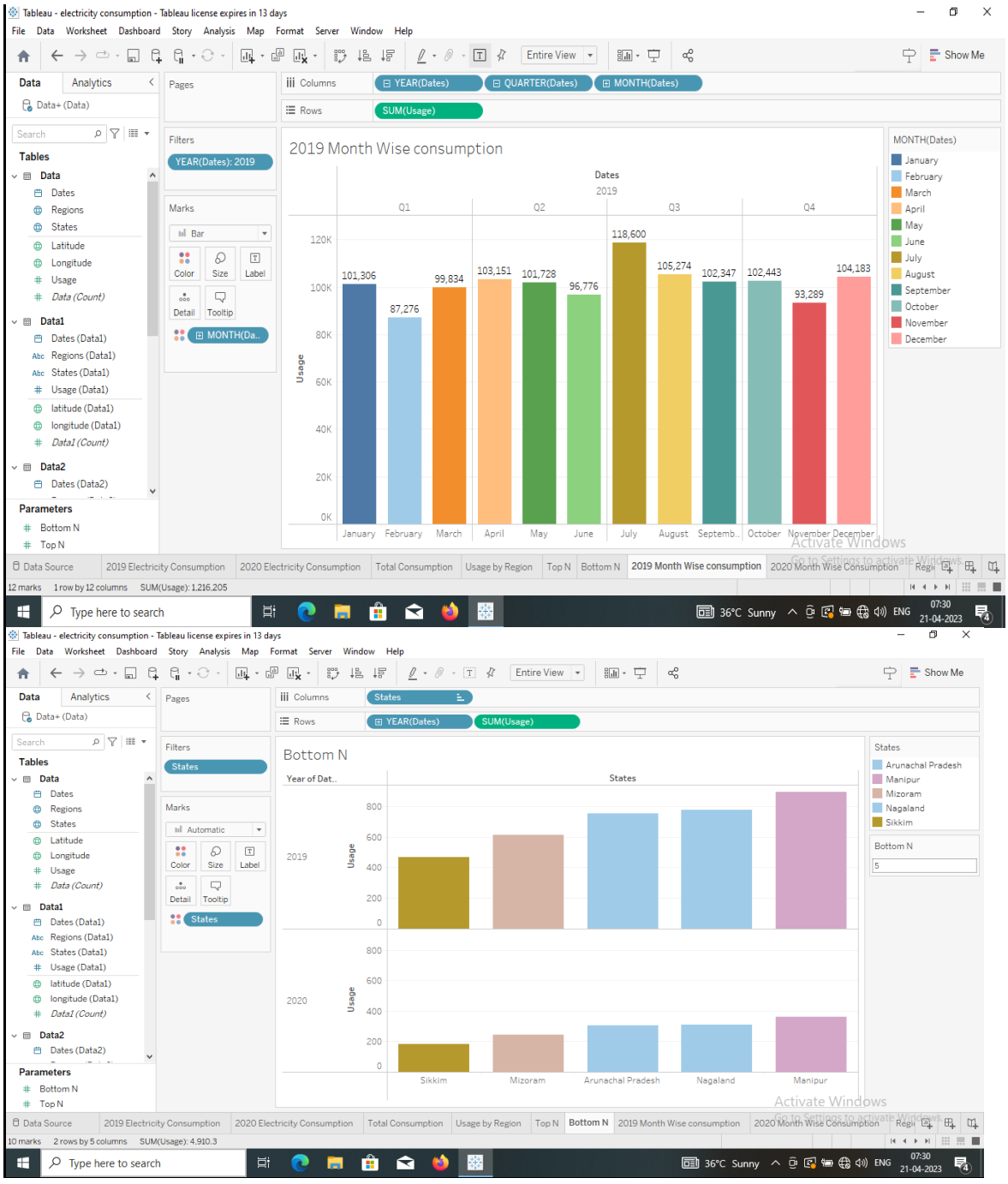
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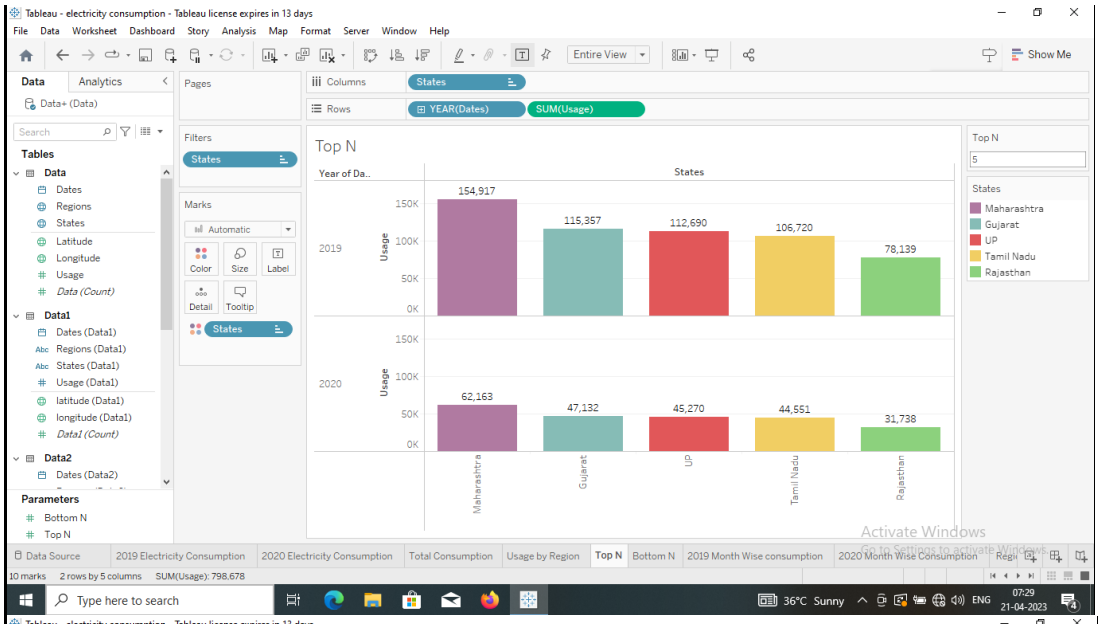
