**Project Initialization and Planning Phase**

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| Date | 20 July 2025 |
| Team ID | SWTID1750360304 |
| Project Title | Power consumption analysis for households |
| Maximum Marks | 3 Marks |

**Project Proposal (Proposed Solution) template**

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| **Project Overview** | |
| Objective | To develop an AI-driven analytics platform that identifies inefficiencies in household power consumption, provides actionable recommendations, and reduces energy costs while promoting sustainability. |
| Scope | - Analysis of historical and real-time energy usage data from smart meters. |
| **Problem Statement** | |
| Description | Households lack visibility into energy-wasting behaviors and inefficient appliances, leading to high electricity bills and unnecessary carbon emissions. Utility providers struggle with peak demand management due to insufficient granular data. |
| Impact | Solving this problem will:   * Reduce energy bills for consumers (5–15% savings). * Lower grid strain and operational costs for utilities. * Contribute to environmental sustainability goals. |
| **Proposed Solution** | |
| Approach | The project employs a data-driven approach to analyze household power consumption. It begins by collecting real-time smart meter data and integrating weather information through APIs. A machine learning model processes this data to detect usage patterns, identify inefficiencies, and forecast energy demand. The system then generates personalized recommendations, such as optimizing appliance usage during off-peak hours or flagging energy-wasting devices. These insights are delivered through an interactive dashboard, enabling users to monitor consumption and implement cost-saving actions. The solution prioritizes scalability to accommodate diverse households while ensuring data privacy compliance. |
| Key Features | * Real-time energy monitoring * Appliance-level usage breakdown * Dynamic cost-saving recommendations * Anomaly detection for inefficiencies * Weather-adaptive insights * Interactive visualization dashboard * Privacy-focused data processing * Utility pricing API integration |

**Resource Requirements**

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| **Resource Type** | **Description** | **Specification/Allocation** |
| **Hardware** | | |
| Computing Resources | CPU/GPU specifications, number of cores | 4-core CPU, 1 x NVIDIA T4 GPU |
| Memory | RAM specifications | 16 GB RAM |
| Storage | Disk space for data, models, and logs | 500 GB SSD |
| **Software** | | |
| Frameworks | Python frameworks | Flask, FastAPI |
| Libraries | Additional libraries | Pandas, scikit-learn, TensorFlow |
| Development Environment | IDE, version control | Jupyter Lab, Git/GitHub |
| **Data** | | |
| Data | Source, size, format | Kaggle dataset (CSV format) |