

Java programming (CSE 207)L

Project Report on

**S M A R T-E N E R G Y M A N A G E M E N T**

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**TEAM MEMBERS**

**MEGH PRAJAPATI AP21110010402**

**CHAITHANYA INAGANTI AP21110010405**

**SURYA KIRAN KUNCHALA AP21110010408**

**YASHWANTH SAI BUDDI AP21110010438**

MENTOR

**Ms. Kavitha Rani Karnena**

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**CHAPTER 1**

**ABSTRACT**

The Smart Energy Management System is a project developed to address the growing challenges of energy consumption and sustainability. By leveraging smart devices, data analytics, and automation, the system aims to optimize energy usage in various sectors, including residential, commercial, and industrial. Key features of the system include real-time energy monitoring, integration with smart devices, advanced data analytics, and automation and control capabilities. The system offers several benefits, including energy savings, reduced environmental impact, improved efficiency, and data- driven insights. Through successful implementation and deployment, the Smart Energy Management System presents an innovative solution to optimize energy consumption and promote sustainability in a rapidly evolving world.

**CHAPTER 2**

**PROBLEM STATEMENT**

The increasing demand for energy and the pressing need for sustainability pose significant challenges in managing energy consumption effectively. Inefficient energy usage and wastage contribute to higher costs, strain on resources, and environmental concerns.

Traditional energy management methods often lack real- time monitoring, automation, and intelligent control, making it difficult to optimize energy consumption and minimize waste. There is a clear need for a solution that can intelligently monitor, manage, and optimize energy usage across various sectors, ensuring efficiency, cost savings, and reduced environmental impact. Addressing these challenges requires the development of a Smart Energy Management System that leverages advanced technologies to provide real-time insights, automate processes, and promote sustainable energy consumption practices.

**CHAPTER 3**

**OBJECTIVE**

The objective of the Smart Energy Management System project is to develop and implement a comprehensive solution that enables efficient management and optimization of energy consumption. The project aims to achieve the following objectives:

* 1. Optimize Energy Usage: Develop a system that intelligently monitors energy consumption patterns, identifies inefficiencies, and suggests strategies to optimize energy usage.
  2. Cost Reduction: Reduce energy costs for users by optimizing energy usage, identifying areas of wastage, and implementing energy-saving measures.
  3. Environmental Sustainability: Promote sustainability by reducing carbon footprint, conserving resources, and minimizing energy wastage, thus contributing to a greener and more sustainable future.
  4. User-Friendly Interface: Develop a user-friendly interface that allows users to easily monitor their energy consumption, adjust settings, and access relevant information and recommendations.

**CHAPTER 4**



**SYSTEM REQUIREMENTS**

1. Hardware Requirements:

Sufficient computational resources to handle data processing and analytics.

Connectivity options to integrate with smart devices, sensors, and energy monitoring equipment.

Adequate storage capacity for storing energy consumption data and analytics results.

1. Software Requirements:

Operating System: The system should be compatible with common operating systems such as Windows, macOS, and Linux.

Database Management: A robust database management system to store and retrieve energy consumption data efficiently.

Programming Language: Utilize a suitable programming language for system development and integration with smart devices.

Data Analytics Tools: Implement data analytics software or libraries to perform advanced data analysis and generate meaningful insights.

**CHAPTER 6**

**CODE: SYSTEM IMPLEMENTATION**

**Source code:**

import java.util.Scanner;

public class SmartEnergyManagementSystem { public static void main(String[] args) { Scanner sc = new Scanner(System.in);

double presentUnits, goalUnits, maxUnits; System.out.print("Enter present units: "); presentUnits = sc.nextDouble(); System.out.print("Enter goal units: "); goalUnits = sc.nextDouble();

maxUnits = presentUnits + (presentUnits - goalUnits);