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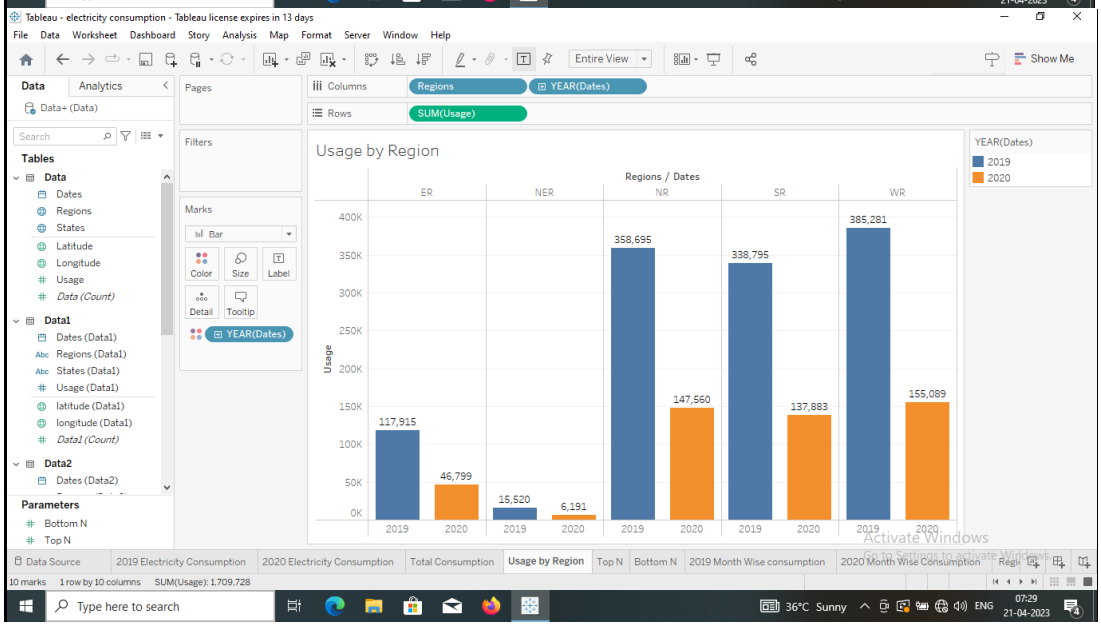
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