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-

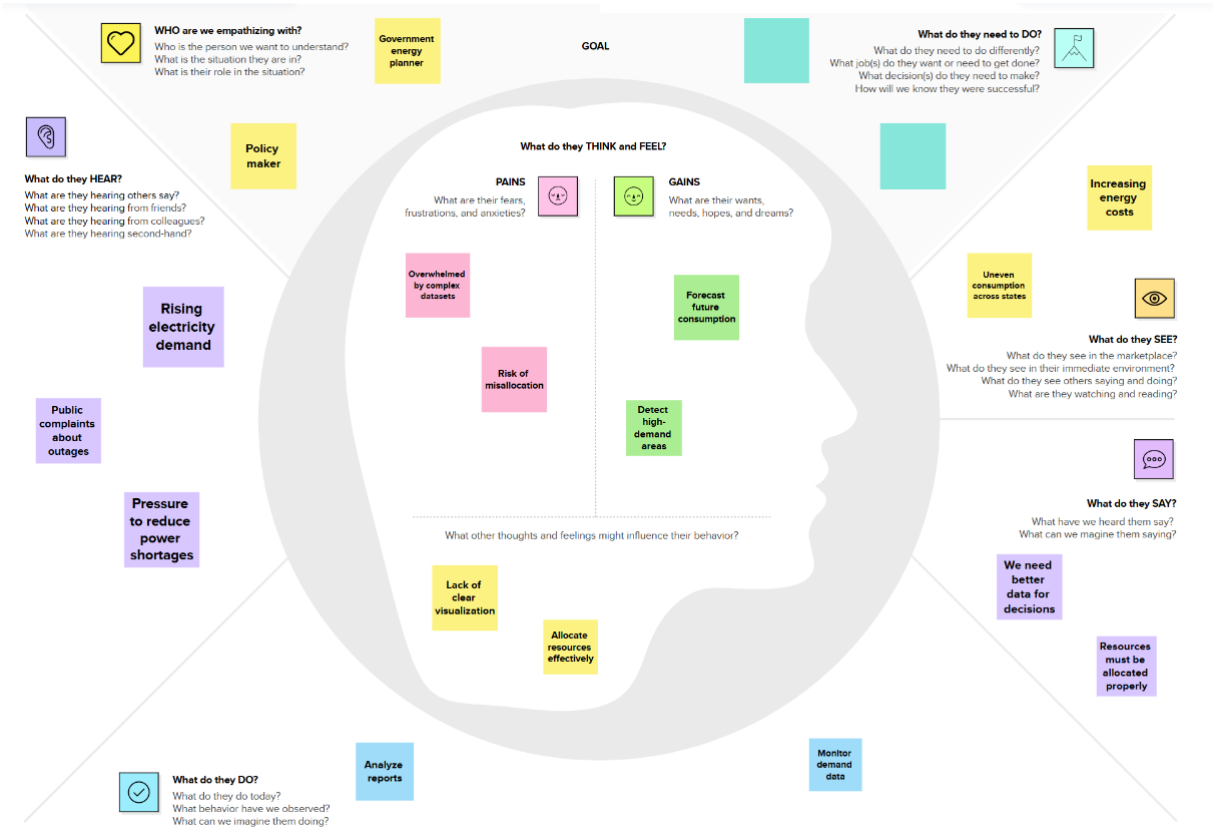
The purpose of this project is to simplify complex electricity consumption data and transform it into clear, interactive visual insights. The system helps users understand state-wise, year-wise, and sector-wise electricity usage, supporting better analysis, comparison, and informed decision-making for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

