

“PLUGGING INTO THE FUTURE: AN
EXPLORATION
OF ELECTRICITY CONSUMPTION
PATTERN”

POWERED BY: DATA ANALYTICS WITH TABLEAU

TEAM SIZE: 4

TEAM LEADER: G. NISHA

TEAM MEMBER: K. MANJU

TEAM MEMBER: S. MADHUMATHI

TEAM MEMBER: K. DHANALAKSHMI

1.INTRODUCTION:

1.1 OVERVIEW:

We are living in air-conditioned comfortable houses, going to school or office using city transport network such as trains and subway cars which run every few minutes and sending and receiving data to and from any place in over the world through the Internet instantaneously. We are, however, scarcely acknowledging the fact that today's conveniently working society is supported by the enormous consumption of electric energy, and if supply of electricity is stopped, this society will be thrown into a terrible chaos. Electricity, like air and water, is so wide spread that nobody may recognize its existence. Progress in urbanization and advancement of the networked information society is giving electricity more and more importance as the main energy source for our social life. In view of the increase in its demand, the electric power system has come to face three adversely affecting issues, namely, steady electricity supply (energy security), decrease of electricity price and economic growth (economic growth), and harmonization with environment (environmental protection). Load leveling, electric energy storage technology, and renewable or new energy power generation systems such as photovoltaic and wind-power generation are being developed as the effective measures to solve these types of trilemma syndrome, but it is true that have not found the fundamental solution yet.

1.2 PURPOSE:

Electricity conservation can be achieved through efficient energy use, which has a number of advantages, including a reduction in greenhouse gas emissions and a smaller carbon footprint, as well as cost, water and energy savings. Energy conservation is an essential factor in building design and construction.

Electrical Energy Conservation implies:

- Efficient use of available electrical energy.
- Innovation and Adoption of new technology for minimizing Losses and misuses in all sectors Industrial, Transport, Agriculture and Residential etc.
- Saving electricity leads to reduction in Environmental Pollution, which is good for Society as a whole.

2.PROBLEM DEFINING AND DESIGN THINKING:

2.1 EMPATHY MAP:



2.2 IDEATION AND BRAINSTORM TEMPLATE:

Brainstorm & idea prioritization

Use this template in your next brainstorming session so your team can unleash their imagination and start shaping concepts even if you're not sitting in the same room.

- 10 slides to print
- 1 hour to collaborate
- 10 pages to generate

Before you collaborate

Ask all of your team to bring any and all ideas they have, no matter how small or silly. The more ideas, the better.

1. [Print this slide](#)

Define your problem statement

What problem are you trying to solve? Frame your problem as a clear, specific statement. The all the team of your team.

1. [Print this slide](#)

Brainstorm

Write down any ideas that come to mind. No matter how small or silly. The more ideas, the better.

1. [Print this slide](#)

Group ideas

Now that you have a lot of ideas, it's time to group them. Use the sticky notes to group your ideas into categories. The more categories, the better.

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Prioritize

Now that you have your ideas grouped, it's time to prioritize them. Use the sticky notes to place your ideas on the grid. The more ideas, the better.

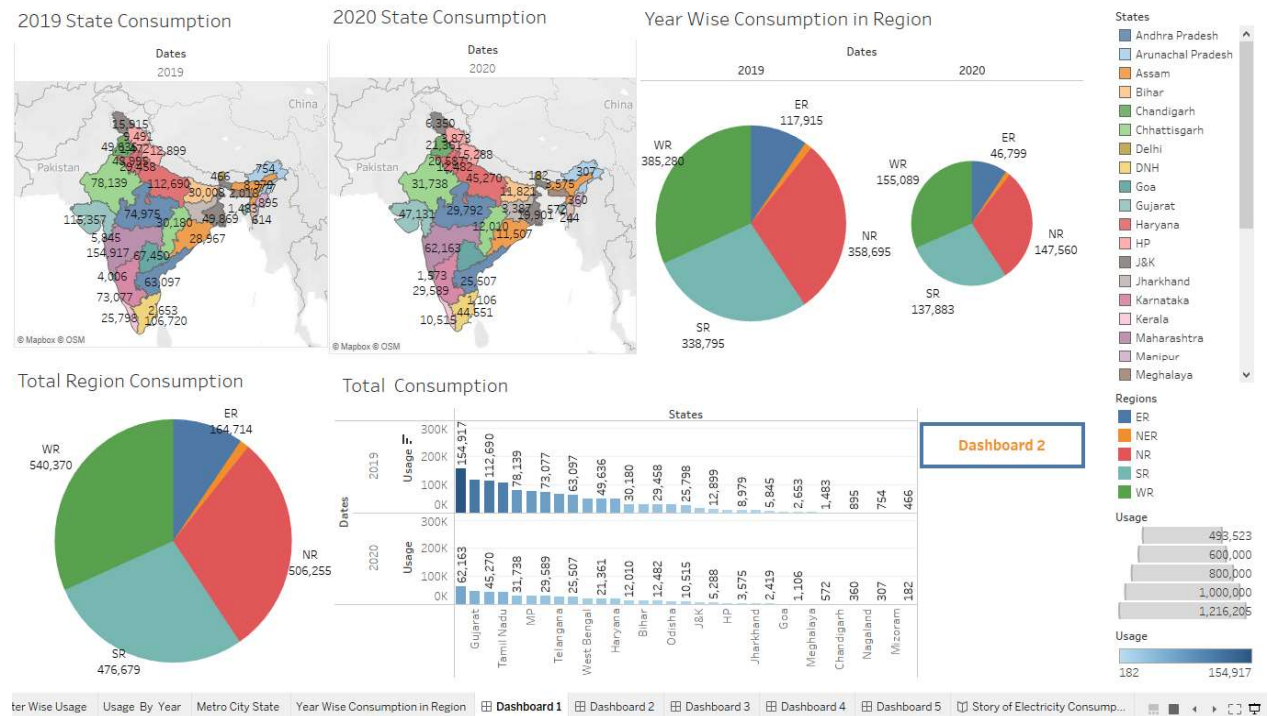
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After you collaborate

Now that you have your ideas prioritized, it's time to implement them. Use the sticky notes to track your progress. The more ideas, the better.

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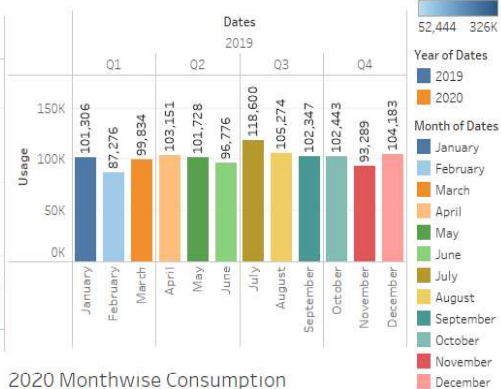
3.1 DASHBOARD:



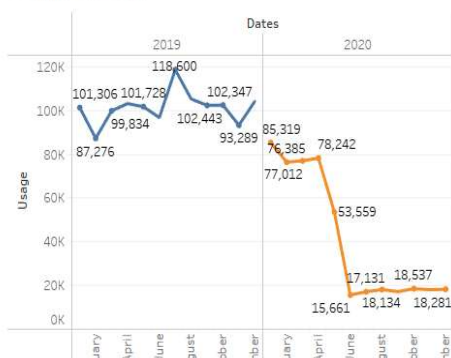
Quarter Wise Usage



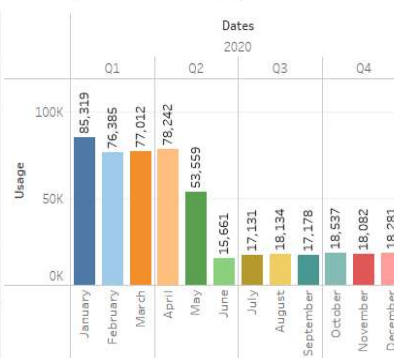
2019 Monthwise Consumption



Usage By Year



2020 Monthwise Consumption



ter Wise Usage Usage By Year Metro City State Year Wise Consumption in Region Dashboard 1 Dashboard 2 Dashboard 3 Dashboard 4 Dashboard 5 Story of Electricity Consump...