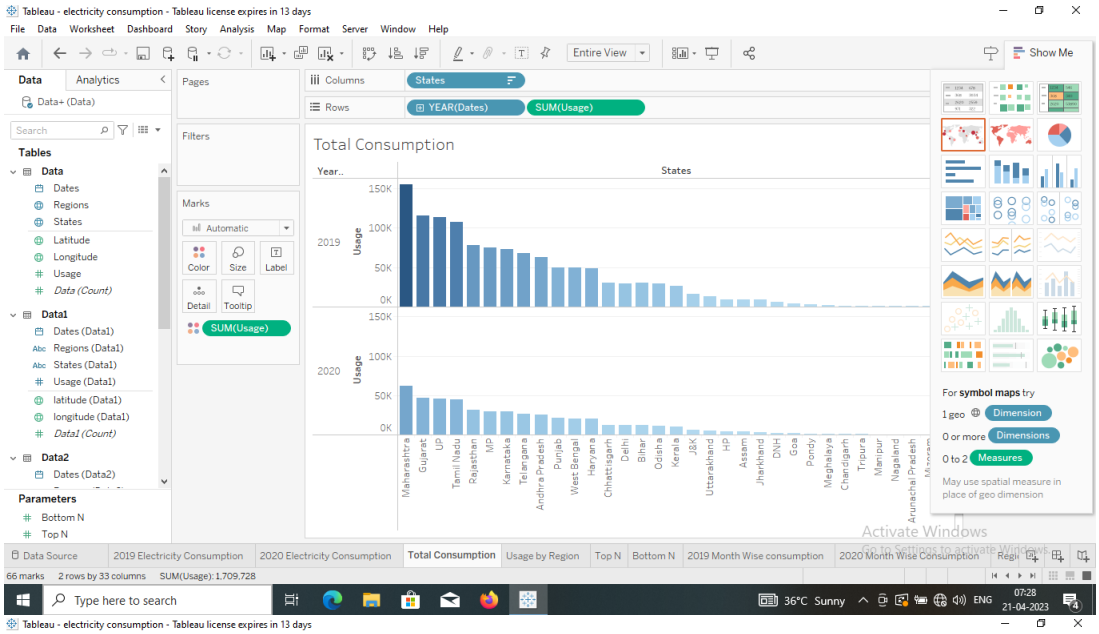
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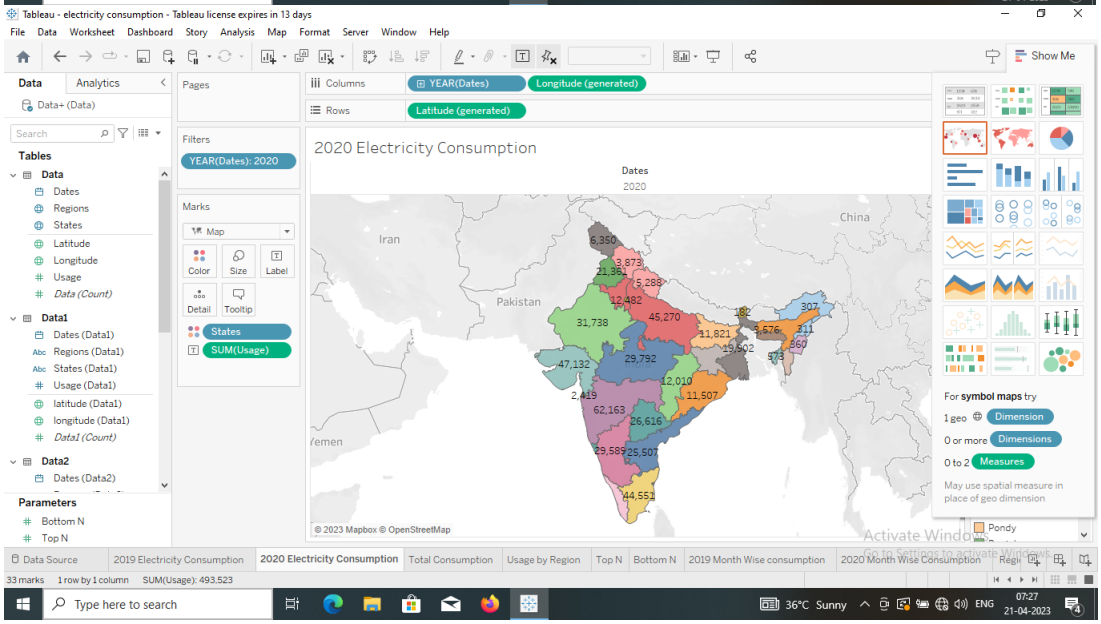