// create smart devices

SmartThermostat thermostat = new SmartThermostat(); SmartLightingSystem lightingSystem = new SmartLightingSystem();

while (true) {

System.out.print("Enter units used: "); double unitsUsed = sc.nextDouble(); presentUnits += unitsUsed;

System.out.println("Total units used: " + presentUnits); thermostat.adjustTemperature(presentUnits, goalUnits); lightingSystem.adjustLighting(presentUnits, goalUnits);

if (presentUnits >= maxUnits) {

System.out.println("Maximum units reached. Power will be cutoff.");

// ask user if they want to continue System.out.print("Do you want to continue? (y/n): "); String choice = sc.next();

if (choice.equalsIgnoreCase("n")) { break;

} else if (choice.equalsIgnoreCase("y")) {

// ask user for new goal units System.out.print("Enter new goal units: "); goalUnits = sc.nextDouble();

maxUnits = presentUnits + (presentUnits - goalUnits);

}

sc.close();

}

class SmartThermostat {

// adjust temperature based on energy usage

public void adjustTemperature(double presentUnits, double goalUnits) { double energyUsageRatio = presentUnits / goalUnits;

if (energyUsageRatio > 1.2) { // if energy usage is more than 20% above goal System.out.println("Energy usage is high. Decreasing temperature to save energy.");

// decrease temperature by 2 degrees

} else if (energyUsageRatio < 0.8) { // if energy usage is less than 20% below goal System.out.println("Energy usage is low. Increasing temperature to optimize comfort.");

// increase temperature by 2 degrees

} else {

System.out.println("Energy usage is normal. Temperature remains unchanged.");

}

}

}

class SmartLightingSystem {

private double brightness = 1.0; // default brightness

// adjust lighting based on energy usage

public void adjustLighting(double presentUnits, double goalUnits) { double energyUsageRatio = presentUnits / goalUnits;

if (energyUsageRatio > 1.2) { // if energy usage is more than 20% above goal System.out.println("Energy usage is high. Dimming lights by 20%.");

// dim the lights by reducing brightness by 20% double newBrightness = 0.8 \* brightness; setBrightness(newBrightness);

} else if (energyUsageRatio < 0.8) { // if energy usage is less than 20% below goal System.out.println("Energy usage is low. Increasing lights by 20%.");

// increase the lights by increasing brightness by 20% double newBrightness = 1.2 \* brightness; setBrightness(newBrightness);

} else {

System.out.println("Energy usage is normal. Lights remain unchanged.");

}

}

// get the current brightness of the lights public double getBrightness() {

return brightness;

}

// set the brightness of the lights

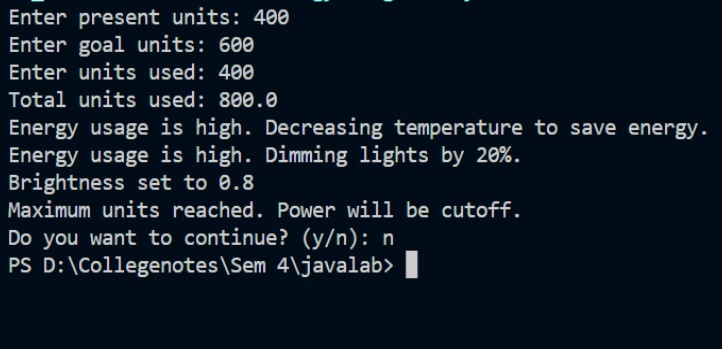
public void setBrightness(double brightness) { this.brightness = brightness; System.out.println("Brightness set to " + brightness);

}

}

C**HAPTER 7**

**OUTCOME RESULTS**



**REFERENCES:**

1. “Introduction to Java Programming By [K. Somasundaram](https://www.google.co.in/search?hl=en&sxsrf=APwXEdeJfaLK3WL7mbnceVFqRyKPw1xfuQ%3A1684930020127&q=inauthor%3A%22K.%2BSomasundaram%22&tbm=bks)
2. Smart Energy Management for Smart Grids.

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