

# Project Report

## 1. INTRODUCTION:

### 1.1 Project Overview-

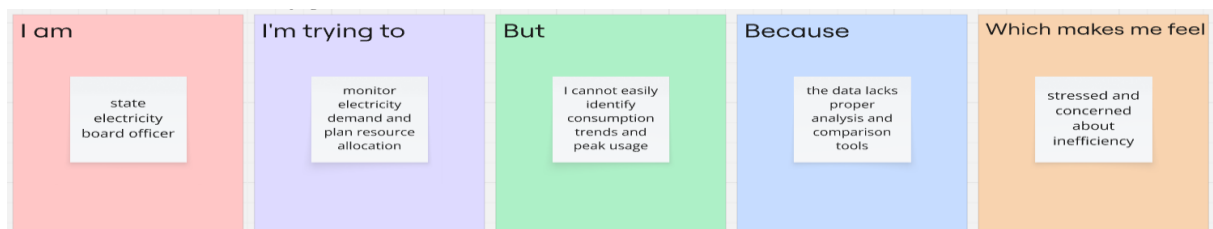
The Electricity Consumption Analysis Dashboard System is a web-based data visualization platform developed to analyze and interpret electricity consumption patterns across different states and sectors. The system processes structured electricity datasets and presents them through interactive charts and graphical representations. It enables users to explore trends, compare regions, and gain meaningful insights from large volumes of consumption data.

### 1.2 Purpose-

The purpose of this project is to simplify complex electricity consumption data and transform it into clear, interactive visual insights. The system helps users understand state-wise, year-wise, and sector-wise electricity usage, supporting better analysis, comparison, and informed decision-making for energy planning and research.

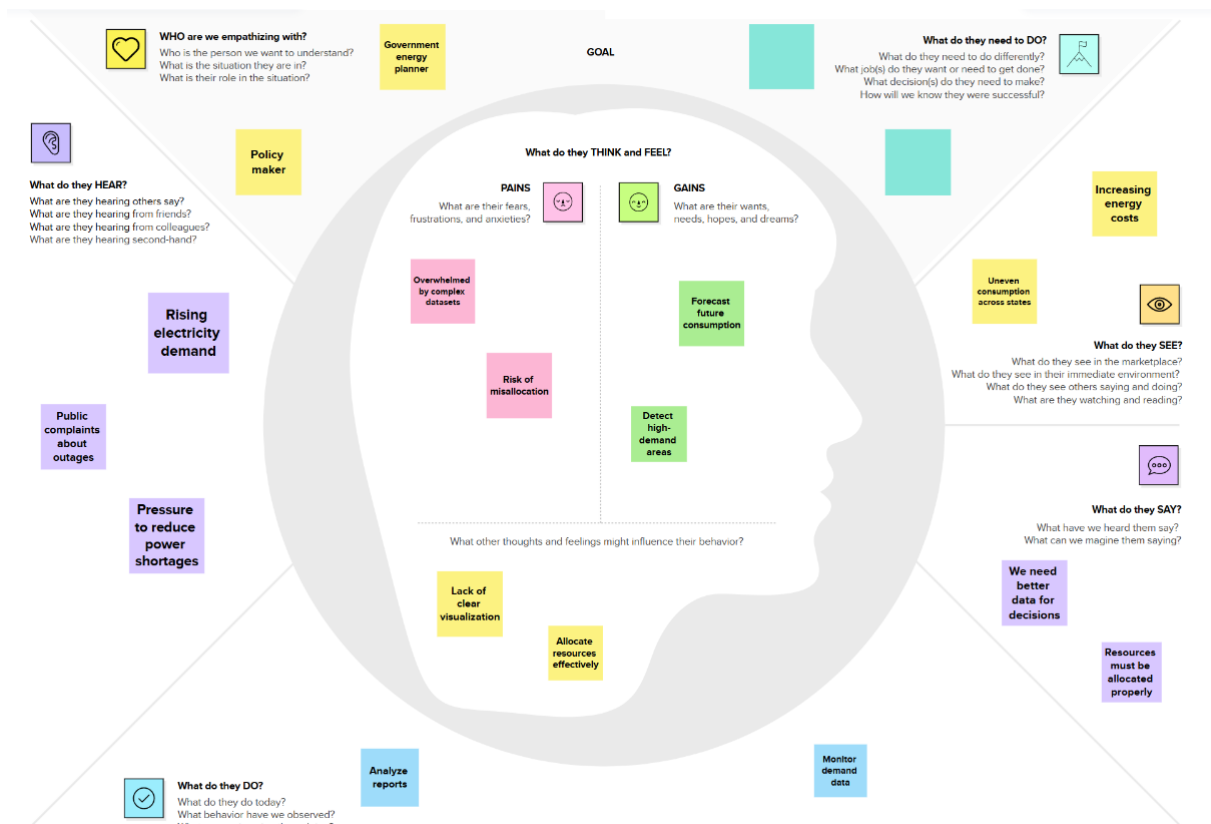
## 2. IDEATIONPHASE:

### 2.1 Problem Statement-



Problem Statement (PS)	I am (Customer)	I'm trying to	But	Because	Which makes me feel
PS1	Government energy planner	Analyse and manage electricity consumption effectively	The data is complex and not clearly visualized	Information is scattered and difficult to interpret	Overwhelmed, Uncertain
PS2	State electricity board officer	Monitor electricity demand and plan resource allocation	I cannot easily identify trends and peak usage	The data lacks proper analysis and comparison tools	Stressed, Concerned

## 2.2 Empathy Map Canvas-



## 2.3 Brainstorming-

1

### Define your problem statement

What problem are you trying to solve? Frame your problem as a How Might We statement. This will be the focus of your brainstorm.

