**Problem** **Definition** & **Design** **Thinking**

**Title**:**AI**-**Powered** **Energy** **Efficiency** **Optimization** **System**

**Problem** **Statement**:

In a world facing rising energy demands, limited resources, and environmental concerns, optimizing energy consumption is a major challenge. Many homes, industries, and buildings waste energy due to inefficient systems, human error, or lack of monitoring. Traditional energy-saving approaches are often manual, reactive, and lack precision.

The problem is how to use AI to monitor, analyze, and optimize energy usage in real-time to reduce costs, minimize environmental impact, and improve sustainability.

**Target** **Audience**:

1.Homeowners looking to reduce electricity bills

2.Businesses and factories aiming to cut energy waste

3.Smart city planners

4.Educational institutions and public buildings

5.Renewable energy operators

**Objectives**:

1.To develop an AI system that identifies energy usage patterns and inefficiencies.

2.To provide real-time suggestions and automation for energy-saving.

3.To enable predictive analytics for maintenance and energy forecasting.

4.To integrate with smart devices and IoT systems for automated control.

5.To track and report energy savings and environmental benefits.

**Design** **Thinking** **Approach**:

**Empathize**:

People often don’t realize how much energy they waste daily due to inefficient lighting, outdated appliances, or improper habits. Businesses face high costs due to energy mismanagement, and many users lack the tools or knowledge to make improvements.

**Key** **User** **Concerns**:

1.High electricity bills with unclear causes.

2.Inconvenience in manually monitoring or adjusting devices.

3.Lack of knowledge about energy-efficient practices.

4.Limited integration of current systems with smart energy tools

**Define**:

The solution must intelligently monitor energy use, learn from consumption patterns, and recommend or automate improvements. It should cater to both tech-savvy and non-technical users and integrate with existing infrastructure.

**Key** **Features** **Required**:

1.Real-time energy usage tracking via sensors or smart meters.

2.AI-driven pattern analysis and optimization suggestions.

3.Device-level control for automation (turn off/on).

4.Predictive maintenance alerts (e.g., faulty AC unit).

5.Dashboard for visualization, goal-setting, and reporting.

**Ideate**:

Some potential ideas include:

1.AI model that learns optimal usage times for different appliances.

2.A mobile app that gives energy tips and tracks daily usage.

3.Integration with smart plugs, thermostats, and lighting systems.

4.AI assistant that adapts to seasonal or lifestyle changes.

5.Reward system for meeting energy-saving goals.

**Brainstorming** **Results**:

1.A “Smart Energy Coach” chatbot for home users.

2.Industry dashboard showing high-consumption areas.

3.Integration with solar panels to balance grid vs. Renewable energy use.

4.Voice-enabled AI suggestions (e.g., “Would you like to turn off idle devices?”).

**Prototype**:

Create a system prototype including:

1.Smart sensors installed in key areas/appliances.

2.AI model analyzing usage and offering savings strategies.

3.User interface (web/mobile) with personalized reports.

4.Automation layer for scheduled or triggered device control.

**Key** **Components** **of** **Prototype**:

1.IoT-enabled devices and sensors.

2.Machine learning algorithms for usage prediction and anomaly detection.

3.Data dashboard with usage history and optimization tips.

4.Notification system for user alerts and suggestions.

**Test**:

Testing will be carried out in:

1.A smart home environment.

2.A small office building.

3.Select industrial zones with high energy use.

**Testing** **Goals**:

1.Evaluate energy savings achieved over time.

2.Check user understanding and adoption of suggestions.

3.Test system stability under real-time data load.

4.Assess automation accuracy and comfort.