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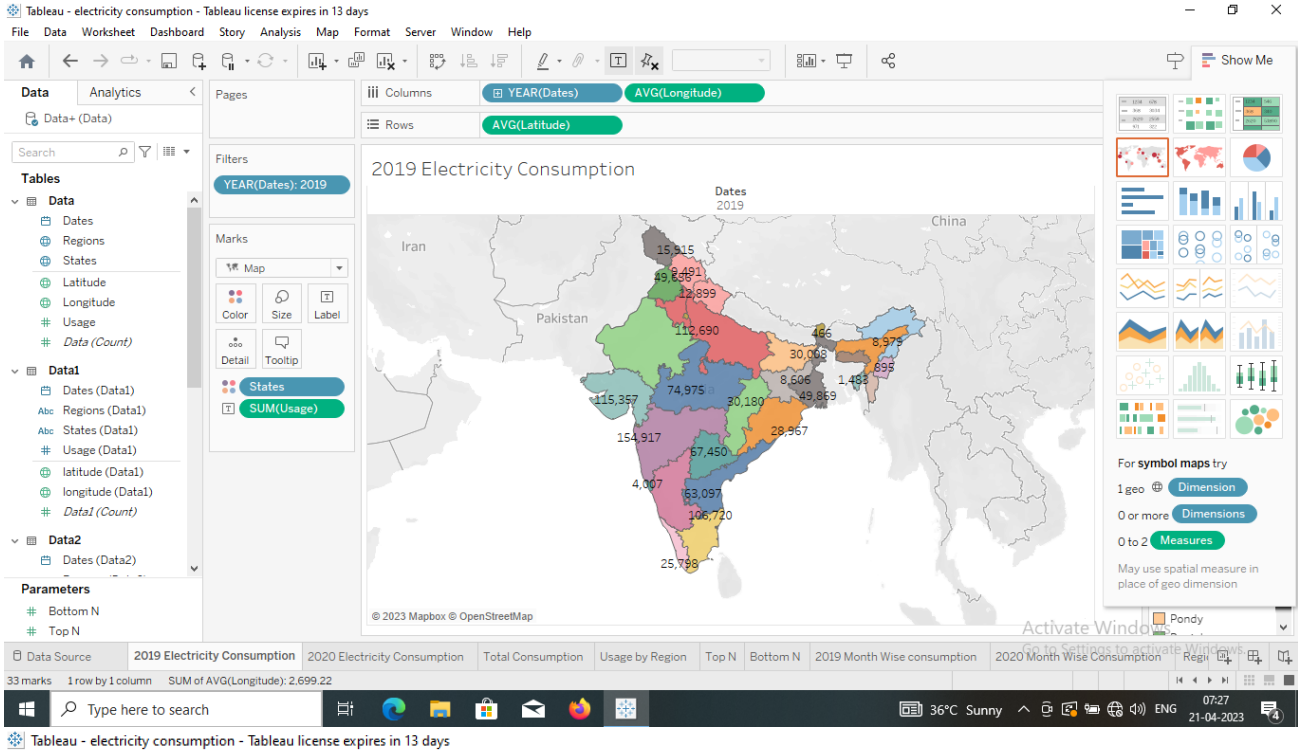
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