2. IDEATIONPHASE:

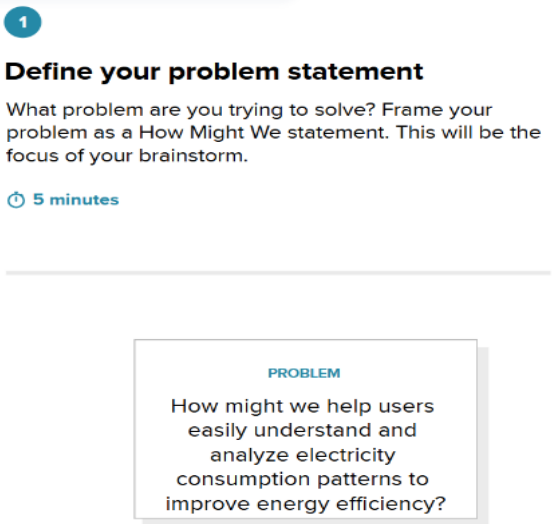
2.1 Problem Statement-

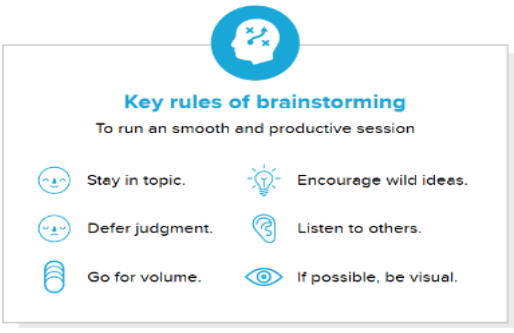
Problem Statement (PS)	I am (Customer)	I'm trying to	But	Because	Which makes me feel
PS1	Government energy planner	Analyse and manage electricity consumption effectively	The data is complex and not clearly visualized	Information is scattered and difficult to interpret	Overwhelmed, Uncertain
PS2	State 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-





2

Brainstorm

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

10 minutes

PAVANI

- Interactive state-wise comparison dashboard
- Monthly and yearly consumption trend analysis
- Peak demand identificatio n
- Sector-wise consumption breakdown (residential, industrial, etc.)
- Forecast future electricity demand
- Highlight high and low consumption states
- Energy efficiency recommend ation system
- Real-time data visualization
- Alert system for unusual consumption spikes

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 and break it up into smaller sub-groups.

20 minutes

Understanding Consumption Patterns

- State-wise comparison dashboard
- Monthly/ yearly trend analysis
- Sector-wise breakdown
- High & low consumptio n states

Planning & Improvement

- Future demand forecasting
- Energy efficiency recommendations

Monitoring & Control

- Peak demand identification
- Unusual consumpti on spike alerts
- Real-time data visualization

Easy Access & Usability

- Simple and user-friendly interface
- Filter options (state, year, sector)
- Downloadable reports

Sustainability & Decision Support

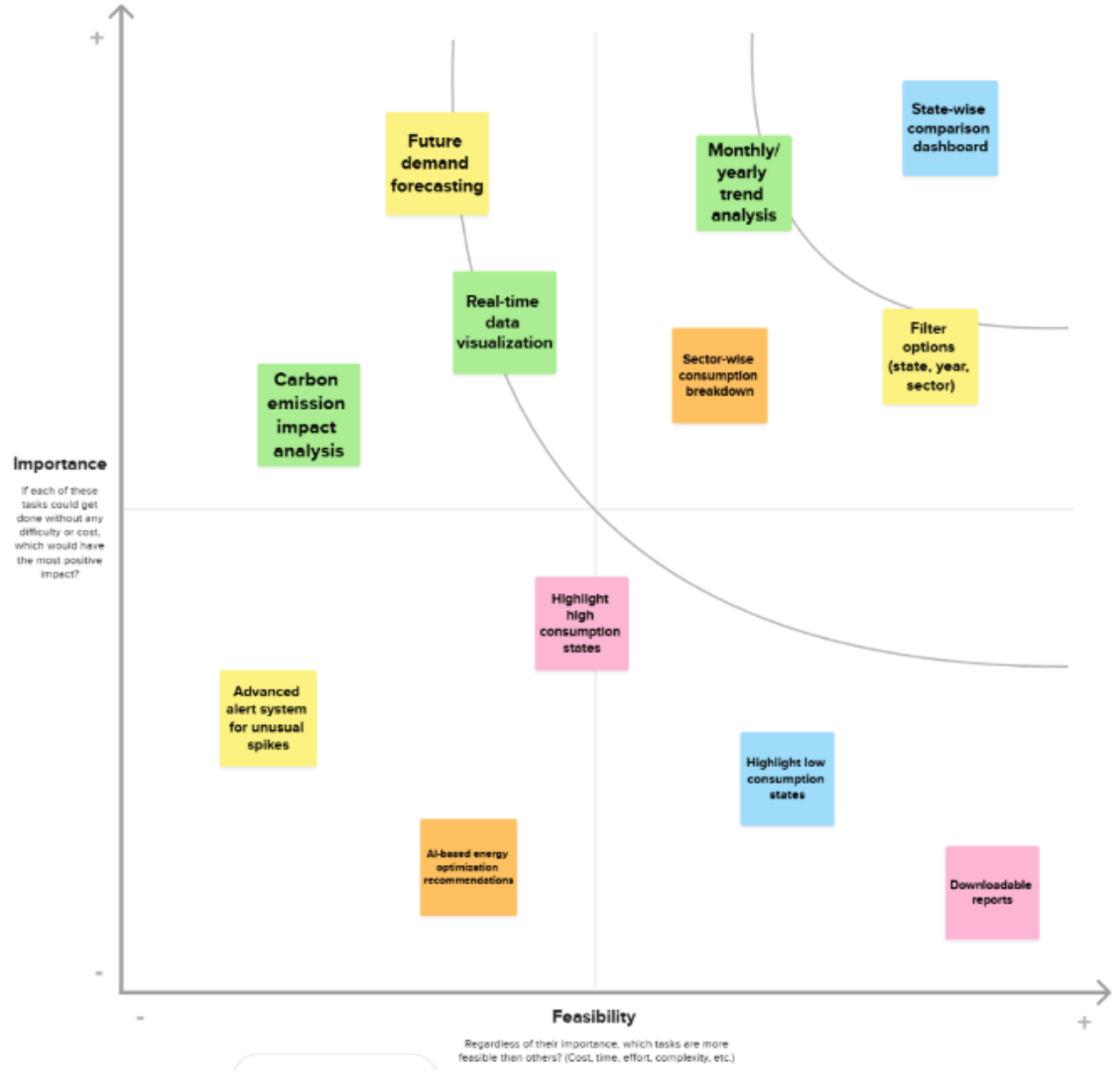
- Renewable energy comparison
- Carbon emission impact analysis
- Support for government planning

