Project Design Phase-II

Technology Stack (Architecture & Stack)

Date	29 june 2025
Team ID	LTVIP2025TMID47899
Project Name	Plugging Into the Future – An Exploration of Electricity Consumption Patterns using Tableau.”
Maximum Marks	4 Marks

Technical Architecture:

The Deliverable shall include the architectural diagram as below and the information as per the table1 & table 2

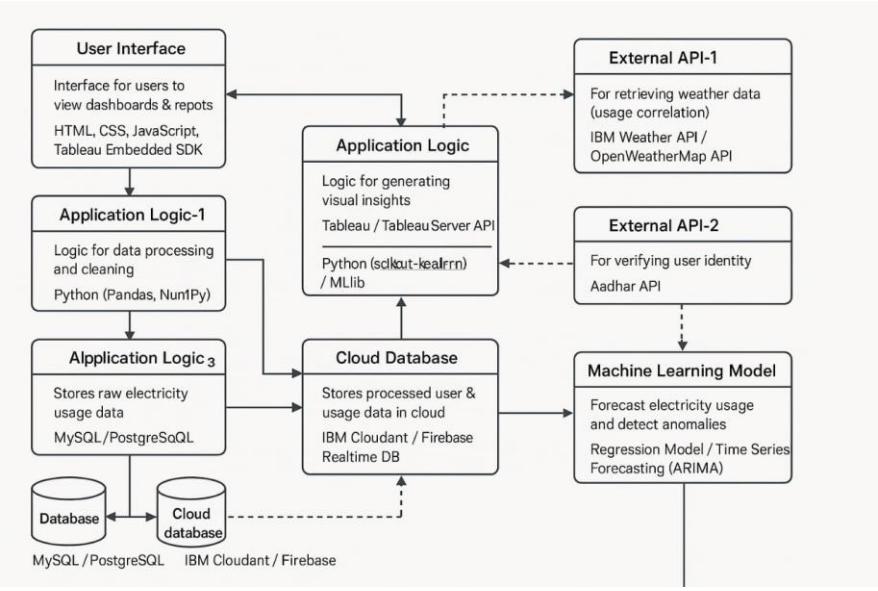

Table-1 : Components & Technologies:

S.No	Component	Description	Technology
1.	User Interface	Interface for users to view dashboards & reports	HTML, CSS, JavaScript, Tableau Embedded SDK.
2.	Application Logic-1	Logic for data processing and cleaning	Python (Pandas, NumPy)
3.	Application Logic-2	Logic for generating visual insights	Tableau / Tableau Server API

4.	Application Logic-3	Recommendation engine based on usage	Python (scikit-learn) / MLlib
5.	Database	Stores raw electricity usage data	MySQL / PostgreSQL
6.	Cloud Database	Stores processed user & usage data in cloud	IBM Cloudant / Firebase Realtime DB
7.	File Storage	Stores usage reports and export files	IBM Block Storage / AWS S3 / Local Filesystem
8.	External API-1	For retrieving weather data (usage correlation)	IBM Weather API / OpenWeatherMap API
9.	External API-2	For verifying user identity	Aadhar API
10.	Machine Learning Model	Forecast electricity usage and detect anomalies	Regression Model / Time Series Forecasting (ARIMA)
11.	Infrastructure (Server / Cloud)	Hosts backend services and dashboards	IBM Cloud, Local Server, Kubernetes

Table-2: Application Characteristics:

S.No	Characteristics	Description	Technology
1.	Open-Source Frameworks	Frameworks used to collect, analyze, and visualize electricity consumption data.	Python (Pandas, NumPy, Plotly), Apache Kafka (real-time data), PostgreSQL, Flask, Dash
2.	Security Implementations	Securing data access and protecting user and infrastructure integrity.	HTTPS, SHA-256 for hashing, OAuth 2.0, Role-Based Access, Firewall (e.g., AWS Security Groups)
3.	Scalable Architecture	The system should handle growing data volume and multiple user dashboards efficiently.	3-Tier Architecture (Presentation – Logic – Data), Microservices for ETL pipeline, Docker
4.	Availability	System should be accessible at all times	Load Balancer (NGINX), Cloud Hosting

S.No	Characteristics	Description	Technology
		with failover and replication strategies.	(AWS/GCP/Azure), Distributed Database Replication
5.	Performance	High responsiveness for dashboard queries, handling large datasets, and fast data refresh rates.	Redis (caching), Tableau extracts (TDE/Hyper), CDN for static assets, Indexed queries in DB