Monthwise Top Consumption

Year of Dat..	Month of D..	States				
2019	January	12,332	9,192	10,254	9,038	6,241
	February	11,038	8,186	8,351	7,615	5,797
	March	13,026	9,581	8,977	8,407	6,418
	April	13,079	9,792	8,871	9,359	6,811
	May	12,667	9,556	9,702	8,879	6,250
	June	12,395	9,632	8,873	8,500	6,376
	July	15,428	11,160	10,651	10,674	7,493
	August	13,529	9,806	9,926	8,978	7,040
	September	13,107	10,272	9,326	9,082	6,254
	October	12,905	9,521	10,097	8,516	6,416
	November	12,185	8,975	8,062	8,580	6,055
	December	13,225	9,686	9,600	9,092	6,988
2020	January	10,648	8,032	7,538	7,897	5,280
	February	9,659	7,443	7,493	6,860	4,863
	March	9,601	7,132	7,047	6,849	4,948
	April	9,934	7,669	6,790	7,325	5,397
	May	7,088	5,200	4,876	4,735	3,612
	June	2,214	1,661	1,225	1,237	1,096
	July	2,016	1,522	1,764	1,334	1,084
	August	2,045	1,512	1,979	1,521	1,135
	September	2,445	1,763	1,166	1,680	1,033
	October	2,008	1,655	2,003	1,674	1,167
	November	2,099	1,676	1,777	1,694	1,071

Usage by Region

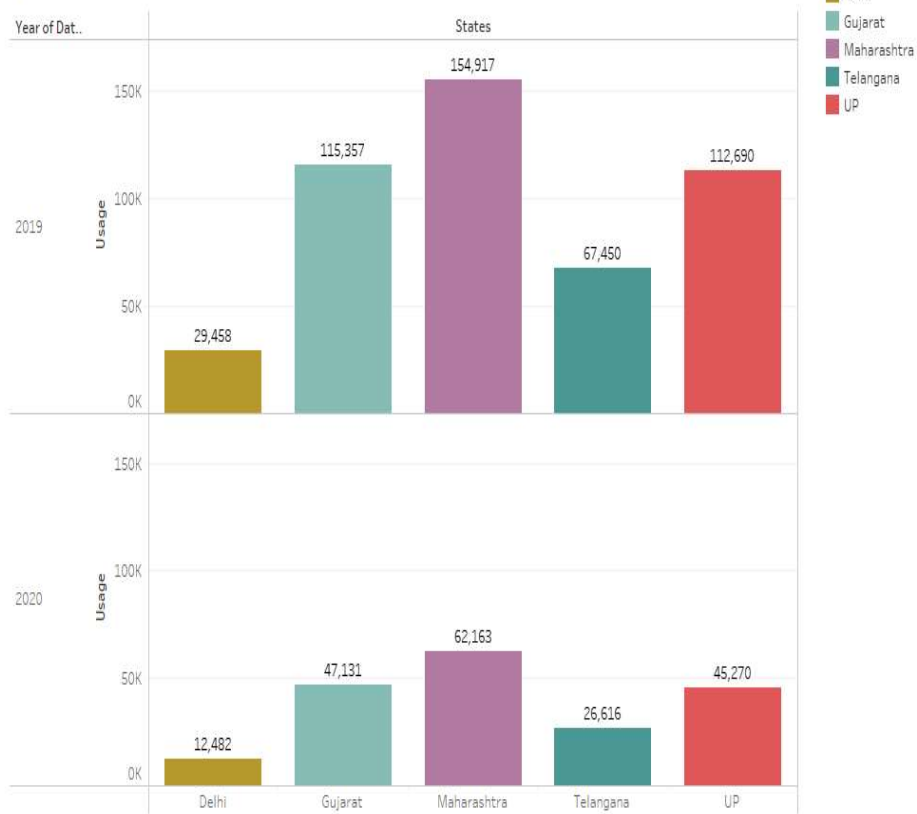


Usage before and during Lockdown



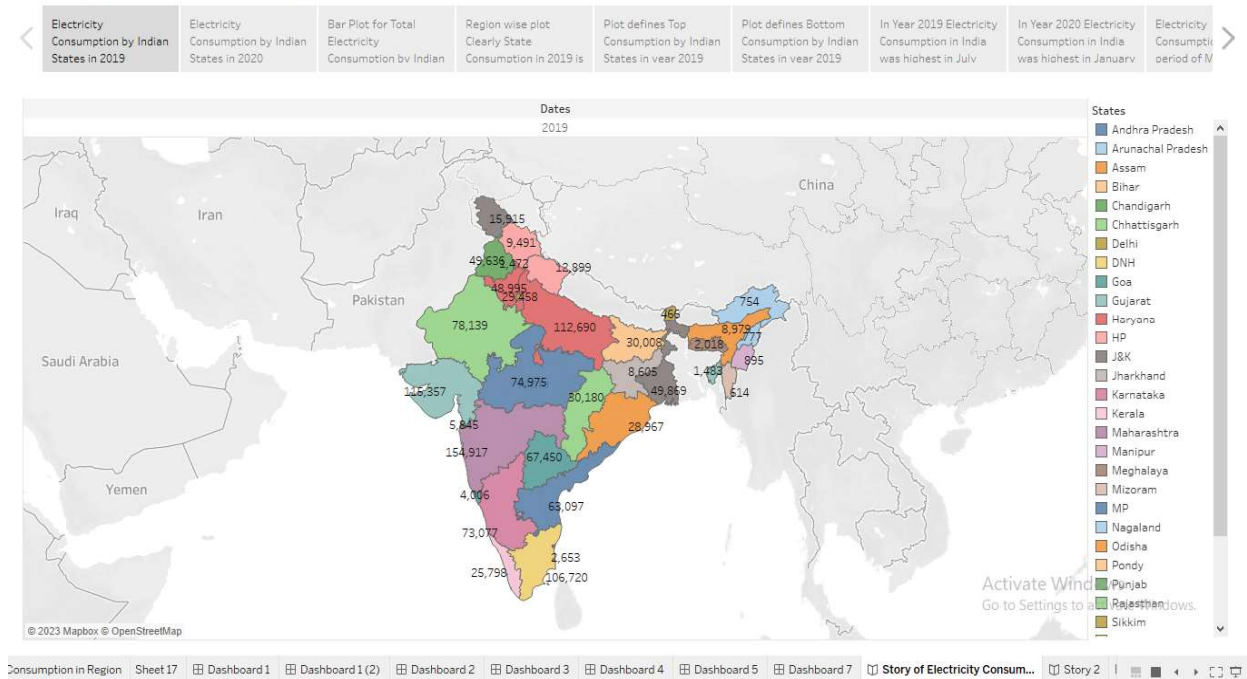
ter Wise Usage Usage By Year Metro City State Year Wise Consumption in Region Dashboard 1 Dashboard 2 Dashboard 3 Dashboard 4 Dashboard 5 Story of Electricity Consump...