4

Prioritize

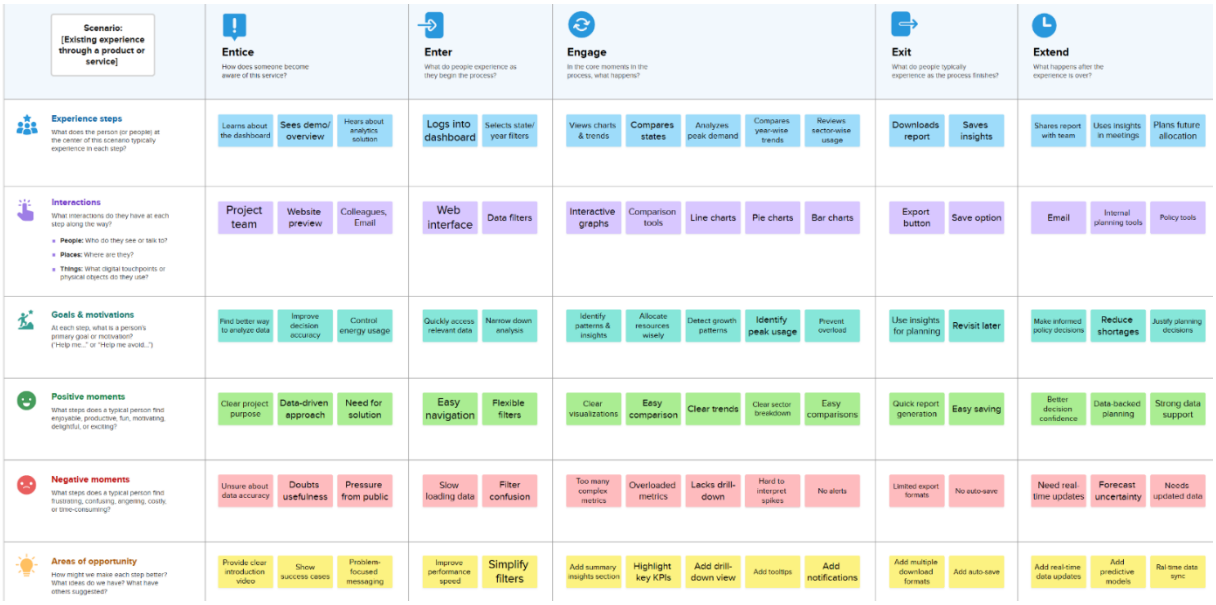
Your team should all be on the same page about what's important moving forward. Place your ideas on this grid to determine which ideas are important and which are feasible.

20 minutes



3. REQUIREMENT ANALYSIS:

3.1 Customer Journey map-



3.2 Solution Requirement-

Functional Requirements:

Following are the functional requirements of the proposed solution.

