# Problem Definition & Design Thinking

**TITLE : ENERGY USAGE OPTIMIZATION**

# Problem Statement

With the increasing cost of power and growing environmental concerns, optimizing power usage has become a critical challenge. Many households, businesses, and industries consume more power than necessary due to inefficiencies, lack of awareness, and outdated systems.

The problem is how to provide real-time, intelligent, and accessible insights into power consumption to help users minimize waste, lower costs, and reduce their carbon footprint - all without disrupting daily operations.

**Target Audience**

Homeowners looking to reduce utility bills

Businesses aiming for power efficiency and cost savings

Industrial operations seeking to reduce wastage and enhance sustainability- Environmentalists and green energy advocates

**Objectives**

Design a smart system to monitor, analyze, and optimize energy consumption.

Enable users to receive actionable recommendations in real time.

Ensure the system is scalable, user-friendly, and adaptable across sectors.

Promote sustainable practices by highlighting power-saving opportunities.

Design Thinking Approach - Empathize

Users often struggle with high energy bills without knowing which appliances or behaviors contribute most. A lack of detailed insight and guidance limits their ability to act effectively.

**Key User Concerns:**

Difficulty understanding power data

Uncertainty about which actions yield the most savings

Hesitance to invest in expensive solutions without clear ROI

**Define**

The solution must identify patterns in power consumption, flag inefficient usage, and provide personalized, context-aware recommendations for power optimization.

**Key Features Required:**

Real-time power usage tracking

AI-powered analytics and forecasting

Device-specific usage breakdown

Simple dashboards and visualizations

Privacy and data security measures

**Ideate:**

Potential ideas for the solution include:

A automated energy advisor that analyzes usage patterns

A dashboard integrated with smart meters and IoT devices

Predictive alerts for peak usage times or anomalies

Energy benchmarking and goal setting tools

**Brainstorming Results :**

App with push notifications for savings tips

Suggestions for replacing or maintaining inefficient appliances

Integration with renewable power sources

Educational tools to raise awareness on efficient practices

**Prototype**

A basic prototype could include a web/mobile interface connected to smart plugs/meters, providing:

Visual energy breakdown by room or device

Instant insights on potential savings

AI suggestions on peak hours usage shifting- Alerts for abnormal spikes or standby power drain

**Key Components:**

IoT-enabled power sensors

AI engine for data analysis and prediction

Intuitive user interface

Backend database to store historical data

**Test**

The prototype will be tested with a diverse group of users, including households and small business owners, to evaluate its effectiveness.

**Testing Goals:**

Check if users find the insights actionable and clear

Assess ease of use for various age groups and tech familiarity

Validate the accuracy of device-level electricity detection

Measure user engagement and behavior change over time