Metro City State

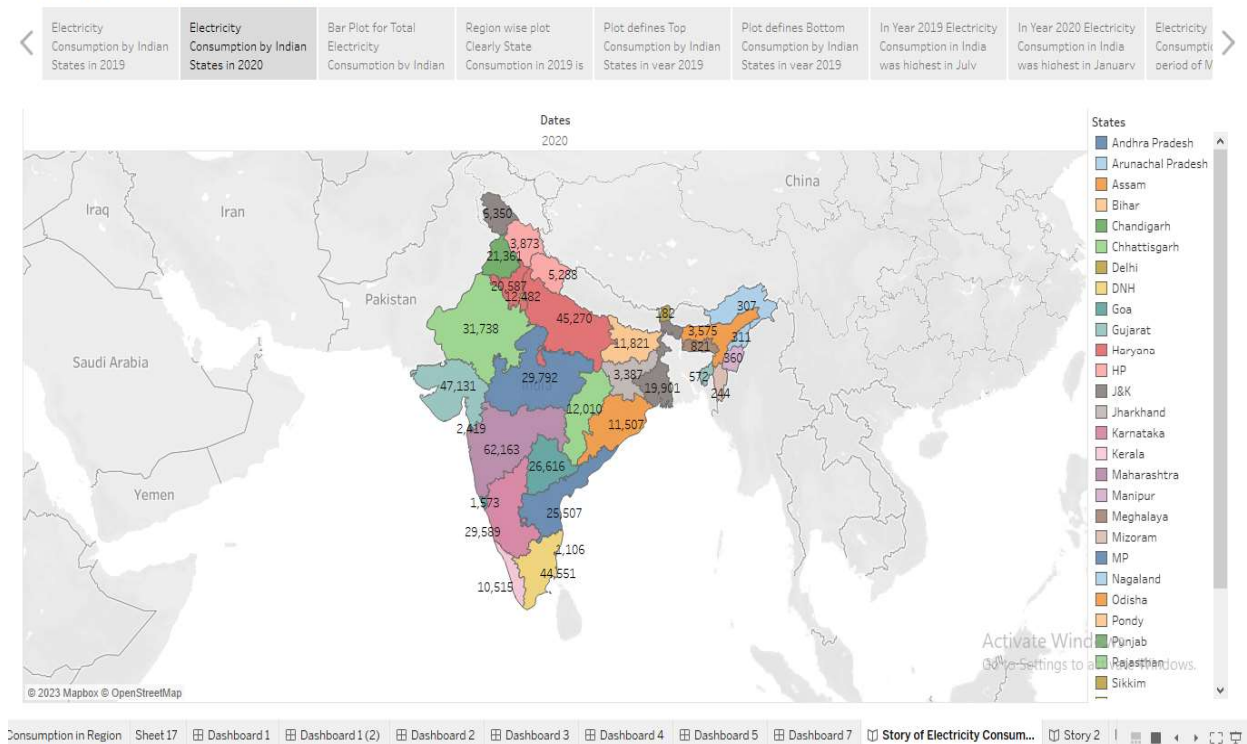


3.2 STORY:

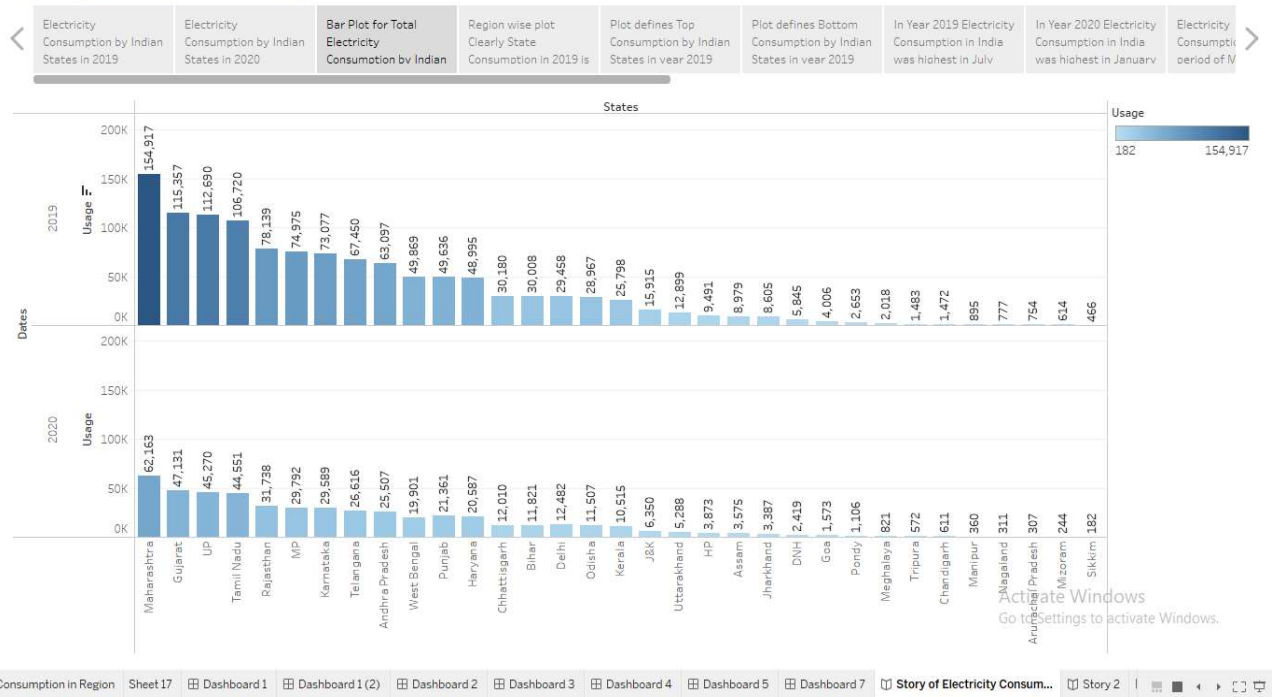
Story of Electricity Consumption in India



