

Project Design Phase-II
Technology Stack (Architecture & Stack)

Date	30 June 3035
Team ID	LTVIP2025TMID50075
Project Name	Plugging into the Future : An Exploration of Electricity Consumption Patterns Using Tableau
Maximum Marks	4 Marks

1.Technical Architecture:



2. Technology Components

Table-1: Core Stack

S.No	Component	Description	Technology
1.	User Interface	Interactive dashboards for stakeholders	Tableau Desktop/Server, Tableau Mobile

S.No	Component	Description	Technology
2.	Application Logic-1	Data cleaning & aggregation	Tableau Prep, Python (Pandas)
3.	Application Logic-2	Peak demand forecasting	TabPy (Prophet, ARIMA)
4.	Database	Historical consumption data	PostgreSQL (Time-series extension)
5.	Cloud Storage	Raw smart meter data	AWS S3
6.	External API-1	Weather data integration	OpenWeatherMap API
7.	External API-2	Government energy datasets	National Grid API
8.	Machine Learning Model	Anomaly detection in usage patterns	Isolation Forest (scikit-learn)
9.	Infrastructure	Deployment & scaling	Tableau Server (AWS EC2 auto-scaling)

Table-2: Application Characteristics

S.No	Characteristics	Description	Technology
1.	Open-Source Frameworks	Data processing & ML	Python, scikit-learn, Prophet
2.	Security Implementations	Role-based access, GDPR compliance	Tableau Server SAML, Column-level encryption

S.No	Characteristics	Description	Technology
3.	Scalable Architecture	Microservices for data ingestion & analysis	AWS Lambda (serverless functions)
4.	Availability	99.9% uptime with load balancing	AWS ELB + Multi-AZ deployment
5.	Performance	10K+ concurrent users; <2s response time	Tableau Hyper extracts, Redis caching

3. Key Justifications

Why Tableau?

Best-in-class visualization for spatial (urban/rural) and temporal (hourly) patterns.

TabPy integration enables **real-time ML** (e.g., demand forecasts).

Why AWS?

Auto-scaling: Handles data spikes during extreme weather events.

Security: IAM roles for granular access (consumers vs. policymakers).

Why Python?

Libraries like Prophet (Facebook) for **accurate demand forecasting**.

4. Innovation Highlights

Edge AI: Lightweight anomaly detection on smart meters before cloud processing.

Policy Sandbox: Drag-and-drop sliders in Tableau to simulate energy policies.

Carbon Accounting: Dashboard shows CO₂ savings from reduced usage.