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Load Shedding Time Management with Programmable Interface

Avishkar N. Gadekar, Nikhil B. Patil, Tejasvi N. Vinchu,
Bhavesh S. Wadekar, Dr. Akshay A. Pathare
Department of Electrical Engineering
Amrutvahini College of Engineering, Sangamner, India

Abstract: *Load Shedding Time Management with Programmable Interface aims to develop an automated system for efficient power distribution and management during peak demand or power shortage conditions. Conventional load shedding methods depend on manual operations, which are often inefficient, error-prone, and unable to respond quickly to changing power conditions. To overcome these limitations, the proposed system is being designed around an ESP8266 microcontroller, which automatically controls electrical loads according to preprogrammed schedules and user-defined priorities. The system incorporates a Real-Time Clock (RTC) module for precise timekeeping, ensuring accurate execution of scheduled load control operations.*

Keywords: Load Shedding, Automation Programmable Control System Real-Time Scheduling, Power Distribution Management

I. INTRODUCTION

Load shedding plays a crucial role in ensuring the stability of the electrical grid, especially during periods of high demand or limited power availability. Conventional manual load control methods are often slow, unreliable, and susceptible to human error highlighting the need for an automated approach. The proposed Load Shedding Time Management System with a Programmable Interface employs an ESP8266 microcontroller along with relays and a Real-Time Clock (RTC) to manage non-critical electrical loads automatically according to predefined schedules and real-time operating conditions. A user-friendly keypad and display enable easy configuration of load priorities, scheduling parameters, and real-time system monitoring This intelligent system enhances energy efficiency, safeguards essential equipment, and provides a flexible. economical solution suitable for residential, commercial, and industrial power management applications.

II. PROBLEM STATEMENT/ OBJECTIVE

1. To develop a microcontroller-based system using ESP8266 to control and monitor multiple electrical loads.
2. To implement a programmable scheduling mechanism using a Real-Time Clock (RIC) for precise load shedding operations.
3. To integrate relays for independent control of multiple loads based on priority levels.
4. To provide a user-friendly interface with keypad and display for configuring schedules priorities, and system parameters.

• Increasing Power Demand Rapid growth in electricity consumption Requires an efficient load management system to prevent overloads, and grid instability during peak demand periods

• Automation over Manual Control: Traditional manual load shedding is slow and error-prone. An automated programmable system ensures accurate, timely, and reliable load disconnection and reconnection without human intervention.

• Priority-Based Load Management: Critical loads must remain operational during power shortages. This system allows priority assignment, ensuring essential equipment stays powered while non-essential loads are shed first.

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• Energy Efficiency and Future Scalability: Time-based scheduling reduces power wastage and operational costs, while the programmable interface supports scalability and future integration with lot and smart grid technologies

III. PROPOSED METHODOLOGY

1. Requirement Analysis

Study existing load shedding problems and define system needs like automation, scheduling, and real-time control.

2. System Design

Design modules: input (load data), control (PLC/microcontroller), output (relays), and user interface (SCADA/GUI).

3. Hardware Setup

Use sensors, programmable controller, RTC module, and relays to control different load areas.

4. Software Development

• Time-based scheduling
• Load priority management
• Automatic ON/OFF switching

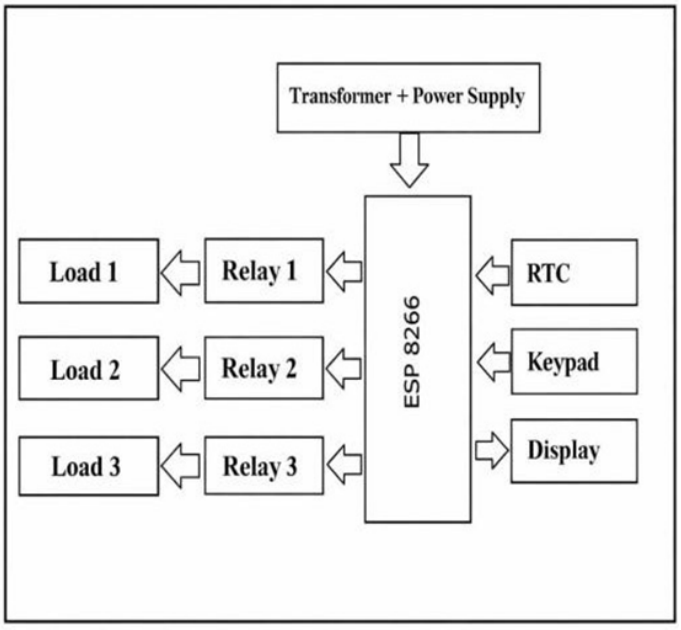
5. Algorithm Implementation

Compare demand vs supply and shed load based on priority and time schedule.

6. User Interface

Provide programmable interface to set timing, priority, and monitor system.

IV. BLOCK DIAGRAM



V. CONCLUSION

The Load Shedding Time Management System with Programmable Interface successfully demonstrates an efficient and reliable approach to modern power management. By integrating the ESP8266 microcontroller with relays and a Real-Time Clock (RTC), the system enables automatic, time-based, and priority-based control of electrical loads. This reduces dependence on manual operations, minimizes human error, and ensures stable power distribution during peak demand and power shortage conditions.

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Overall, the project offers a cost-effective, flexible, and scalable solution suitable for residential, commercial, and industrial applications. Its design supports future enhancements such as lot-based remote monitoring and smart grid integration, making it a practical and sustainable solution for efficient energy management and grid stability.

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