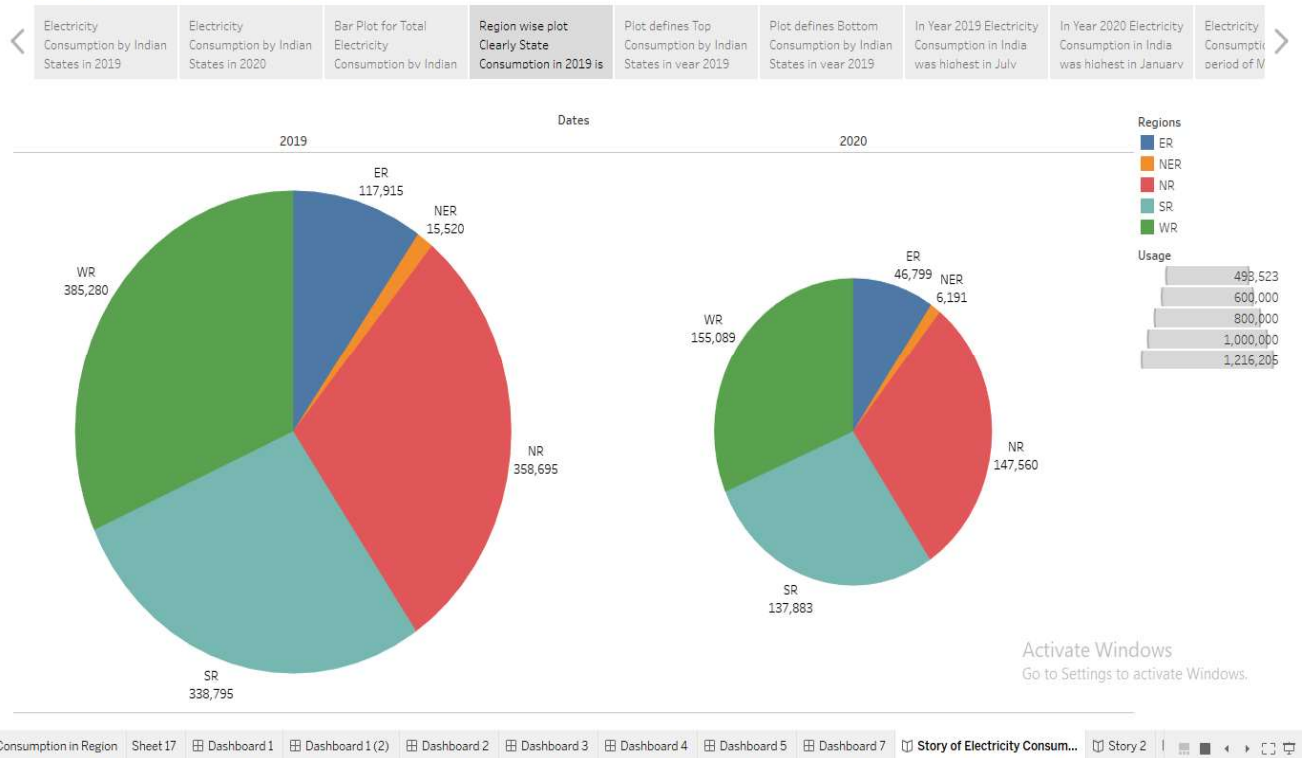
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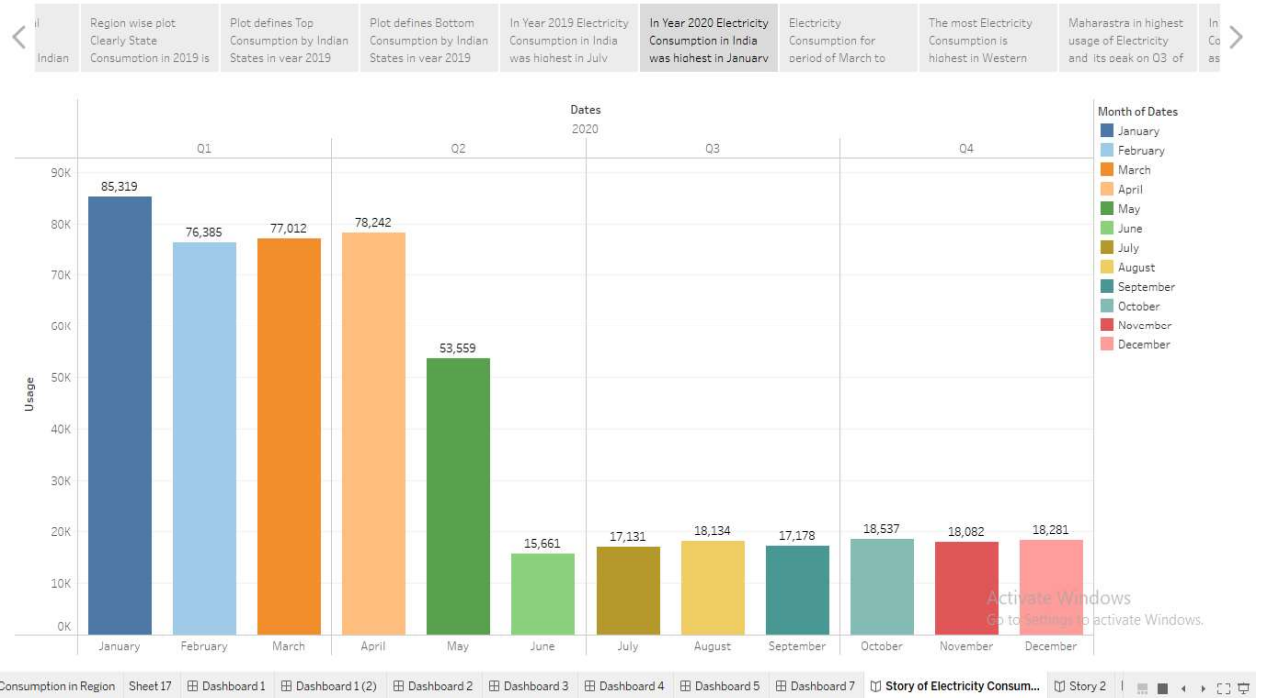
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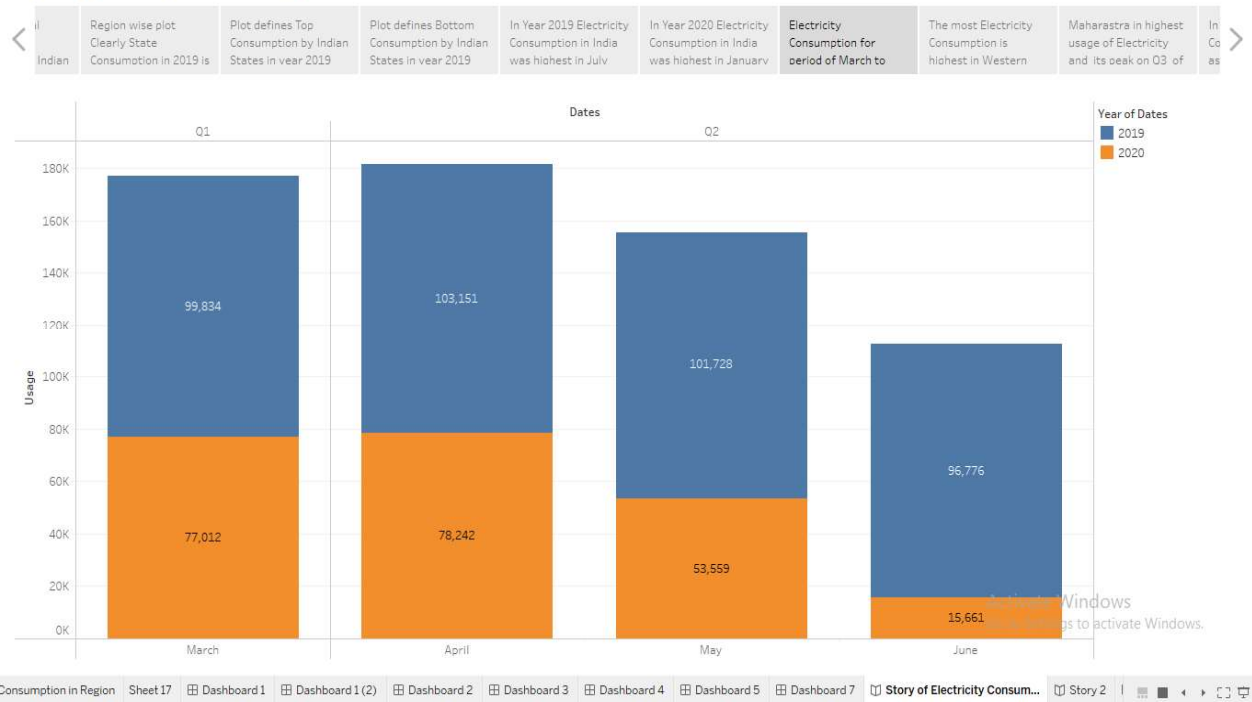
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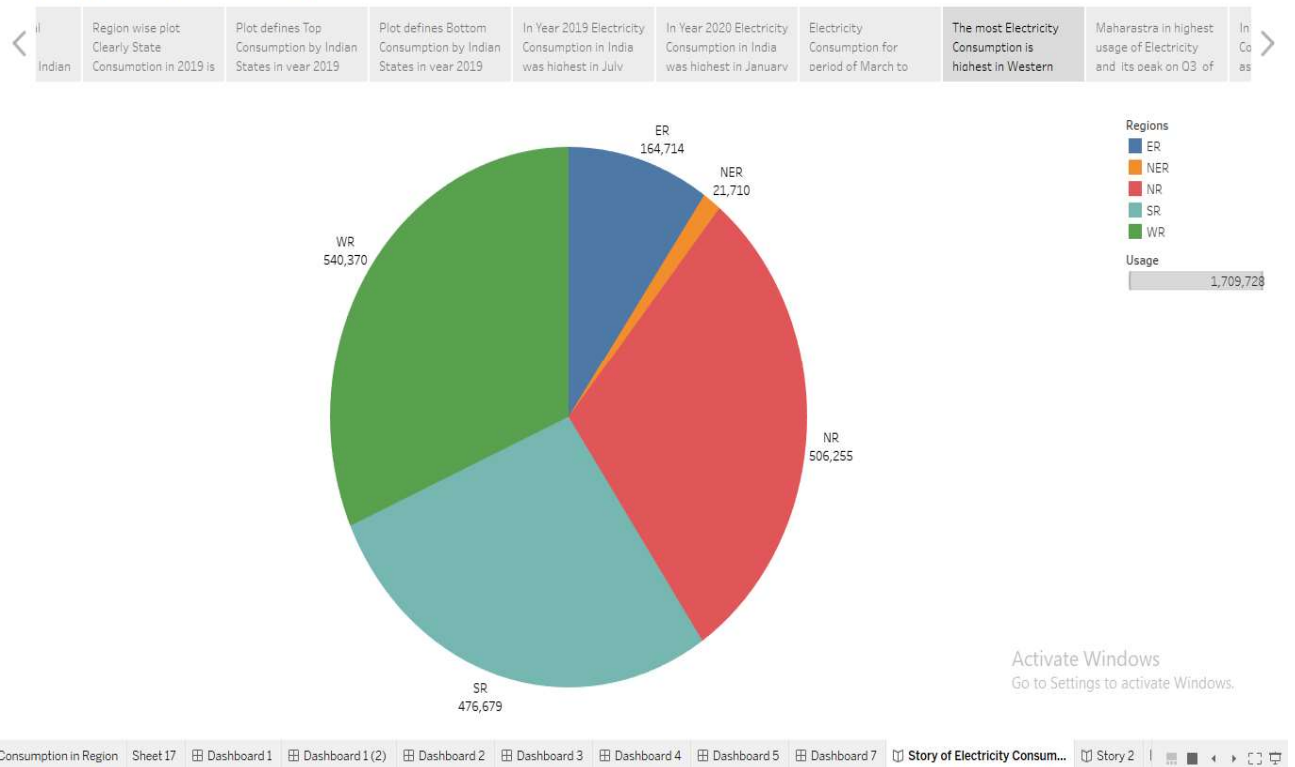