⌚ 5 minutes

#### PROBLEM

How might we help users easily understand and analyze electricity consumption patterns to improve energy efficiency?



#### Key rules of brainstorming

To run a smooth and productive session

- Stay in topic.
- Defer judgment.
- Go for volume.
- Encourage wild ideas.
- Listen to others.
- If possible, be visual.

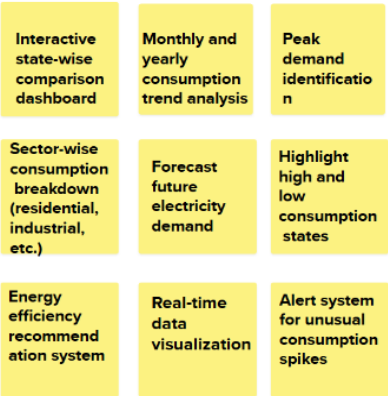
2

Brainstorm

Write down any ideas that come to mind that address your problem statement.

🕒 10 minutes

PAVANI



3

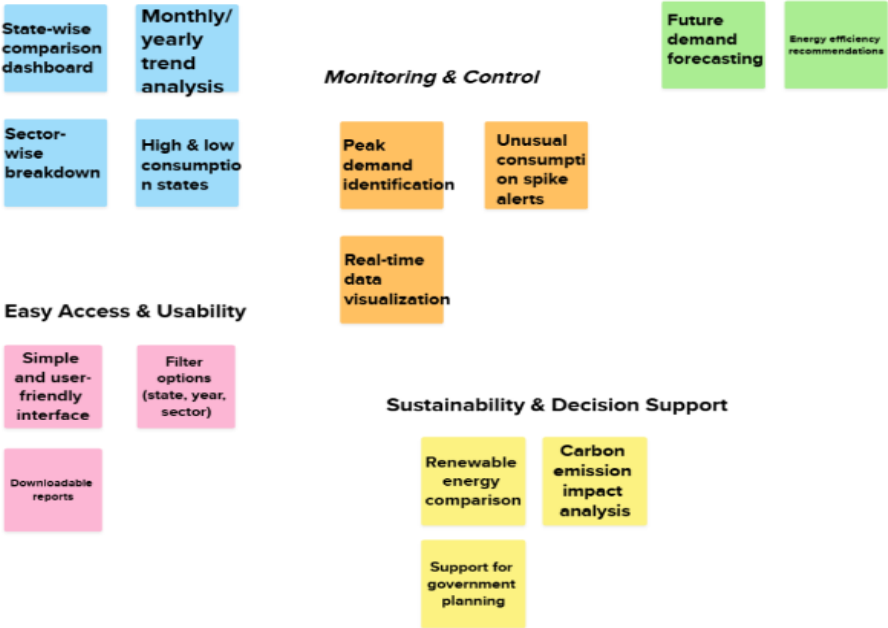
Group ideas

Take turns sharing your ideas while clustering similar or related notes as you go. Once all sticky notes have been grouped, give each cluster a sentence-like label. If a cluster is bigger than six sticky notes, try and see if you can break it up into smaller sub-groups.