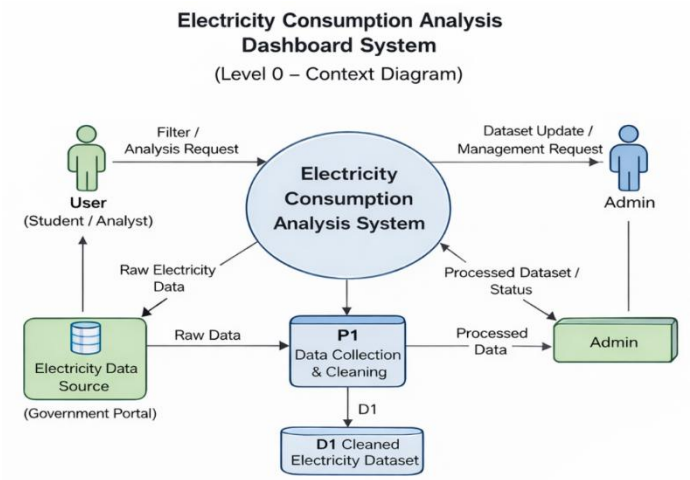
FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	Data Collection & Management	Import electricity dataset
		Clean and preprocess data
		Store cleaned dataset
FR-2	Dashboard Visualization	Display state-wise consumption
		Display year-wise trends
		Display sector-wise breakdown
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

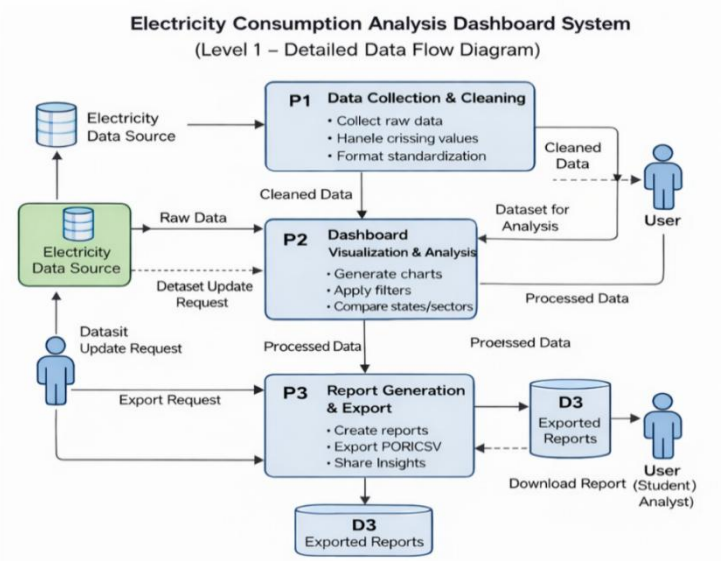
Non-functional Requirements:

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

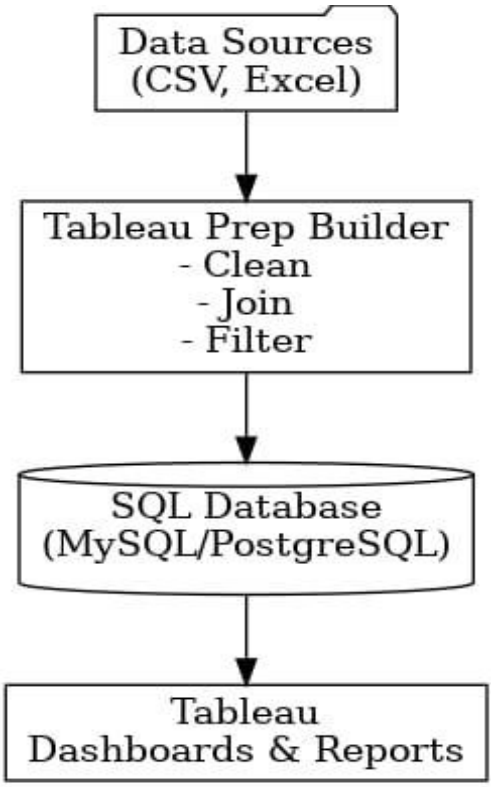
FR No.	Non-Functional Requirement	Description
NFR-1	Usability	The dashboard must be simple, intuitive, and easy to navigate.
NFR-2	Security	Dataset and system access must be protected from unauthorized changes.
NFR-3	Reliability	The system should display accurate and consistent data without errors.
NFR-4	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-