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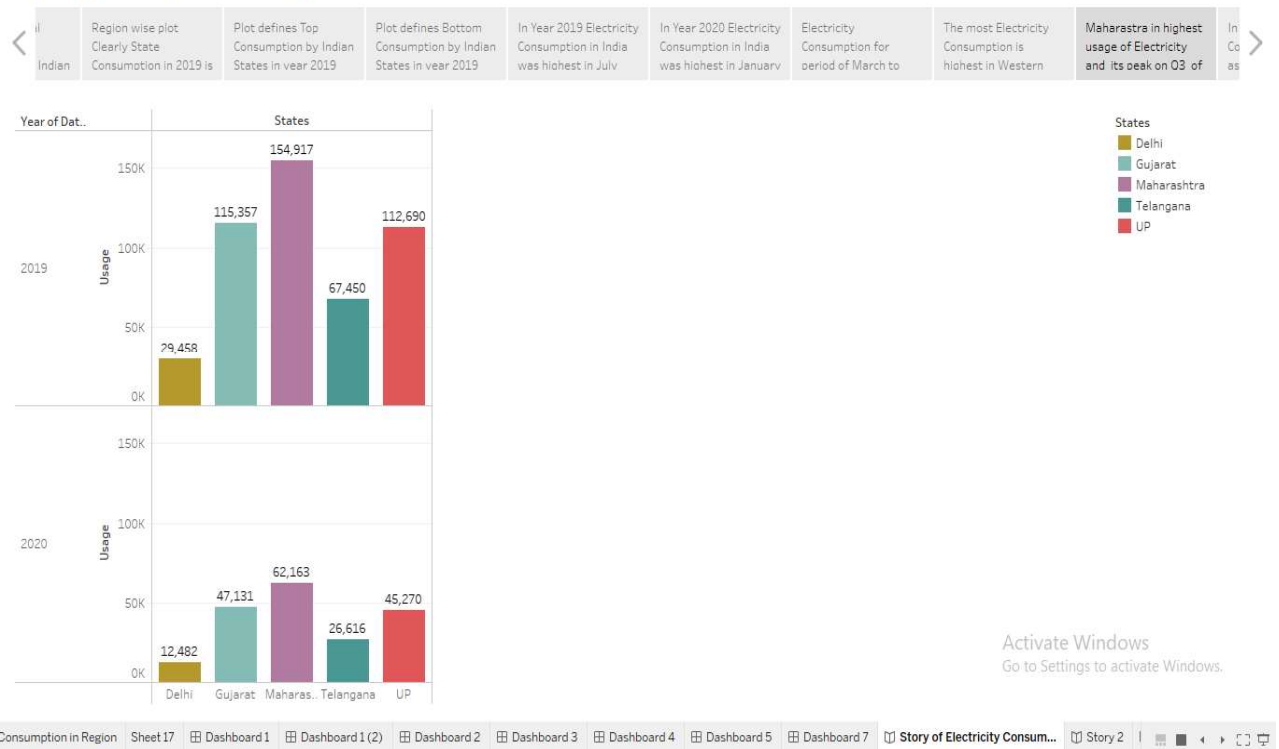
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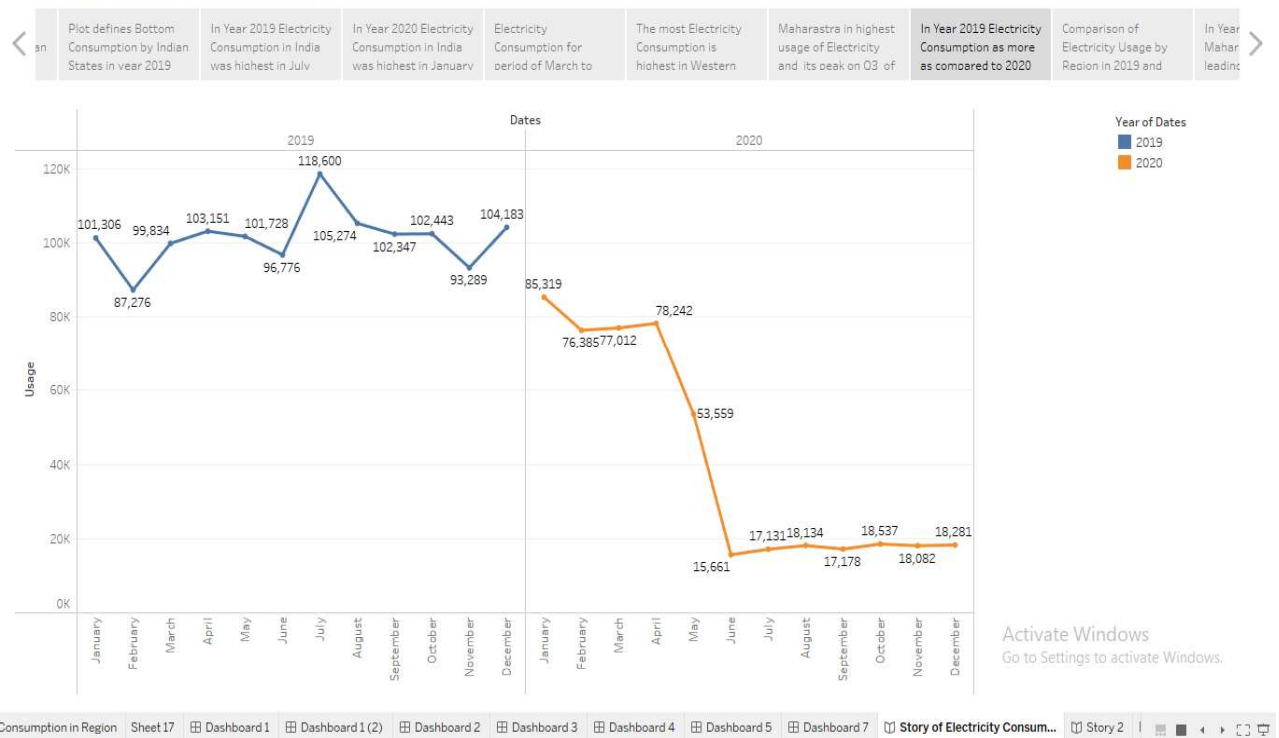
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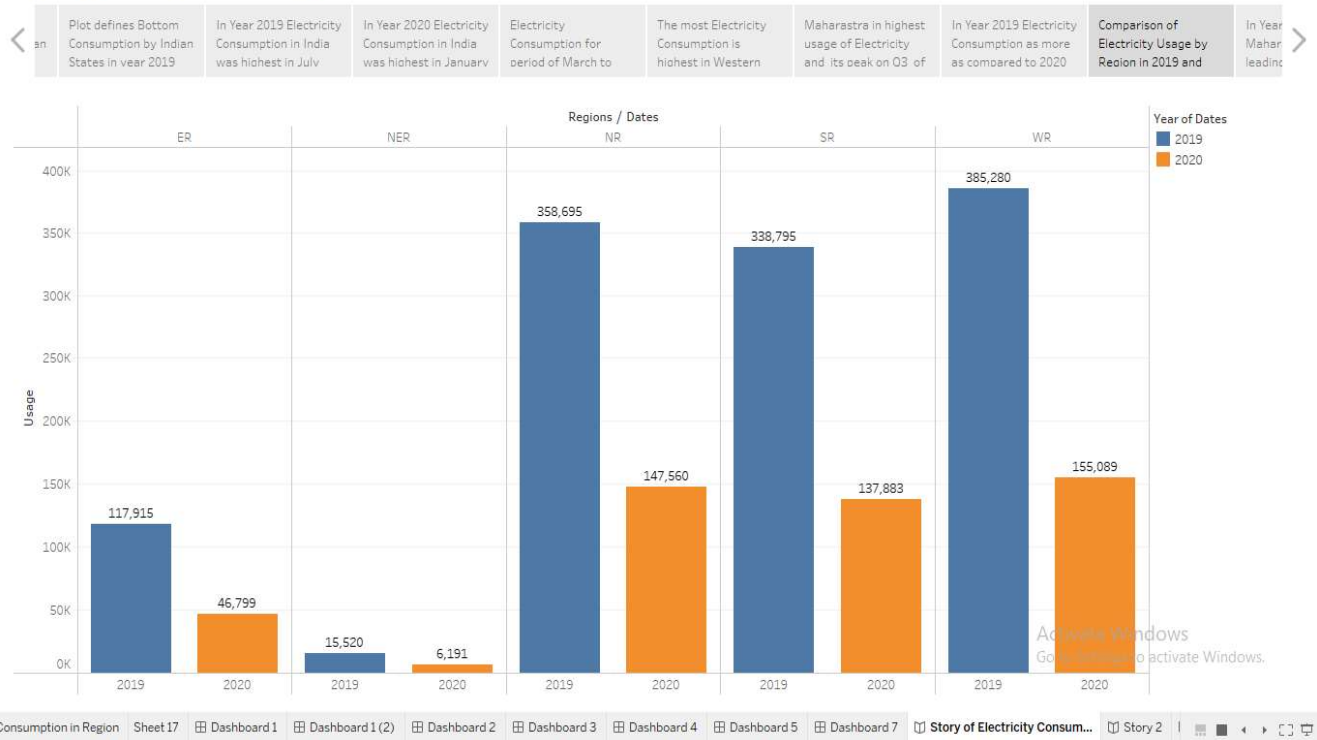
Story of Electricity Consumption in India



