



Special Edition

NCASIT 2023, 29th April 2023

Department of Computer Engineering,

St. Vincent Pallotti College of Engineering & Technology, Nagpur,

SMART HOME ENERGY MANAGEMENT USING ARTIFICIAL INTELLIGENCE

¹Chetna Radke , ²Sharvari Pakmode , ³Romit Mendhe, ⁴Ayushi Punwatkar, ⁵Yash Sattabhayya

¹Student, SVPCET, Department of EE;

²Student, SVPCET, Department of EE

³Student, SVPCET, Department of EE

⁴Student, SVPCET, Department of EE

⁵Student, SVPCET, Department of EE

Email: {¹chetnaradke@gmail.com,

²sharvaripakmode@gmail.com}

Abstract -

Electrical energy is a vital for feature of any developing nation. To meet the growing demand, power generating plants of all types are being installed; though the gap between the supply and the demand is continuously increasing, due to the depletion of natural resources, hence, rise in power demand, the way to overcome the problem is optimal utilization of available energy sources, limiting the wastage of electrical energy which includes both technical and non-technical and limiting the demand during peak hours. In this project, a methodology is proposed to solve problem with load management during peak hours, in case of domestic loads aiming to reduce the gap between the demand and the supply, such that both consumer and supplier get benefited simultaneously. In our proposed project we are going to use AI technology which takes the decision like human brain. We are using the solar power as a renewable energy source to reduce the consumption from grid and to reduce energy bill. From sample of operating conditions AI will be trained and it will be tested for autonomous operation after training. The purpose of using this technology is to optimally utilize solar resource.

Key Words - Home energy management, Artificial intelligence, renewable energy, solar energy, energy management, energy saving.

I. INTRODUCTION

Energy consumption can be reduced by Increasing the contracted power according to the maximum registered peak, but on contrast this will force to pay a higher power than it is really needed.

Another solution will be avoiding the consumption peaks through a vigilance element it can disconnect certain noncritical loads such as air conditioning, compressors, lighting and fans. The general purpose of this project is to monitor and control the maximum power demand in order also can reduce the monthly electricity bill. In our project we used to control essential and non-essential load during peak or off-peak period by the help of controller.

II. EXPERIMENTAL PROCEDURE

- a) System Design: The first step is to design the overall system architecture for smart home energy management. This includes identifying the various components and sensors that will be used to monitor and control energy consumption in the home
- b) Hardware Installation: Once the system design is complete, the next step is to install the necessary hardware components on PCB.

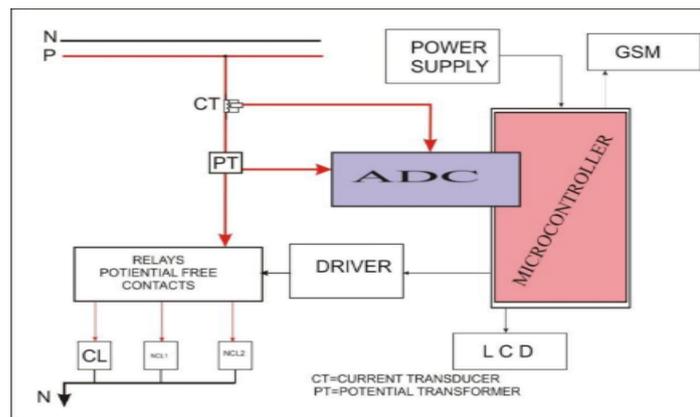
Special Edition

NCASIT 2023, 29th April 2023

Department of Computer Engineering,

St. Vincent Pallotti College of Engineering & Technology, Nagpur,

- c) Algorithm finalizing: Identify and finalize the AI algorithm that will be used to optimize the energy usage.
- d) Data Collection: Once the programming part is done, the system will begin collecting data on energy consumption patterns in the home. This data will be used to train the AI algorithms and to develop models for predicting future energy usage.
- e) AI Model Development: Using the collected data, the AI models will be developed to predict energy usage patterns and to optimize energy consumption in the home
- f) Testing and Validation: Once the AI models are developed, they will be tested and validated using real-world data from the home
- g) Implementation and Monitoring: Once the AI models have been validated, they will be implemented in the home and continuously monitored to ensure that they are working effectively.
- h) Data Analysis and Reporting: Finally, data from the system will be analyzed on a regular basis to identify trends and patterns in energy consumption, and to provide recommendations for further optimization of energy usage in the home.