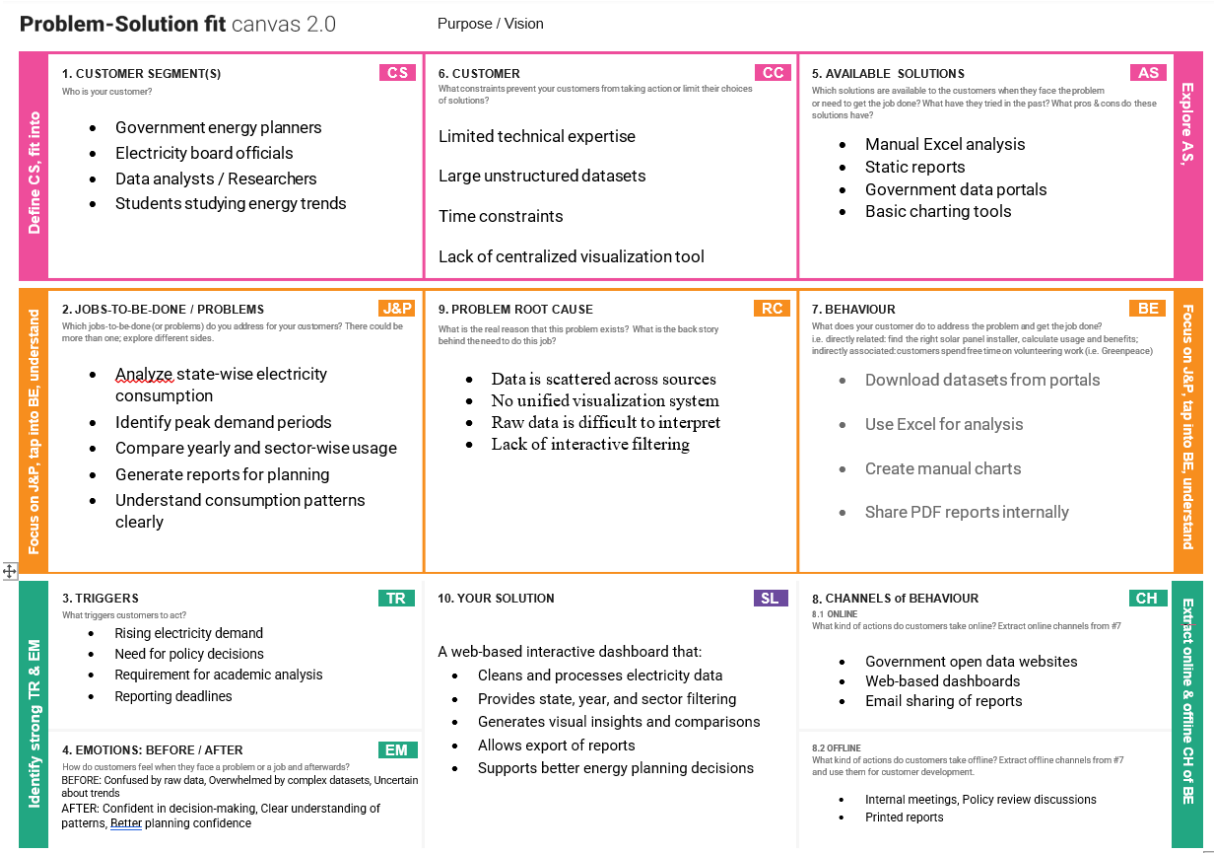


3.4 Technology Stack-



4. PROJECT DESIGN :

4.1 Problem Solution Fit-



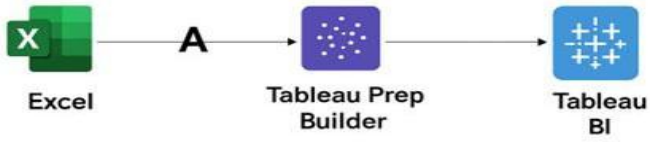
4.2 Proposed Solution-

Proposed Solution Template:

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

S.No	Parameter	Description
1	**Problem Statement (Problem to be solved)**	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	**Idea / Solution Description**	Develop a web-based interactive dashboard that cleans, processes, and visualizes electricity consumption data with filtering, comparison, trend analysis, and report export features.
3	**Novelty / Uniqueness**	Provides centralized, interactive visualization with real-time filtering and comparative analysis instead of static reports or manual Excel analysis.
4	**Social Impact / Customer Satisfaction**	Helps government planners and analysts make better energy management decisions, leading to efficient electricity distribution and improved public service reliability.
5	**Business Model (Revenue Model)**	Can be offered as a government analytics tool, licensed dashboard solution, or SaaS-based data analytics platform for energy departments and research institutions.
6	**Scalability of the Solution**	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).