🕒 20 minutes

Understanding Consumption Patterns

Planning & Improvement

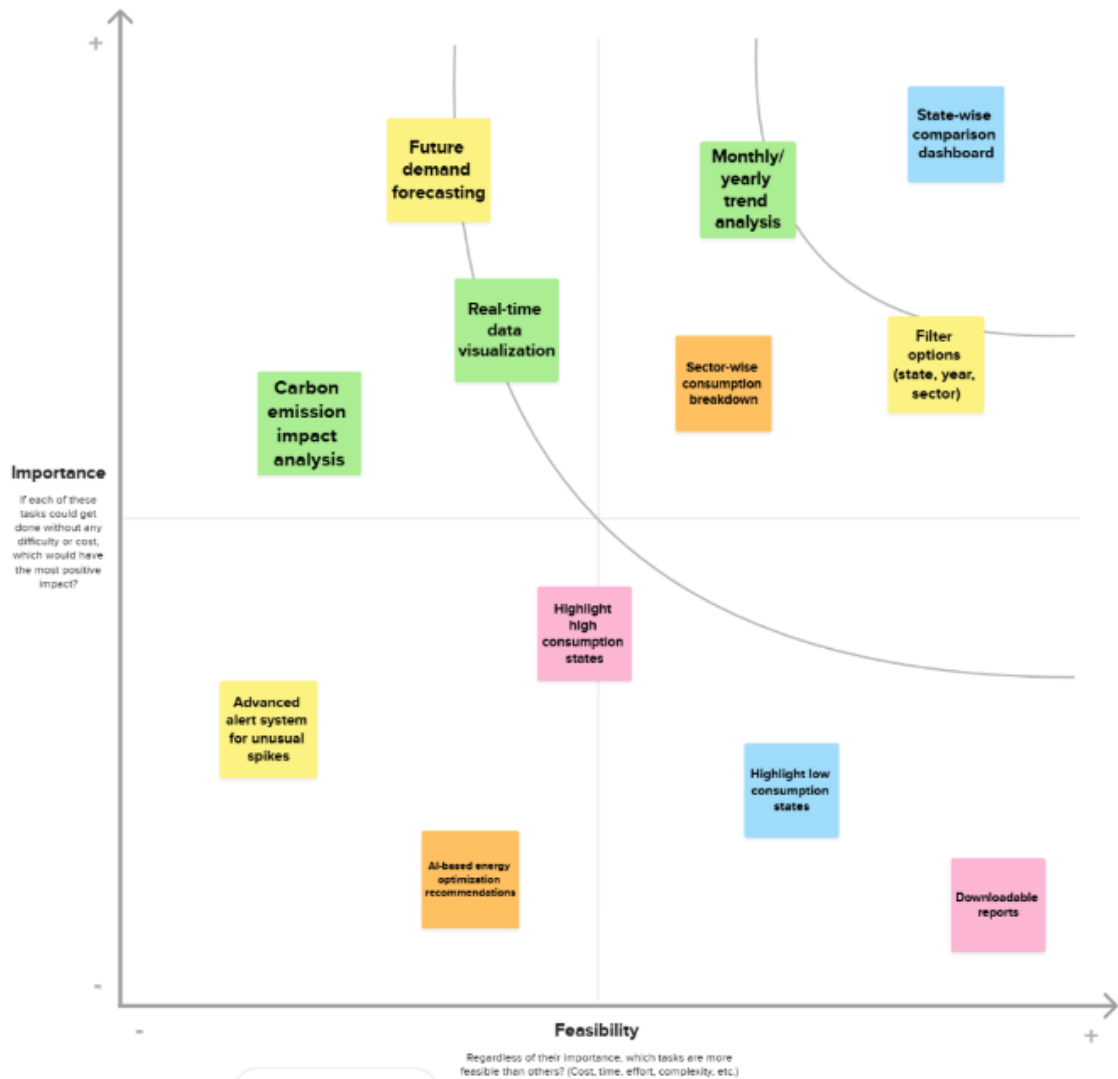


4

## Prioritize

Your team should all be on the same page about what's important moving forward. Place your ideas on this grid to determine which ideas are important and which are feasible.

🕒 20 minutes



## 3. REQUIREMENT ANALYSIS:

### 3.1 Customer Journey map-

Scenario: [Existing experience through a product or service]	Entice How does someone become aware of this service?	Enter What do people experience as they begin the process?	Engage In the core moments in the process, what happens?	Exit What do people typically experience as the process finishes?	Extend What happens after the experience is over?
<b>Experience steps</b> What does the person go through at the center of this scenario typically experience in each step?	Learns about the dashboard Sees demo/overview Hears about analysts solution	Logs into dashboard Selects state/year filters	Views charts & trends Compares states Analyzes peak demand Compares year-wise trends Reviews sector-wise usage	Downloads report Saves insights	Shares report with team Uses insights in meetings Plans future allocation
<b>Interactions</b> What interactions do they have at each step along the way? • People: Who do they see or talk to? • Places: Where are they? • Things: What digital touchpoints or physical objects do they use?	Project team Website preview Colleagues, Email	Web interface Data filters	Interactive graphs Comparison tools Line charts Pie charts Bar charts	Export button Save option	Email Internal planning tools Policy tools
<b>Goals &amp; motivations</b> At each step, what is a person's primary goal or motivation? ("Help me..." or "Help me avoid...")	Find better way to analyze data Improve decision accuracy Control energy usage	Quickly access relevant data Narrow down analysis	Identify patterns & insights Allocate resources wisely Detect growth patterns Identify peak usage Prevent overload	Use insights for planning Revisit later	Make informed policy decisions Reduce shortages Justify planning decisions
<b>Positive moments</b> At each step, what is a person's first ego-state: productive, fun, motivating, delightful, or exciting?	Clear project purpose Data-driven approach Need for solution	Easy navigation Flexible filters	Clear visualizations Easy comparison Clear trends Clear sector breakdown Easy comparisons	Quick report generation Easy saving	Better decision confidence Data backed planning Strong data support
<b>Negative moments</b> What steps does a typical person find frustrating, confusing, angering, costly, or time-consuming?	Unclear data accuracy Doubts usefulness Pressure from public	Slow loading time Filter confusion	Too many complex metrics Overloaded metrics Lacks drill-down Hard to interpret spikes No alerts	Limited export formats No auto-save	Need real-time updates Forecast uncertainty Needs updated data
<b>Areas of opportunity</b> How might we make each step better? What ideas do we have? What have others suggested?	Provide clear introduction video Show success cases Problem-focused messaging	Improve performance speed Simplify filters	Add summary insights section Highlight key KPIs Add drill-down view Add tooltips Add notifications	Add multiple download formats Add auto save	Add real-time data updates Add predictive models Real-time data sync

### 3.2 Solution Requirement-

#### Functional Requirements:

Following are the functional requirements of the proposed solution.