BLOCK DIAGRAM

I. THEORY

Smart home energy management using artificial intelligence (AI) involves utilizing AI technologies to optimize energy consumption and minimize energy wastage in households. The ultimate goal is to create more energy-efficient, cost-effective, and environmentally friendly homes. These systems use sensors and intelligent algorithms to monitor and control energy usage in real-time. By analyzing data on household energy usage patterns, the system can adjust energy consumption to minimize waste and lower costs. For instance, an AI-based energy management system can shift total load to renewable energy sources like solar energy to reduce reliance on the grid and lower monthly electricity bills. With the use of solar panels, homeowners can generate electricity and reduce their carbon footprint. The combination of smart home energy management using AI and solar energy holds great potential for creating more sustainable and efficient homes. By optimizing energy usage, we can help to build a brighter and more sustainable future for our planet.

RESULT



Special Edition

NCASIT 2023, 29th April 2023

Department of Computer Engineering,

St. Vincent Pallotti College of Engineering & Technology, Nagpur,

Expected output of the paper presented is to intelligently shift the total load of home on the solar energy when the output of the solar is sufficient to supply the power to the appliances. This will cause all the load shift on the solar energy during the day time as the solar gives sufficient output during day. Solar energy saves the excess energy consumption from grid and save up to 50% cost on energy bill. AI will make decision like a human and turn off the non-critical load whenever not in use.

CONCLUSION

In conclusion, electrical energy is a crucial aspect of any developing nation, and meeting the growing demand has become a challenge due to the depletion of natural resources and the rise in power demand. The applications of power management systems are varied and extensive. The primary objectives of these systems are to monitor maximum power demand in homes, control power usage, and maintain or reduce monthly electricity bills. These systems find applications in various industries, including process control industries, main incomers in substations, hospitals, hotels, corporate offices, and educational institutes. . The versatility of these systems makes them an essential part of energy management in various sectors, ensuring efficient use of resources and reduction in energy wastage.

NOMENCLATURE

KWH	kilo watt hour
AI	artificial Intelligence
ADC	analogue to digital converter
PIC	peripheral interface controllers
LCD	liquid crystal display
PCB	printed circuit board

ACKNOWLEDGEMENT

Authors would like to express their gratitude to the department of electrical engineering of St. Vincent Pallotti college of engineering and technology, Nagpur for their support in preparing this work.

REFERENCE

[1] J. S. Hassan, R. M. Zin, M. Z. A. Majid, S. Balubaid, and M. R. Hainin, "Building energy consumption in Malaysia: an over-view," Jurnal Teknologi, vol. 70, no. 7, pp. 33–38, 2014.



Special Edition

NCASIT 2023, 29th April 2023

Department of Computer Engineering,

St. Vincent Pallotti College of Engineering & Technology, Nagpur,

- [2] S. Engineering and D. Systems, "Monitoring and reducing the consumption of home electric appliances December 2013," Monitoring and reducing the consumption of home electric appliances, p. 53, 2013.
- [3] E. Effah, F. L. Aryeh, W. K. Kehinde, and E. Effah, "GSM- Based Home Appliances Control System for Domestic Power Users in Ghana," Ghana Journal of Technology, vol. 1, no. 1, pp. 25–30, 2016.
- [4] T. Teng-Fa and K. Cheng-Chien, "A smart monitoring and control system for the household electric power usage," in 2013 IEEE PES Asia-Pacific Power and Energy Engineering Conference (APPEEC), Hong Kong, China, 2013.
- [5] Y. R. Tan, F. W. Akashah, and N. Mahyuddin, "The analysis of fire losses and characteristics of residential fires based on investigation data in Selangor, 2012-2014," in MATEC Web of Conferences, vol. 66, p. 00109, 2016.
- [6] PIC microcontroller and Embedded system, Author: -Mazidi, MA Mckinlay, R Etal. Publisher: - Pearson India.
- [7] PIC microcontroller and Embedded system, Author:- Muhammad Ali Mazidi, Danny E. Causey, Publisher:- Pearson India