Story of Electricity Consumption in India



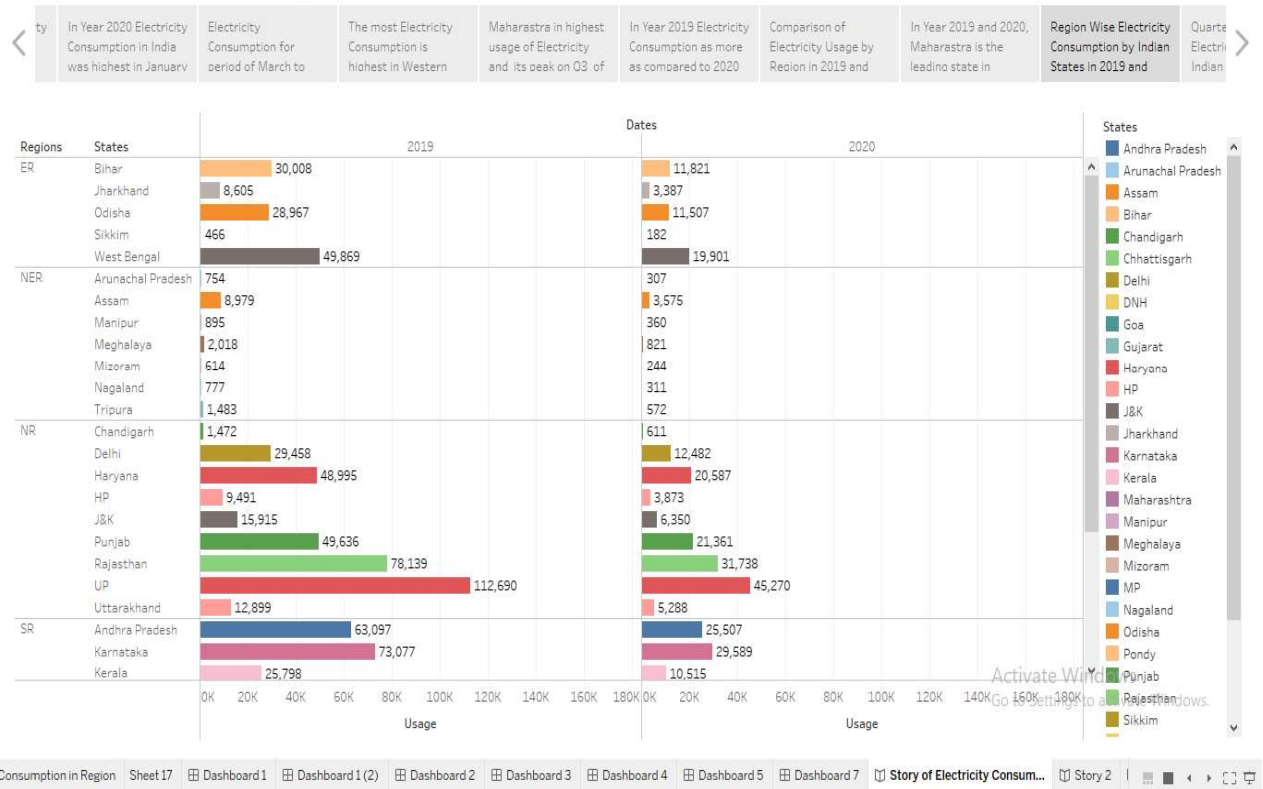
Story of Electricity Consumption in India