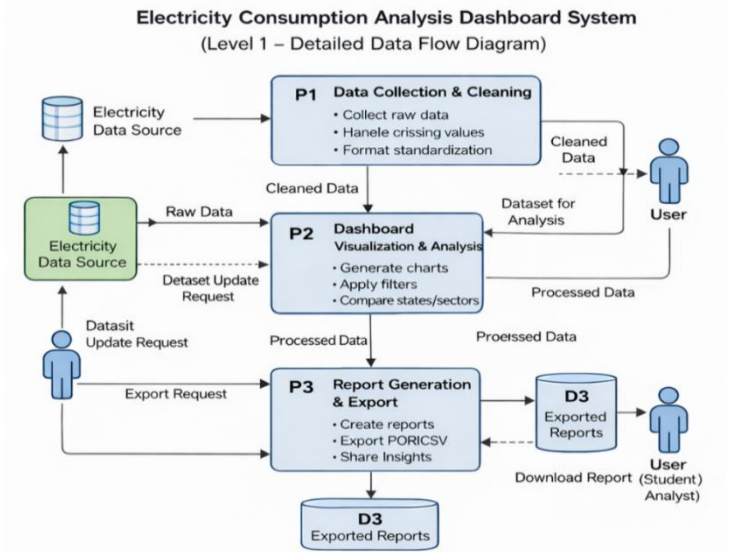
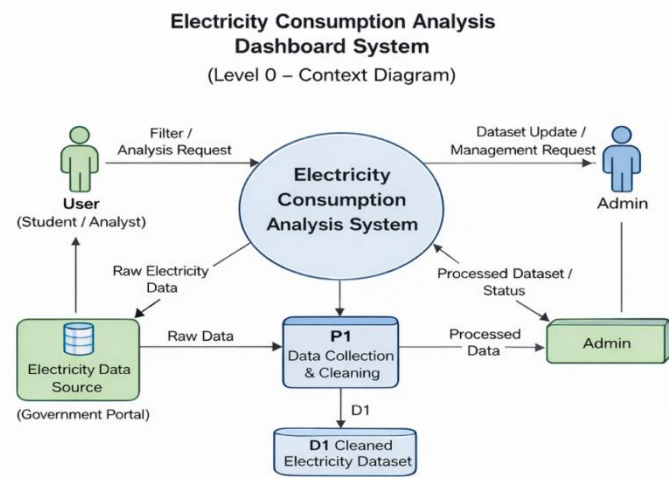
FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	Data Collection & Management	Import electricity dataset
		Clean and preprocess data
		Store cleaned dataset
FR-2	Dashboard Visualization	Display state-wise consumption
		Display year-wise trends
		Display sector-wise breakdown
FR-3	Filtering & Analysis	Filter data by state
		Filter data by year
		Compare multiple states
FR-4	Insights Generation	Identify high & low consumption
		Highlight peak demand trends
FR-5	Report & Export	Export dashboard data
		Generate downloadable report

#### Non-functional Requirements:

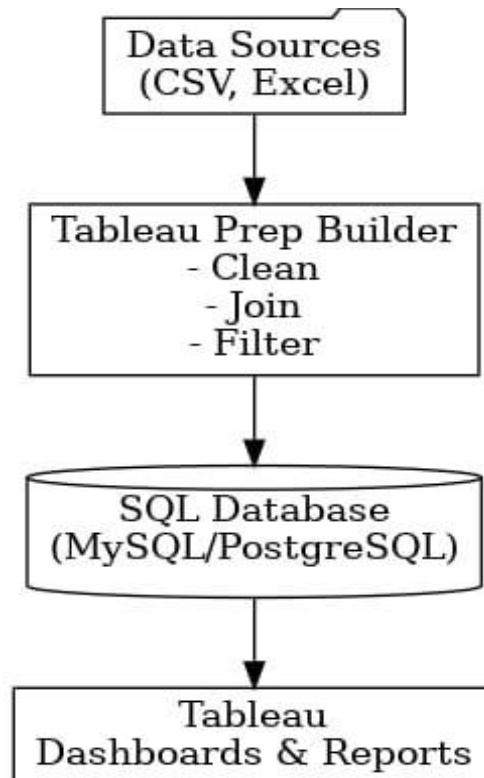
Following are the non-functional requirements of the proposed solution.

FR No.	Non-Functional Requirement	Description
NFR-1	Usability	The dashboard must be simple, intuitive, and easy to navigate.
NFR-2	Security	Dataset and system access must be protected from unauthorized changes.
NFR-3	Reliability	The system should display accurate and consistent data without errors.
NFR-4	Performance	Dashboard should load and update visualizations within a few seconds.
NFR-5	Availability	The system should be accessible whenever users need it.
NFR-6	Scalability	The system should handle increasing dataset size without performance issues.