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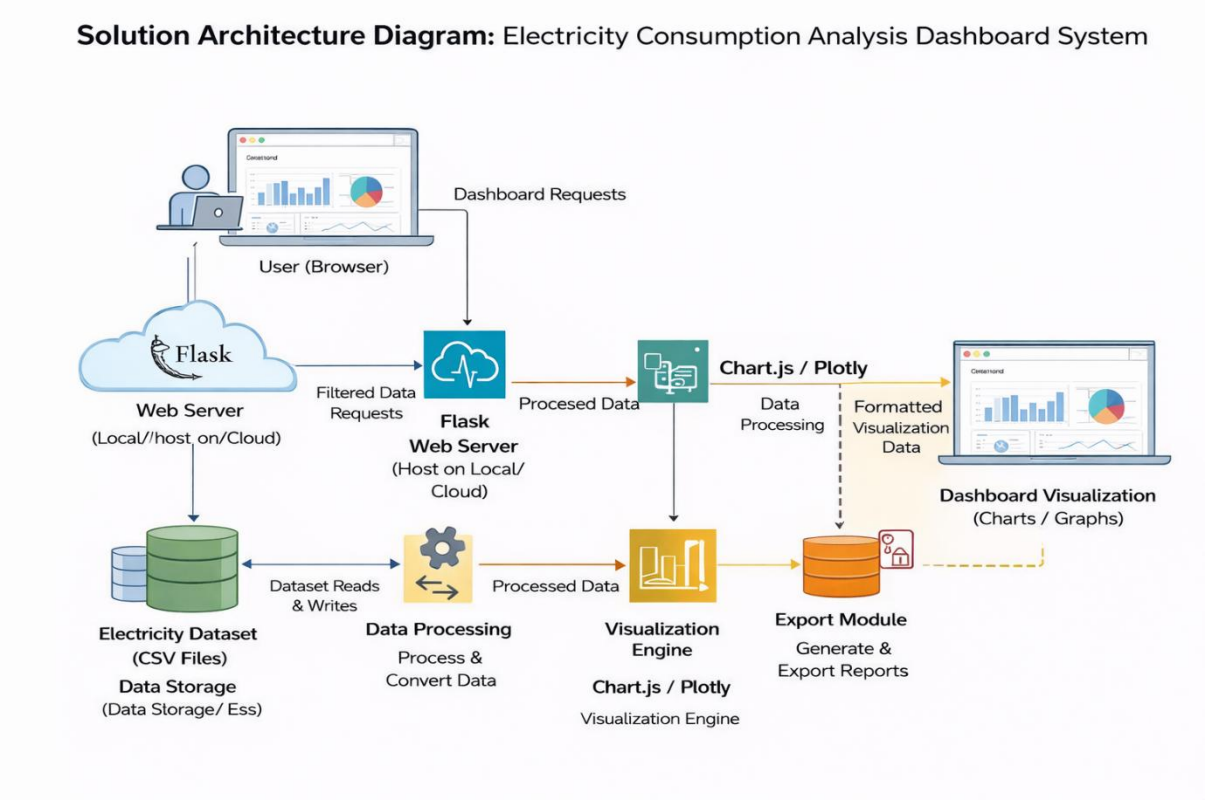


5. PROJECT PLANNING & SCHEDULING:

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-

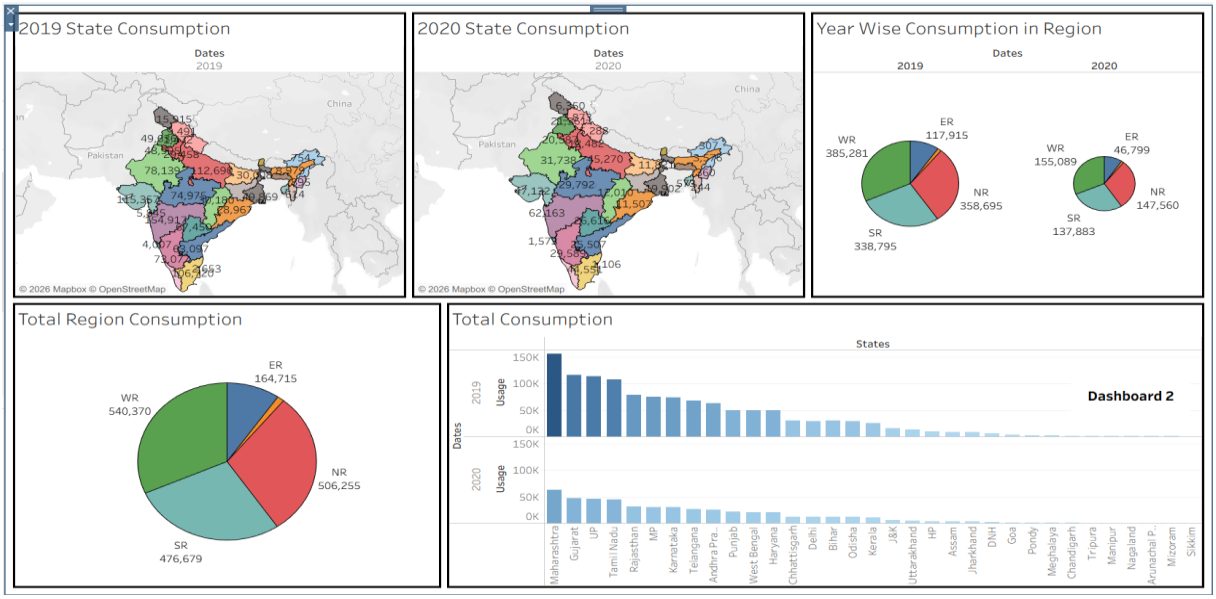
Model Performance Testing:

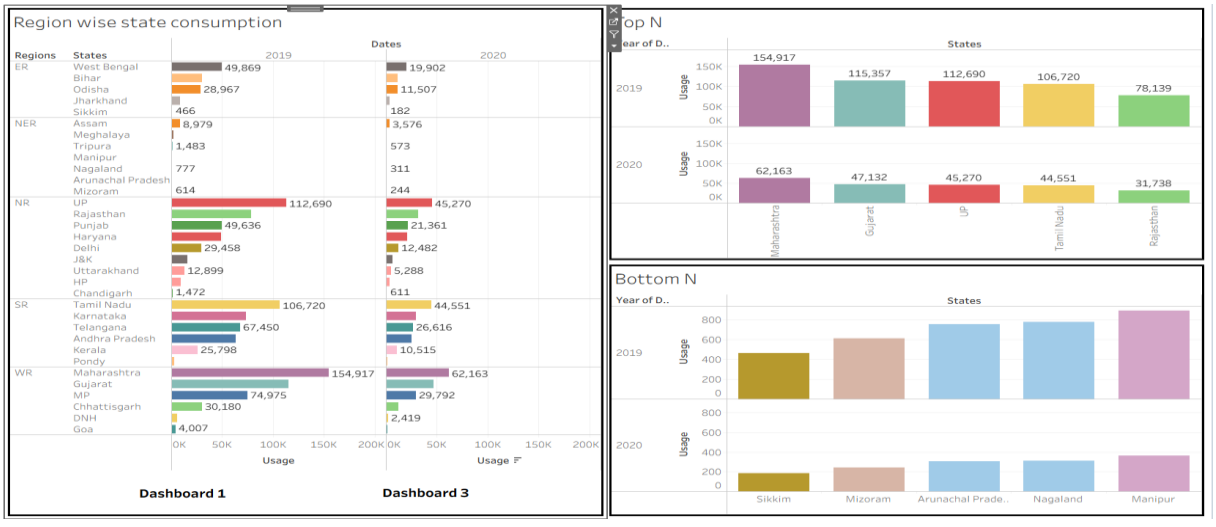
Project team shall fill the following information in model performance testing template.