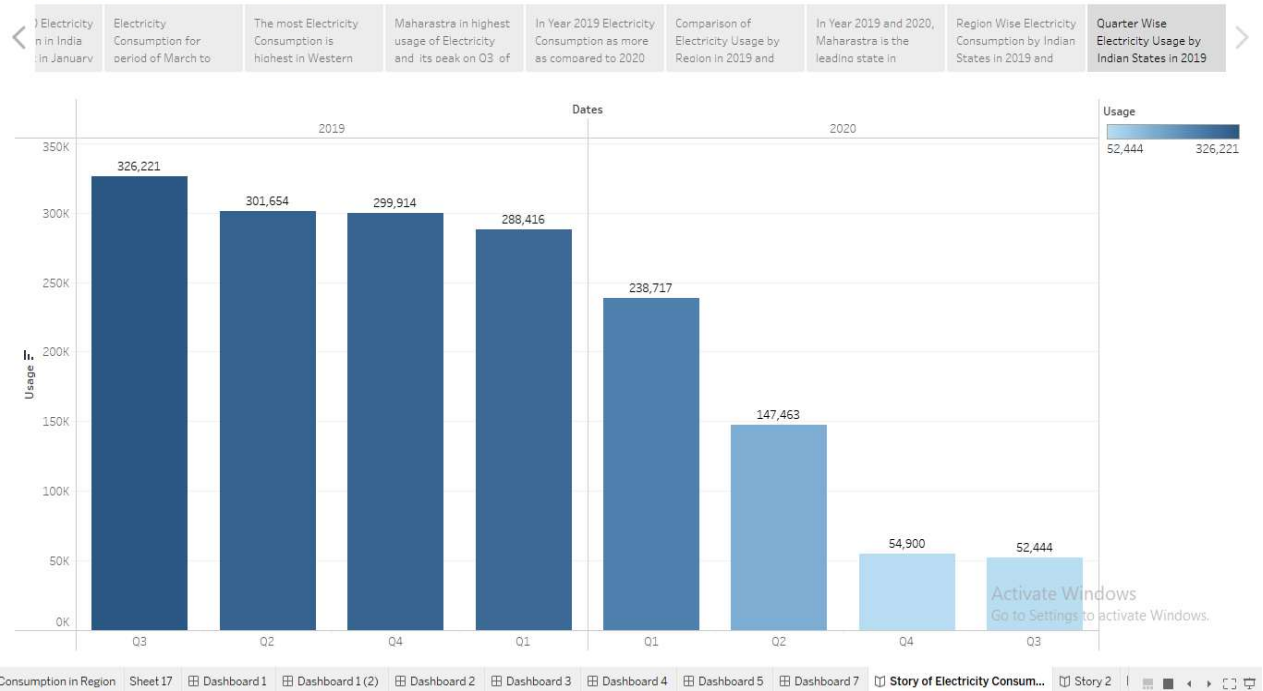
Story of Electricity Consumption in India

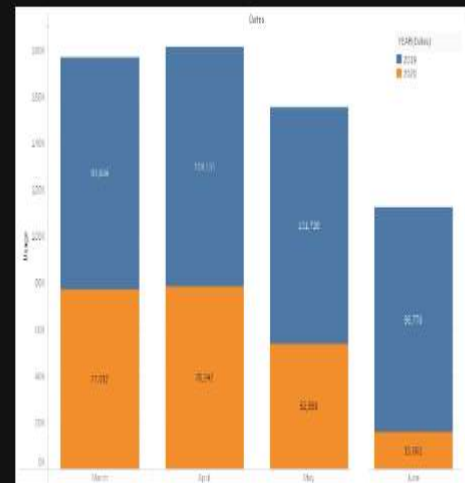


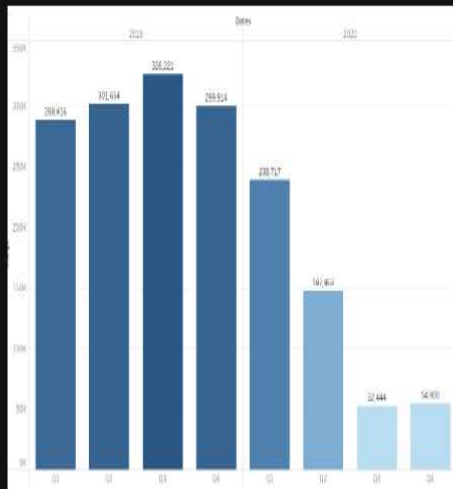
Story of Electricity Consumption in India



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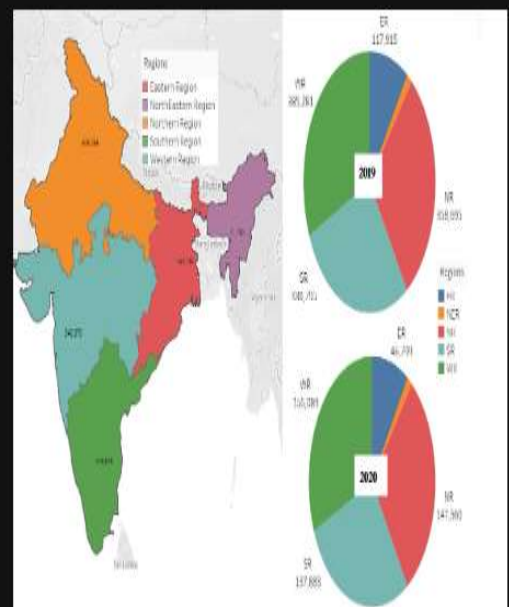


Electricity Consumption in Quarters

- ✓ Electricity Consumption in 2019 for Quarter 3 was Highest.
- ✓ Electricity Consumption in 2019 for Quarter 1 was Lowest.
- ✓ Electricity Consumption in 2020 for Quarter 3 was Lowest.
- ✓ Electricity Consumption in 2020 for Quarter 1 was Highest.

Electricity Consumption in Regions

- ✓ Total Electricity consumption in Western Region is Highest.
- ✓ Total Electricity consumption in North Eastern Region is Lowest.
- ✓ Electricity Consumption in 2020 for Quarter 3 was Lowest.
- ✓ Electricity Consumption in 2020 for Quarter 1 was Highest.



4.ADVANTAGES AND DISADVANTAGES:

4.1ADVANTAGES:

ELECTRICAL ENERGY CONSERVATION IMPLIES:

- Efficient use of available electrical energy.
- Innovation and Adoption of new technology for minimizing losses and misuses in all sectors - Industrial, Transport, Agriculture and Residential etc.
- Saving electricity leads to reduction in environmental pollution, which is good for society as a whole.

ELEMENTS OF ENERGY POLICY:

The key elements of the energy policy followed by the

Developing countries are:

- PROPER ENERGY PRICING
- FIERCELY COMPETITIVE MARKETS FORCING INDUSTRIES TO REDUCE PRICING
- ENERGY LABELLING & ENERGY EFFICIENCY STANDARDS – for EQUIPMENTS
- INCREASING CONSUMERS AWARENESS ---

ABOUT ENERGY EFFICIENCY & PRESERVATION OF ENVIRONMENT

➤ STABLE POPULATION

ELECTRICAL LOAD MANAGEMENT:

It means the scheduling of loads and maintaining the load factor nearly 100% so that peak demand and demand charges can be reduced. Load scheduling is subjected to operational constraint and possibility of load scheduling. Demand can be controlled by:

- Time Control – can be exercised, if cyclic energy consumption is consistence,
- Manual Control – monitoring the variation in demand and sheds some load to keep Maximum demand within limit
- Centralized Load Control –Monitoring the energy consumption to be done centrally to keep MD within limit.
- Power Factor – Industrial loads are inductive so PF will be low causing more energy consumption. It is to be improved by providing shunt bank condenser at the end of the feeder.