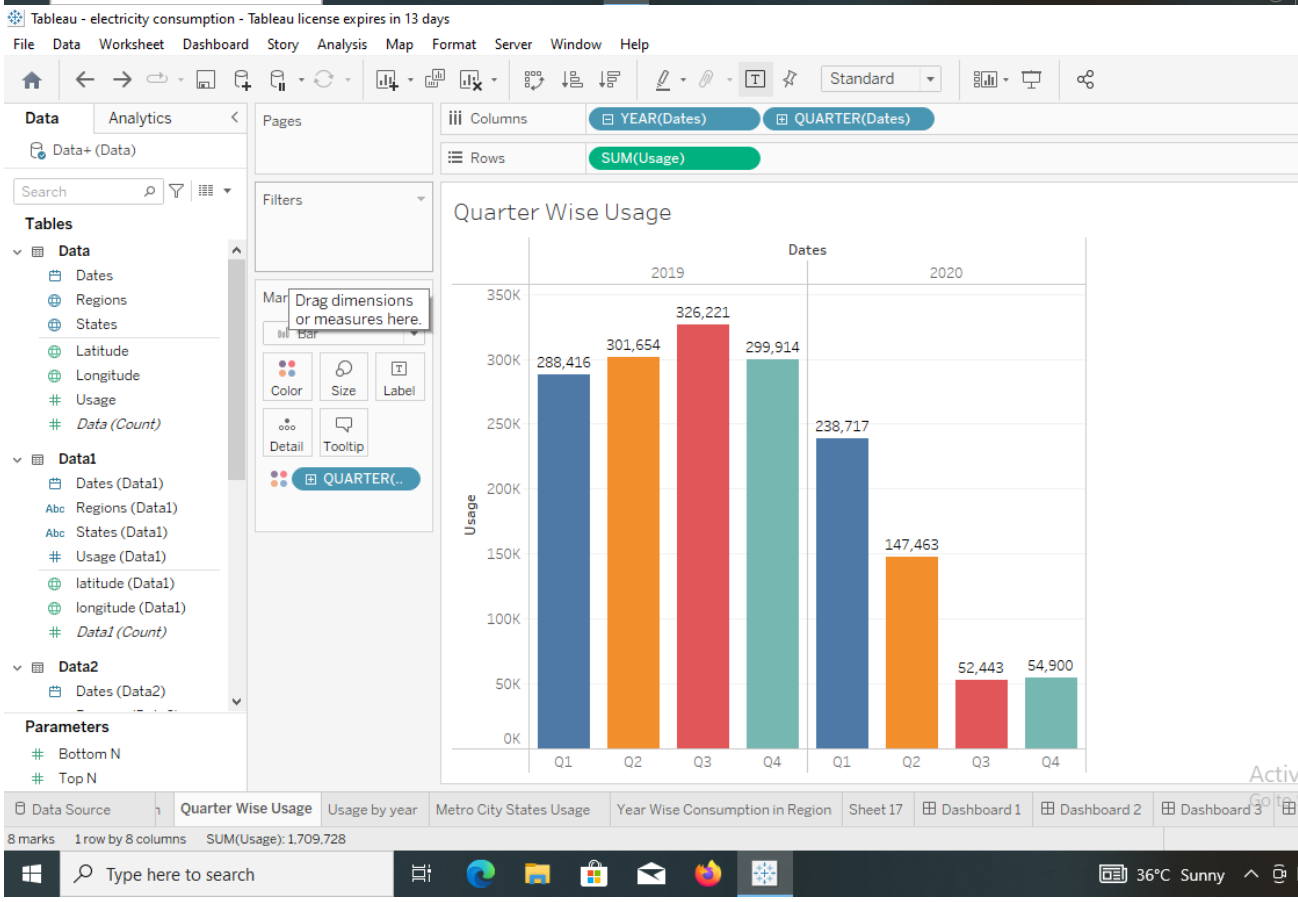
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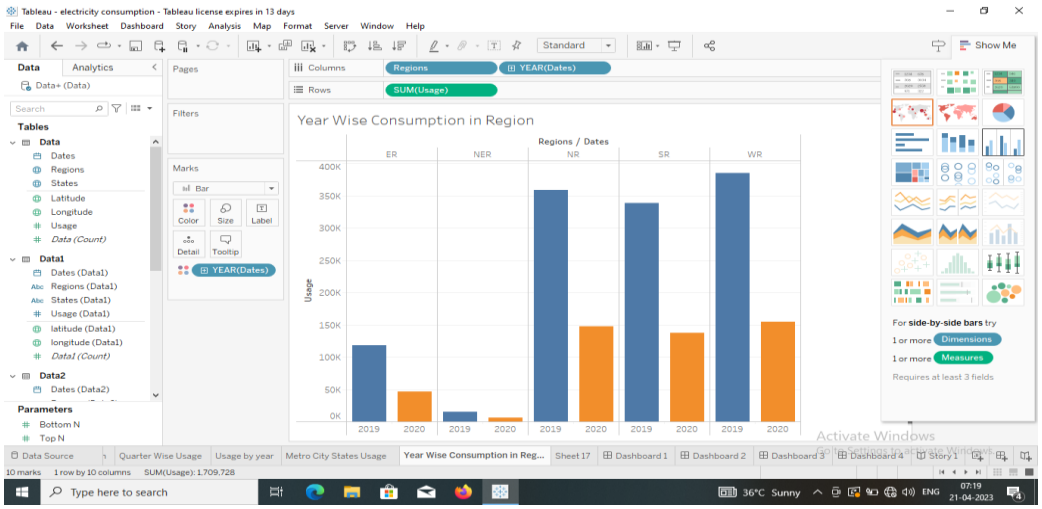