### 3.3 Data Flow Diagram-



### 3.4 Technology Stack-



## 4. PROJECT DESIGN :

### 4.1 Problem Solution Fit-

## Problem-Solution fit canvas 2.0

Purpose / Vision

Define CS, fit into	<b>1. CUSTOMER SEGMENT(S)</b> <span>CS</span> Who is your customer? <ul style="list-style-type: none"> <li>Government energy planners</li> <li>Electricity board officials</li> <li>Data analysts / Researchers</li> <li>Students studying energy trends</li> </ul>	<b>6. CUSTOMER</b> <span>CC</span> What constraints prevent your customers from taking action or limit their choices of solutions? Limited technical expertise Large unstructured datasets Time constraints Lack of centralized visualization tool	<b>5. AVAILABLE SOLUTIONS</b> <span>AS</span> Which solutions are available to the customers when they face the problem or need to get the job done? What have they tried in the past? What pros & cons do these solutions have? <ul style="list-style-type: none"> <li>Manual Excel analysis</li> <li>Static reports</li> <li>Government data portals</li> <li>Basic charting tools</li> </ul>	Explore AS.
	<b>2. JOBS-TO-BE-DONE / PROBLEMS</b> <span>J&amp;P</span> Which jobs-to-be-done (or problems) do you address for your customers? There could be more than one; explore different sides. <ul style="list-style-type: none"> <li>Analyze state-wise electricity consumption</li> <li>Identify peak demand periods</li> <li>Compare yearly and sector-wise usage</li> <li>Generate reports for planning</li> <li>Understand consumption patterns clearly</li> </ul>	<b>9. PROBLEM ROOT CAUSE</b> <span>RC</span> What is the real reason that this problem exists? What is the back story behind the need to do this job? <ul style="list-style-type: none"> <li>Data is scattered across sources</li> <li>No unified visualization system</li> <li>Raw data is difficult to interpret</li> <li>Lack of interactive filtering</li> </ul>	<b>7. BEHAVIOUR</b> <span>BE</span> What does your customer do to address the problem and get the job done? i.e. directly related: find the right solar panel installer, calculate usage and benefits; indirectly associated: customers spend free time on volunteering work (i.e. Greenpeace) <ul style="list-style-type: none"> <li>Download datasets from portals</li> <li>Use Excel for analysis</li> <li>Create manual charts</li> <li>Share PDF reports internally</li> </ul>	
Identify strong TR & EM	<b>3. TRIGGERS</b> <span>TR</span> What triggers customers to act? <ul style="list-style-type: none"> <li>Rising electricity demand</li> <li>Need for policy decisions</li> <li>Requirement for academic analysis</li> <li>Reporting deadlines</li> </ul>	<b>10. YOUR SOLUTION</b> <span>SL</span> A web-based interactive dashboard that: <ul style="list-style-type: none"> <li>Cleans and processes electricity data</li> <li>Provides state, year, and sector filtering</li> <li>Generates visual insights and comparisons</li> <li>Allows export of reports</li> <li>Supports better energy planning decisions</li> </ul>	<b>8. CHANNELS of BEHAVIOUR</b> <span>CH</span> <b>8.1 ONLINE</b> What kind of actions do customers take online? Extract online channels from #7 <ul style="list-style-type: none"> <li>Government open data websites</li> <li>Web-based dashboards</li> <li>Email sharing of reports</li> </ul>	Extract online & offline CH or BE
	<b>4. EMOTIONS: BEFORE / AFTER</b> <span>EM</span> How do customers feel when they face a problem or a job and afterwards? BEFORE: Confused by raw data, Overwhelmed by complex datasets, Uncertain about trends AFTER: Confident in decision-making, Clear understanding of patterns, Better planning confidence	<b>8.2 OFFLINE</b> What kind of actions do customers take offline? Extract offline channels from #7 and use them for customer development. <ul style="list-style-type: none"> <li>Internal meetings, Policy review discussions</li> <li>Printed reports</li> </ul>		

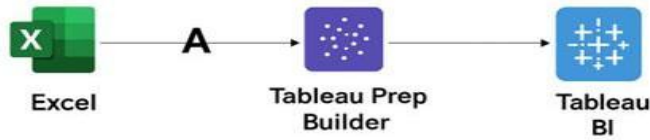
## 4.2 Proposed Solution-

### Proposed Solution Template:

Project team shall fill the following information in the proposed solution template.

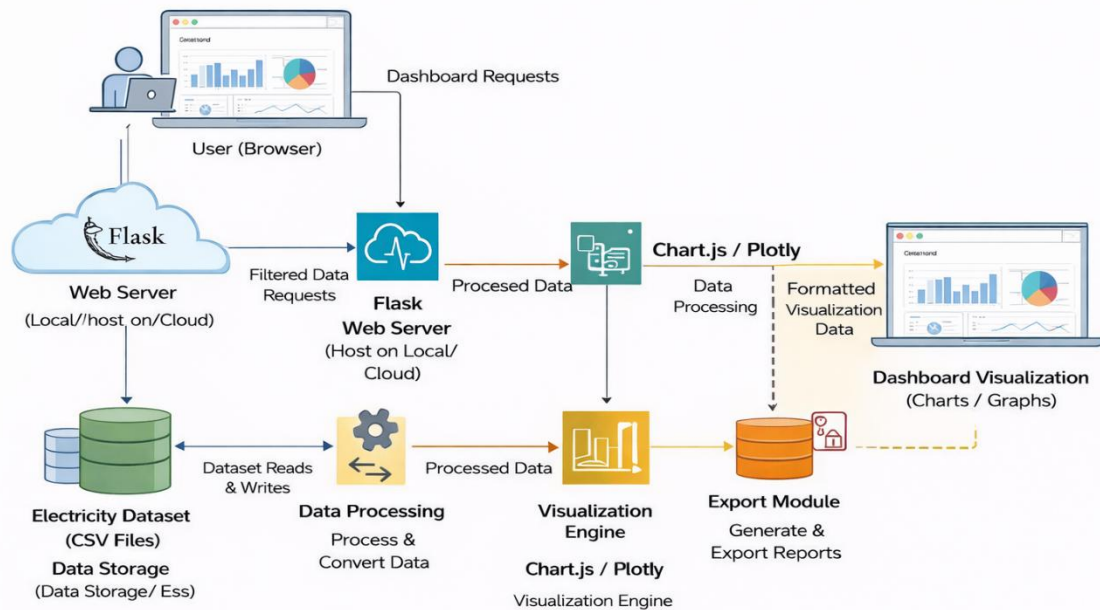
S.No	Parameter	Description
1	<b>Problem Statement (Problem to be solved)</b>	Electricity consumption data is large, complex, and scattered across sources, making it difficult for planners and analysts to identify trends, compare regions, and make informed decisions efficiently.
2	<b>Idea / Solution Description</b>	Develop a web-based interactive dashboard that cleans, processes, and visualizes electricity consumption data with filtering, comparison, trend analysis, and report export features.
3	<b>Novelty / Uniqueness</b>	Provides centralized, interactive visualization with real-time filtering and comparative analysis instead of static reports or manual Excel analysis.
4	<b>Social Impact / Customer Satisfaction</b>	Helps government planners and analysts make better energy management decisions, leading to efficient electricity distribution and improved public service reliability.
5	<b>Business Model (Revenue Model)</b>	Can be offered as a government analytics tool, licensed dashboard solution, or SaaS-based data analytics platform for energy departments and research institutions.
6	<b>Scalability of the Solution</b>	The system can scale to include more states, real-time datasets, renewable energy analytics, and integration with larger databases or cloud deployment.

