



Automatic EB-DG Changeover System with Load Priority Control

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ABSTRACT: In modern electrical systems, power interruptions are a common issue, especially in residential and small industrial applications. To ensure uninterrupted power supply, backup sources such as diesel generators (DG) are widely used. However, manual switching between Electricity Board (EB) supply and DG supply can lead to delays, improper load management, and potential safety issues.

This project proposes an Automatic EB–DG Changeover System with Load Priority Control. The system automatically detects EB power failure and switches the load to DG supply using relay-based control logic. Additionally, the system manages multiple loads by prioritizing them. Under normal EB supply, all loads (three bulbs) operate. During power failure, only essential loads (bulb 3) remain ON, while non-essential loads (bulb 1 and 2) are automatically turned OFF. The system uses relay modules for switching, ensuring electrical isolation and safety. This design eliminates the need for manual intervention and prevents overload on the generator. The proposed system is cost-effective, reliable, and suitable for small-scale applications such as homes, shops, and laboratories.

KEYWORDS: EB Supply, DG Generator, Automatic Changeover, Load Priority, Relay Control

I. INTRODUCTION

Power supply interruptions can cause inconvenience and operational issues in both domestic and industrial environments. Traditionally, switching between EB supply and backup generator is done manually, which can lead to delays and human errors.

This project introduces an automatic changeover system that detects EB failure and switches to DG supply instantly. In addition to switching, the system incorporates load management, ensuring that only critical loads are powered during generator operation.

The system is designed using relays, making it simple, reliable, and cost-effective. It avoids complex programming and can be easily implemented using available components.

II. RESEARCH METHODOLOGY

This project sets the foundation for a detailed study of the PLC Based Intelligent Power Source and Load Management System, focusing on automatic source switching, intelligent load control, and real-time monitoring. The proposed system ensures uninterrupted power supply, prevents generator overloading, and improves the overall safety and reliability of electrical power management in industrial and commercial applications.

2.1 Literature Review

Automatic power switching systems are widely used in industries and commercial buildings. Existing systems include Automatic Transfer Switches (ATS), PLC-based systems, and microcontroller-based designs. These systems ensure uninterrupted power but often lack load prioritization in low-cost implementations.

2.2 Review of Existing Technologies

Existing technologies for power source control and load management include manual changeover systems, relay-based automatic transfer switches, generator backup systems, and PLC-based automation systems. Conventional manual systems are commonly used for switching between EB mains supply and Diesel Generator, but they require human



intervention and do not provide intelligent load control. Relay-based automatic transfer systems offer basic source switching, but they often lack priority-based load management and overload protection features. Some advanced industrial systems use PLC controllers for automatic monitoring and control, which improve reliability and response time. Mobile and IoT-based monitoring systems also enable remote supervision of power source and load conditions. However, many existing solutions focus only on source transfer or only on monitoring, and do not provide a fully integrated, intelligent, and user-friendly power management system.

2.3 Key Problems Identified

From the analysis of existing technologies, several key problems have been identified in conventional power source and load management systems. Most systems do not provide automatic source switching and intelligent load control during power failure conditions. There is limited capability to manage loads based on priority, which may lead to inefficient power usage and generator overloading. Many existing solutions still depend on manual operation or basic relay-based control, reducing reliability and increasing the possibility of human error. In addition, traditional systems often lack real-time monitoring, remote access, and user-friendly control interfaces, making it difficult for users to efficiently monitor and manage the overall power distribution system.

2.4 Design and Component Selection

The proposed system is designed as an intelligent power management and source control system that integrates power source monitoring, automatic switching, load control, and mobile-based communication functionalities. The Programmable Logic Controller (PLC) is selected as the main controller due to its high reliability, fast response, and suitability for industrial automation applications. Voltage sensing units are used to detect the availability of EB mains supply and Diesel Generator (DG) safely and accurately. Contactors and relays are selected for switching the power source and controlling the connected loads based on the PLC logic. Load classification is implemented to separate high-priority and low-priority loads for efficient backup power utilization. For communication and real-time monitoring, a mobile app interface is integrated into the system to provide source status, load condition, and manual control features. Thus, the selected components ensure safe operation, intelligent control, and reliable performance of the proposed power source and load management system.

2.5 Theoretical framework

The proposed system is based on the basic principles of electrical power distribution, automation, and control systems. It works by continuously monitoring the EB mains supply and Diesel Generator (DG) to ensure uninterrupted power supply. The PLC processes the source and load status through input-output control logic. Voltage sensing circuits, contactors, and relays are used for source detection and safe switching. The system also uses load prioritization to supply only essential loads during backup operation and prevent generator overloading.