# 4. ADVANTAGES & DISADVANTAGES

## Advantages of Electricity consumption:

- It is a clean, safe, cheap and convenient sources of energy
- Lower maintenance cost
- More efficient
- No tailpipe emission
- It doesn’t require as many employees
- Reduce greenhouse emission
- Makes barely any pollution compare to other ways of creating or generating electricity
- Relatively low maintenance cost
- Hydroelectric station are inexpensive to operate

- Hydroelectricity produces no gas emissions or waste
- A station can operate and run for long periods of time
- It is renewable

**Disadvantages of electricity :**

- More expensive than gasoline
- Loss of fish species
- Sometimes messes up wildlife
- Dependent on precipitation

- More power plants and more pollution
- Damming can cause loss of land suitable for agriculture as well as recreation
- Cost for construction
- Change in river or stream quality
- An electric vehicle is not completely emission free
- In electricity, there are a limited number of feasible sites for a large number of dams
- Drought can affect power production
- Hydroelectric natural seasonal changes in river and ecosystems can be destroyed

## 5. APPLICATIONS

## Electricity consumption in the United States was about 4 trillion kilowatthours (kWh) in 2022

Electricity is an essential part of modern life and important to the U.S. economy. People use electricity for lighting, heating, cooling, and refrigeration and for operating appliances, computers, electronics, machinery, and public transportation systems. Total U.S. electricity consumption in 2022 was about 4.05 trillion kWh, the highest amount recorded and 14 times greater than electricity use in 1950. Total annual U.S. electricity consumption increased in all but 11 years between 1950 and 2022, and 8 of the years with year-over-year decreases occurred after 2007.

Total electricity end-use consumption includes retail sales of electricity to consumers and *direct use* electricity.[1] Direct use electricity is used by the same industrial or commercial sector facility where it is produced. The industrial sector accounts for most direct use electricity. Total direct use of electricity by the industrial and commercial sectors was about 3% of total electricity end-use consumption in 2022.

Total U.S. electricity end-use consumption in 2022 was about 2.6% higher than in 2021. In 2022, retail electricity sales to the residential sector were about 3.5% higher than in 2021, and retail electricity sales to the commercial sector were about 3.4% higher than in 2021. Electricity retail sales to the industrial sector in 2022 were about 0.7% higher than in 2021 but were about 5.3% lower than in 2000, the year of highest U.S. retail sales to the industrial sector. The industrial sector's percentage share of total U.S. electricity retail sales was about 31% in 2000 and 26% in 2022.