## 4.3 Solution Architecture-1).



2).

## Solution Architecture Diagram: Electricity Consumption Analysis Dashboard System



## 5. PROJECT PLANNING & SCHEDULING:

### 5.1 Project Planning-

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Data Management	USN-1	As an admin, I can upload the electricity dataset	3	High	Pavani
Sprint-1	Data Processing	USN-2	As a system, I clean and preprocess electricity data	3	High	Pavani
Sprint-1	Dashboard	USN-3	As a user, I can view state-wise electricity consumption	5	High	Pavani
Sprint-1	Dashboard	USN-4	As a user, I can view year-wise consumption trends	5	High	Pavani
Sprint-1	Filtering	USN-5	As a user, I can filter data by state	3	High	Pavani
Sprint-1	Filtering	USN-6	As a user, I can filter data by year	3	High	Pavani
Sprint-2	Comparison	USN-7	As a user, I can compare electricity consumption between states	5	Medium	Pavani
Sprint-2	Insights	USN-8	As a user, I can identify high and low consumption states	3	Medium	Pavani
Sprint-2	Reports	USN-9	As a user, I can export dashboard data	3	Medium	Pavani
Sprint-2	Visualization	USN-10	As a user, I can view sector-wise electricity usage	4	Medium	Pavani

### Project Tracker, Velocity & Burndown Chart: (4 Marks)

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	20	6 Days	18 Jan 2026	23 Jan 2026	20	23 Jan 2026
Sprint-2	20	6 Days	25 Jan 2026	30 Jan 2026	18	31 Jan 2026
Sprint-3	20	6 Days	01 Feb 2026	06 Feb 2026	20	06 Feb 2026
Sprint-4	20	6 Days	08 Feb 2026	13 Feb 2026	19	14 Feb 2026