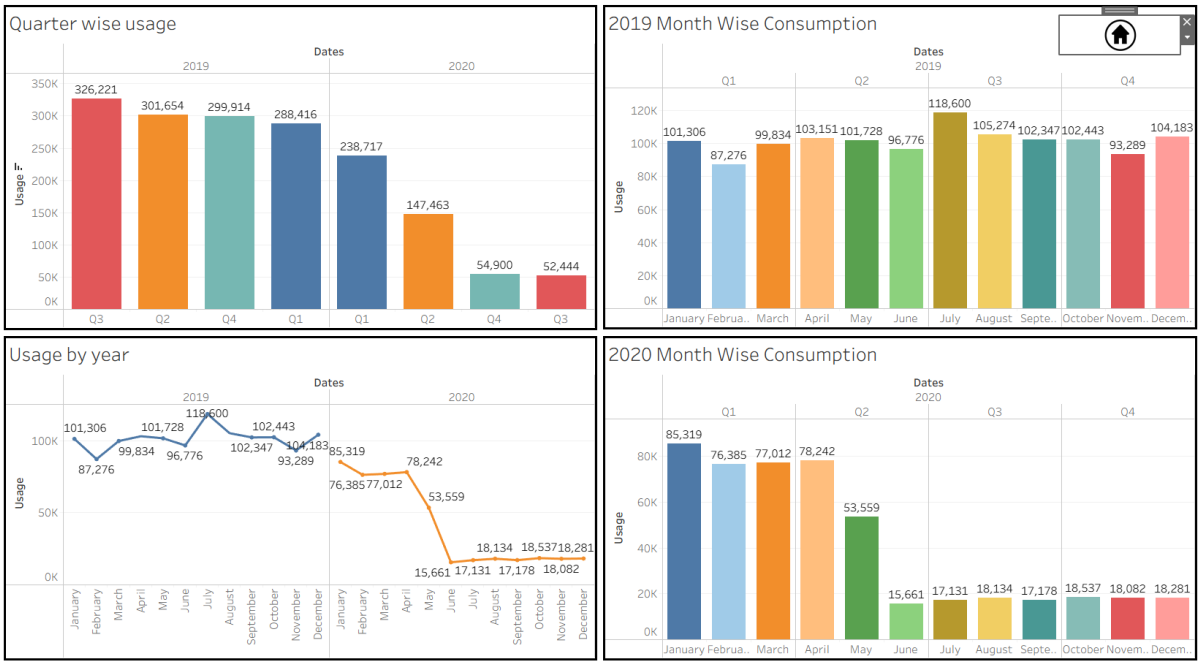
S.No.	Parameter	Screenshot / Values
1	**Data Rendered**	State-wise electricity consumption, Year-wise trends, Sector-wise usage data displayed using charts and graphs.
2	**Data Preprocessing**	Cleaned missing values, formatted dataset, applied aggregation (SUM, GROUPBY), structured data for visualization 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**

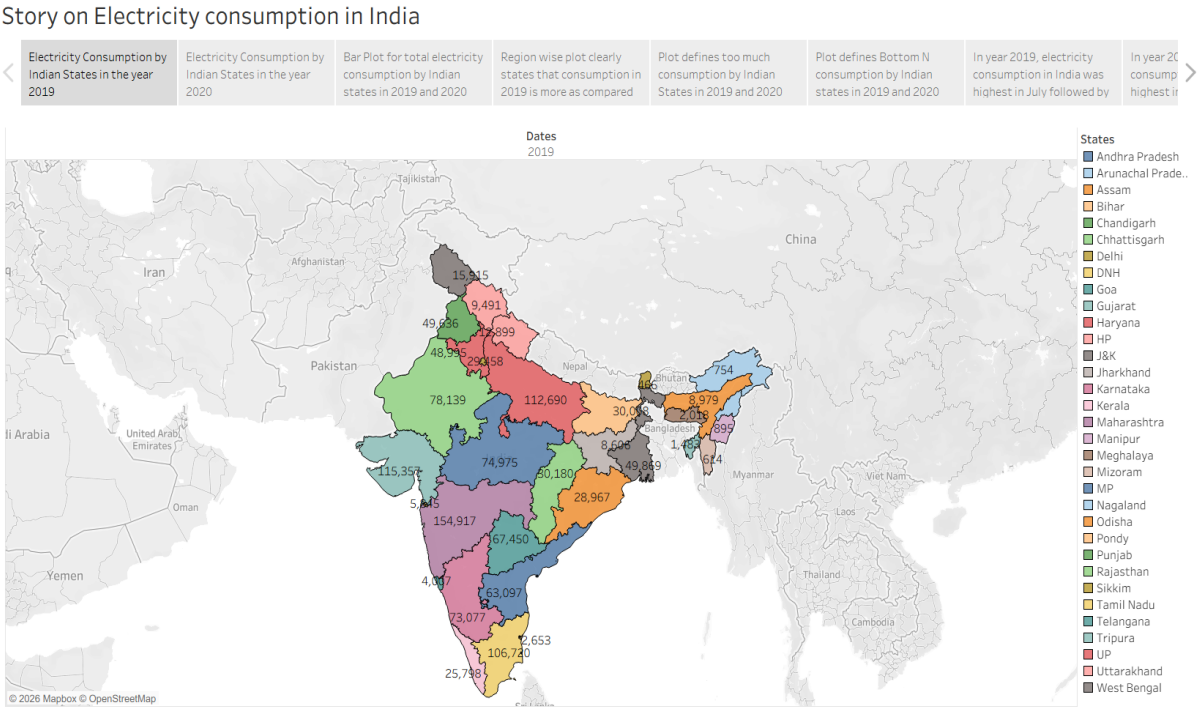
7. RESULTS:

7.1 Output Screenshots-









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

Project Demo Link-

https://drive.google.com/file/d/1iLmo0XxwBVeoXXdJenRnqr0xMU_OOemP/view?usp=sharing

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