- **The retail sales of electricity to major consuming sectors and percentage share of total electricity retail sales in 2022 were:**
- residential***1.42 trillion kWh***38.9%
- commercial***1.37 trillion kWh***35.1%

- industrial***1.01 trillion kWh***25.8%
- transportation (mostly to public transit systems)***0.01 trillion kWh***

"Electricity was first sold in the United States in 1879 by the California Electric Light Company in San Francisco, which produced and sold only enough electricity to power 21 electric lights (Brush arc light lamps)."

## Heating and cooling are the largest residential electricity uses

- Heating and cooling (air conditioning) account for the largest annual uses of electricity in the residential sector. Because these uses are mainly weather related, the amounts and their shares of total annual residential electricity consumption vary from year to year.
  The *Residential Energy Consumption Survey* (RECS) data for 2015 indicate that heating was the largest use of electricity in homes.
  The *Annual Energy Outlook* (AEO) provides estimates and projections for annual electricity use in the residential sector by type of end use.

## Computers and office equipment account for the largest share of commercial sector electricity consumption

Five uses of electricity hold the largest shares of total annual electricity use in the commercial sector: computers and office equipment (combined), refrigeration, space cooling, lighting, and ventilation.

Historically, electricity use for lighting usually accounted for the largest share of total annual commercial sector electricity use, but its share has declined over time mainly because of the increasing use of high efficiency lighting equipment. Conversely, the amount and share of electricity use for computers and office equipment has increased over time. Space cooling requirements are determined by weather, climate, and building design, and by heat produced by lighting equipment, computers, office equipment, miscellaneous appliances, and building occupants.

## Machine drives are the largest use of electricity by U.S. manufacturers

The industrial sector uses electricity to operate machinery and manufactureing facilities. Some industries—such as aluminum and steel manufacturing, use electricity for process heat, and other industries—such as food processors, use electricity for cooling, freezing, and refrigerating food. Many manufacturers, especially pulp and paper and lumber mills, generate their own electricity for direct use, mostly in combined heat and power systems. Some manufactures sell some of the electricity that they generate.

The *Manufacturing Energy Consumption Survey* (MECS) provides detailed data on electricity use by type of manufacturer and by major end uses in selected years. The AEO provides estimates and projections for annual electricity purchases by the industrial sector and by type of industry and manufacturer. According to the AEO2023 Reference case, in 2022, manufacturers account for about 78% of total annual industrial sector electricity purchases, followed by construction (8%), mining (8%), and agriculture (7%).[2]

### Electricity use in the United States is projected to grow slowly

Although near-term U.S. electricity demand may fluctuate as a result of year-to-year changes in weather, trends in long-term demand tend to be driven by economic growth offset by increases in energy end-use efficiency. In the AEO2023 Reference case, the annual growth in total U.S. electricity demand is projected to average about 1% from 2022 through 2050.

### World electricity use may grow fastest in non-OECD countries

The member countries of the Organization for Economic Cooperation and Development (OECD) accounted for about 40% of total world electricity consumption in 2021. In the projections of the *International Energy Outlook 2021* Reference case, non-OECD country electricity consumption will grow about 2% per year and OECD member country electricity use will grow about 1% per year through 2050. OECD nations' share of world electricity use will be 33% in 2050.[3]

Electricity consumption data includes only electricity generated by utility-scale power plants—those with electric generation capacity of 1 megawatt or more. Data excludes electricity at distributed or small-scale

facilities with an electric generation capacity of less than 1 megawatt, for example, small-scale solar photovoltaic generation. Direct use does not include station use (electricity consumed to operate a power plant).

## 6. CONCLUSION

**Electric energy consumption** is energy consumption in the form of electrical energy. About a fifth of global energy is consumed as electricity: for residential, industrial, commercial, transportation and other purposes. Quickly increasing this share by further electrification is extremely important to limit climate change, because most other energy is consumed by burning fossil fuels thus emitting greenhouse gases which trap heat.

## 7. FUTURE SCOPE

Help improve services, understand consumer needs, refine business strategies, grow and retain customers, and even sell the data as second-party data to other businesses at a profit.