## 6. FUNCTIONAL AND PERFORMANCE TESTING:

### 6.1 Performance Testing-



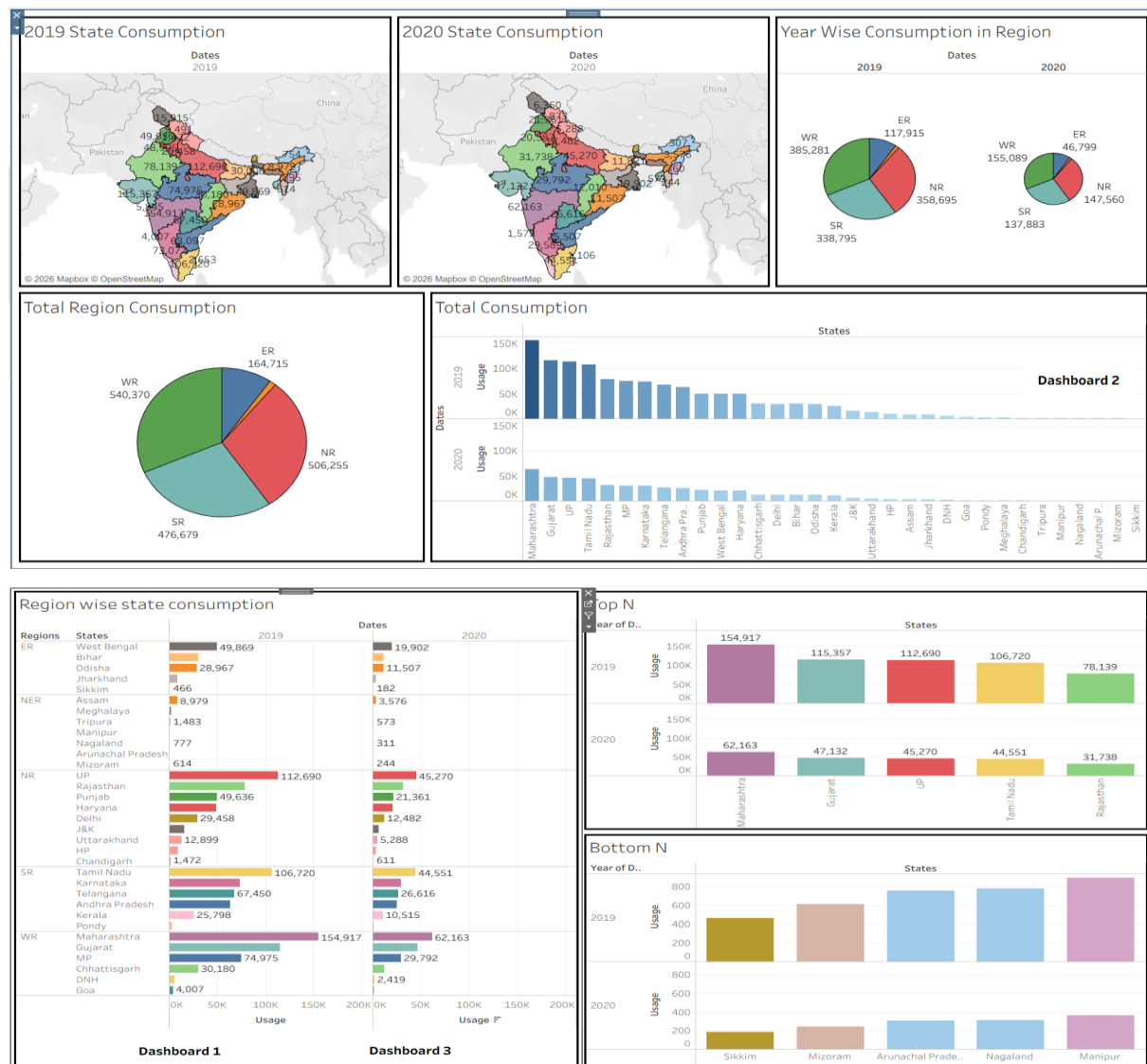
## Model Performance Testing:

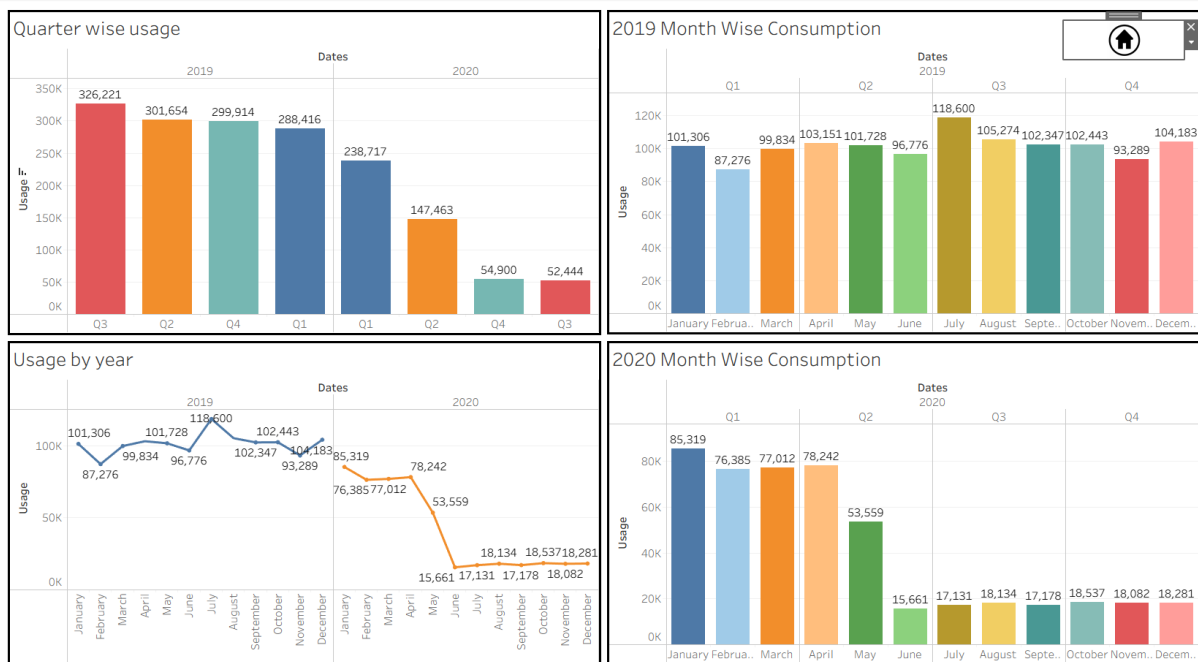
Project team shall fill the following information in model performance testing template.