4.2 DISADVANTAGES:

ENERGY-RELATED ENVIRONMENTAL ISSUES:

The use of fossil fuel (coal, oil & gas) has been harmful to Environment and their use lead to such rapid industrial development that effects on the environment were not studied or even considered until recently. Besides fossil fuels, nuclear energy also poses environmental risks.

Of all the energy-related environmental issues, there are 9 that are causing the greatest concern at the moment. They are:

- Green house effect – effect of the increased CO₂ & other gases collected in the earth atmosphere.
- Acid rain – rain that contains chemical pollution falls to earth.
Dilute acid with absorption of SO₂ & NO_x-ingredient
- Nuclear waste
- Water pollution
- Depletion of ozone layer
- Smog
- Accident
- Power lines & pipe lines
- Water storages

5.APPLICATION:

Energy Saving Approach Area:

- Lighting
- Industrial Motors
- Air-conditioning
- Water supply system (Pumps)
- Electric heating & Electrolysis

Save Energy in Lighting:

About 15% of the total energy consumption in any Installation is in Lighting only so subject of lighting is concerned. Selection of most suitable lamp is based on its luminous efficiency, colour rendering characteristics, cost, useful life maintainability and decorative quality. Energy efficient lighting means:

- Use of efficient light source – Low energy SL&PL lamps are low pressure gas discharge lamps with high efficiency.
- Optimum Optical efficacy
- Good house keeping
- Best designed system
- Need based lighting by control of switching operation
- For interior lighting effect of room surface finishes is essential.

Energy cost Vs Lamp cost:

Many techniques have been put to reduce the energy consumption in Lighting. The cost effectiveness of these methods depends upon energy costs, utility of system and cost of installation of new system.

The comparison shows how significant is the cost of energy to operate Light installation?

Running cost FL 40W HPMV125 HPSV70W
LPSV35

Per 1000 hrs	Rs	W Rs	Rs	W Rs
E/cost with	117	315	191	113
Gear loss				
Lamp cost	07	30	35	60
Per 1000hr				
Total cost	124	345	226	173
E/cost as	94%	91%	85%	65%

INDUSTRIAL MOTORS:

Electric motors constitute about 72% of the total industrial load, where Induction motors are invariably used. Criteria for selection:

- Process requirement – General, Auto / Non auto control, variable speed etc
- Types of Motors and their starting arrangement– improved controls
- Electric power system requirement– operation at rated supply
- Availability, Reliability and maintenance requirements

Operational Improvements:

1. Operated at rated voltage and balanced supply.
2. Improve controls and regular maintenance
3. Improved cooling

Retrofit Improvement:

1. Replacement of oversized motors by lower ratings.
2. Replacement of old and inefficient motors by new motors.

Energy conservation in water supply pumping

installations:

Electrical Pumps of varying capacities are commonly used for pumping water from the source to the overhead tank. The efficiency of the pumping station varies from 10 to 70%. Prevention of wastage and leakage can save energy up to 5%. Overhead storage tanks should be located at minimum height commensurate with pressure requirement. Regulation of discharge may be done by matching pumps and motors with required volume and pressure instead of using partial closed valve, which waste the energy considerably.

Railways cannot control energy prices, but can control energy consumption by raising the efficiency of energy use in pumping installations.

Railways can also bring down cost of pumping water by improving the reliability of pumping installation in addition to raising the efficiency.

Energy conservation in Air-conditioning System:

Air-conditioning is another intensive operation .A combination of Central AC with packed individual units may prove more energy efficient. It is proved that 1degree centigrade less cooling temperature. Can mean 8 to 10% less energy consumption. Inside temperature 25 degree centigrade most reasonable for both human and equipments. Hence thermostatic control may be set from 23 to 25 degree Celsius. In winter room need not to be heated upto 18 degree centigrade regular maintenance of the AC Equipments are required for the saving of energy.

The other means to achieve economies in energy consumption are:

1. Locating heaters etc outside AC areas
2. Prevention leakage of air from and into the AC areas.
3. Intake air to be limited to minimum.
4. Electronic voltage control for speed control of blowers to be provided.
5. Air filters to be cleaned regularly.

Energy conservation in Electric Heating & Electrolysis:

Electric Heating:

- Temperature and Mode of heat transfer are the 2 main factors, which decides a form of heating to adopt.
- Energy conservation in electric heating is possible mainly by
- Reducing heat losses
- Using more efficient equipment or processes

Electrolysis:

- Some of the measures that may be taken to effect saving in electric Energy consumed in electrolysis are given as:
- Storage batteries
- Electrolytic processes
- Recover waste heat
- Use of efficient controls & Rectifiers

Electrical energy conservation monitoring measures in Indian

Railways:

Institutional arrangement have been strengthen both at Zonal and Divisional level for monitoring the energy saving approach and make necessary arrangement to implement the program.

At Zonal level Deputy CME (fuel) is nominated as secretary and other members to look after the works of Energy Conservation plans and monitoring all the energy used every year.

Similarly ADRM heads the divisional level to maintain the Conservation plans and make necessary efforts for proper utilization of energy.

In each Railway Workshop one energy officer of Deputy Rank is nominated for coordination for proper energy utilization.

Following are the efforts --

- Training --Energy conservation efforts will succeed only when one have trained people in implementing the energy conservation program and energy audit technique. Indian Railways are conscious of it.
- Motivation and Incentives: -The aspect is fully considered and Rly. Personnel are given awards for their contribution towards saving energy in the Rly..
- Specific Energy Consumption—Energy consumed per unit of output is the specific energy consumption of the product.

6. CONCLUSION:

ELECTRICAL ENERGY & ENVIORNMENT:

The process of Energy generation, transmission and utilization leads to significant environment, pollution.

The Green house effect due to increase in the level of CO₂, Methane and other gases are leading to global warming.

The CO₂ level in the atmosphere has increased from 280 ppm in 1980 to about 380 ppm at present.

The average temperature of the EARTH'S atmosphere is likely to increase by 1.5 to 04 degree centigrade in the next 05 years, if emission of Green house is not curbed.

Global warming may lead to rise in sea levels, significant change in rain fall patterns, increase in frequency of heat waves, storms and other unpredictable consequences.

The production of Chloro Fluoro Carbons (CFCS), which affects the ozone layer, has been phased out and at the time developing countries have agreed to reduced Carbon emission.

The World is moving towards a SUBSTANTIAL ENERGY FUTURE With emphasis on ENERGY EFFICIENCY & USING RENEVABLE ENERGY SOURCE.

7.FUTURE SCOPE:

ELECTRICITY – A FRIEND AND A FOE

The impact of Electricity and its use in the modern times is phenomenal.

Electricity has come to be a part of our daily life and its important is felt most when there is a power failure. Although modern science has come out with alternatives in the event of power failure, the same is only a stop gap. The alternative again depends on the resumption of power, to charge the batteries etc, to be an effective stand by.

Therefore intense is needed for electricity, that its use has been largely negligent. While the above negligent acts have resulted in breakdowns of

machinery and equipment, it has also brought about Catastrophes in the form of electrical shocks, fires and deaths.
