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Smart Energy Usage Simulator

Authors: Daisi M, Divya C, Kavyashri L H, Nagashri Narayan Upadhya

Affiliation: ISE, Global Academy of Technology, Bengaluru, 560098

Abstract

The Smart Energy Usage Simulator is a web-based system designed to monitor, analyze, and visualize household energy consumption. It helps users understand their daily usage through interactive charts and real-time simulation, enabling informed decisions for energy conservation. The project focuses on improving awareness, reducing wastage, and supporting sustainable energy practices.

Keywords

Smart Energy, Energy Monitoring, Simulation, React, Tailwind CSS, Recharts, Power Consumption, IoT.

1.INTRODUCTION

Energy consumption in households is increasing, making it essential to track and optimize usage. Traditional meters provide limited insights, whereas modern simulation tools offer better visualization and predictive analysis. This project aims to simulate energy usage patterns and present them in an understandable format, helping users manage electricity effectively.

2.LITERATURE REVIEW

Previous studies highlight that smart monitoring systems significantly reduce energy wastage by providing real-time usage data. Research on IoT-based energy meters and visualization tools shows that users respond positively to interactive dashboards. Web technologies such as React and data-driven charts enhance user engagement and decision-making.

3.METHODOLOGY

1. Collect sample household meter readings.
2. Preprocess and structure the data.
3. Build a responsive UI using React and Tailwind CSS.
4. Visualize daily, weekly, and appliance-level usage using Recharts.

5. Simulate consumption patterns to help users understand energy behavior.
6. Evaluate results for accuracy and usability.

4.PROJECT DETAILS

- **Frontend:** React, Tailwind CSS
- **Charts:** Recharts (bar, line, pie charts)
- **Modules:**
    - Home dashboard
    - Daily energy usage visualization
    - Appliance-wise consumption
    - Alerts for high usage
    - Simulation controls
- **Output:** Interactive graphs, consumption summaries, and usage predictions.

5.FUTURE SCOPE

1. Integration with real IoT smart meters.
2. Mobile app version for quick monitoring.
3. AI-based energy prediction and anomaly detection.
4. Automated appliance control for energy saving.
5. Cloud storage and user account management.

6.CONCULISION

The Smart Energy Usage Simulator provides an effective platform for visualizing household electricity consumption. By using modern web technologies, it improves user awareness, supports better decision-making, and encourages energy conservation. The system can be further enhanced with real-time IoT integration and intelligent automation.

7.REFERENCES

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