S.No.	Parameter	Screenshot / Values
1	Data Rendered	State-wise electricity consumption, Year-wise trends, Sector-wise usage data displayed using charts and graphs.
2	Data Preprocessing	Cleaned missing values, formatted dataset, applied aggregation (SUM, GROUPBY), structured data for visualization using Pandas.
3	Utilization of Filters	State filter, Year filter, Sector filter for dynamic data updates on dashboard.
4	Calculation Fields Used	Total consumption (SUM), Average consumption (AVG), Year-wise growth comparison, State comparison metrics.
5	Dashboard Design	No of Visualizations / Graphs – 3
6	Story Design	No of Visualizations / Graphs – 16

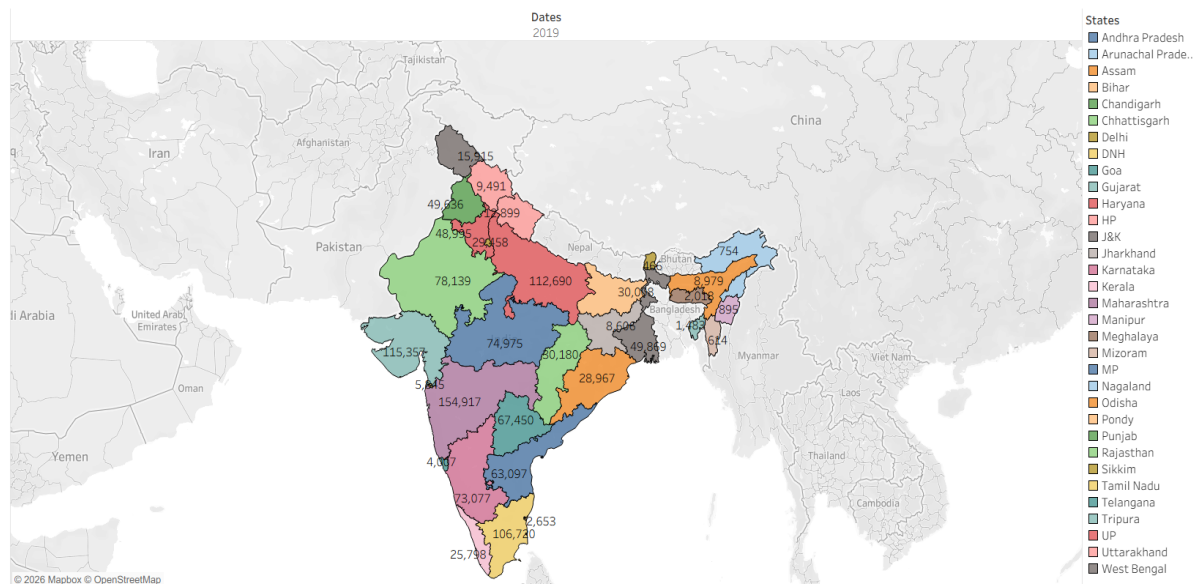
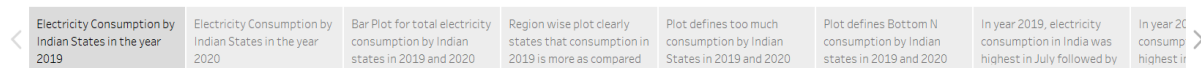
## 7. RESULTS:

### 7.1 Output Screenshots-





## Story on Electricity consumption in India



## 8. ADVANTAGES & DISADVANTAGES:

### Advantages:

#### 1. Improved Data Visualization

The dashboard converts complex electricity consumption data into clear charts and graphs, making it easier to understand.

#### 2. Easy Comparison

Users can compare state-wise, year-wise, and sector-wise electricity usage efficiently.

### 3. Time-Saving Analysis

Reduces manual data processing efforts compared to traditional Excel-based analysis.

### 4. Interactive Filtering

Allows dynamic filtering of data based on user selection, improving analytical flexibility.

### 5. Better Decision Support

Provides meaningful insights that support informed energy planning and research.

## **Disadvantages:**

#### 1. Data Dependency

The accuracy of results depends on the quality and completeness of the dataset.

#### 2. No Real-Time Data

The system works with historical datasets and does not provide real-time updates.

#### 3. Performance Constraints

Handling very large datasets may affect system performance.

#### 4. Limited Predictive Features

Advanced forecasting and AI-based analytics are limited.

#### 5. Deployment Requirements

Requires proper environment setup for hosting and deployment.

## **9. CONCLUSION:**

The Electricity Consumption Analysis Dashboard System successfully transforms complex electricity consumption data into clear, interactive visual insights. By providing state-wise, year-wise, and sector-wise analysis, the system enables users to understand consumption patterns efficiently. The implementation of filtering, comparison, and aggregation features improves data interpretation and reduces manual analysis efforts. Overall, the project demonstrates how data visualization techniques can enhance decision-making in energy management and planning.

## **10. FUTURE SCOPE:**

In the future, the system can be enhanced by integrating real-time electricity consumption data for more accurate and up-to-date analysis. Advanced forecasting techniques and machine learning models can be added to predict future demand trends. The dashboard can also be deployed on a cloud platform for wider accessibility and scalability. Additionally, incorporating renewable energy analytics and automated alert systems for peak demand monitoring can further improve the system's effectiveness and practical impact.

## **11. APPENDIX:**

Dataset Link-

[https://drive.google.com/file/d/1JxlkHNwXxjFztKq7ad0\\_KtkukCqTckNy/view?usp=sharing](https://drive.google.com/file/d/1JxlkHNwXxjFztKq7ad0_KtkukCqTckNy/view?usp=sharing)

Project Demo Link-

[https://drive.google.com/file/d/1iLmo0XxwBVeoXXdJenRnqr0xMU\\_OOemP/view?usp=sharing](https://drive.google.com/file/d/1iLmo0XxwBVeoXXdJenRnqr0xMU_OOemP/view?usp=sharing)

GitHub- <https://github.com/Pavani181/Plugging-into-the-Future>