2.6 PLC

The Programmable Logic Controller (PLC) is used as the main controller of the proposed system. It continuously monitors the status of the EB mains supply, Diesel Generator (DG), and connected loads, and performs the required control actions based on the programmed logic. The PLC is responsible for automatic source switching, load prioritization, load shedding, and generator control during power failure and restoration conditions. It also controls the operation of contactors, relays, and load switching circuits through its output terminals. Due to its high reliability, fast response, industrial durability, and flexible programming, the PLC is highly suitable for intelligent power management and automation applications.

2.7 Voltage Sensing Unit

A Voltage Sensing Unit is used to detect the availability of the EB mains supply and Diesel Generator (DG) without direct high-voltage connection to the PLC. It works by sensing the presence or absence of supply voltage and converting it into a suitable low-level signal for the controller. It provides safe isolation and reliable detection of power source status for automatic control operations.

2.8 Power Source Detection Circuit

A Power Source Detection Circuit is used to identify the presence of EB mains supply and Diesel Generator (DG) at a safe and measurable level. It ensures reliable source detection by converting the high-voltage input into a suitable low-level signal for the PLC while providing electrical isolation from the main power line.



2.9 Contactor and Relay Unit

A Contactor and Relay Unit is used to control the switching of power sources and electrical loads using low-voltage control signals from the PLC. It allows the system to safely connect or disconnect the EB supply, DG supply, and load circuits without direct manual operation or unsafe electrical contact.

2.10 Mobile Communication Module

The Mobile Communication Module is used to provide communication between the PLC system and the mobile application. It enables real-time monitoring and control of the power management system, allowing the user to check source status, load condition, and system operation remotely.

Output tools and power electronic components

To evaluate the efficiency, performance, and economic feasibility of the system, various output tools and econometric models are applied.

3.1 Relay Module

A Relay Module is used to control the switching of electrical loads and power sources through the PLC. It allows the system to safely turn ON or OFF the connected circuits based on the control logic. It provides isolation between the control section and the high-power electrical system for safe operation.

3.2 Indicator Lamps

Indicator Lamps are used to show the current operating status of the power source in the system. They provide visual indication such as EB ON and DG ON, helping the user to easily identify the active power source during operation..

3.3 Power Supply Unit

The Power Supply Unit is used to provide the required DC voltage for the operation of the relay and control circuits. It ensures stable and reliable power supply for proper system functioning.

3.4 Resistors

Resistors are passive components used to limit current, divide voltage, and set operating conditions in circuits. They are used in signal conditioning and protection of components.

3.5 Capacitors

Capacitors are used to store electrical energy temporarily. In this project, they are mainly used for filtering and smoothing the rectified signals to produce a stable DC output.

3.6 Diodes

Diodes are semiconductor devices that allow current to flow in only one direction. They are used in rectifier circuits to convert AC signals into DC.

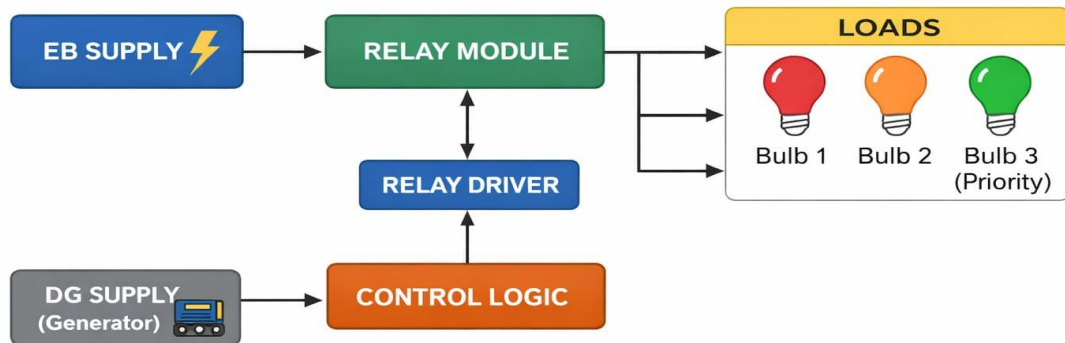
IV. RESULTS AND DISCUSSION

The proposed PLC Based Intelligent Power Source and Load Management System was successfully implemented and tested. The system was able to continuously monitor the availability of EB mains supply and Diesel Generator (DG) using the voltage sensing and control circuits, and the source status was correctly processed by the Programmable Logic Controller (PLC). Based on these input conditions, the system performed automatic source switching and load control effectively.

The contactor and relay-based switching mechanism functioned as expected, allowing the system to automatically transfer the supply from EB to DG during power failure conditions. The priority-based load management also operated correctly, where only the essential loads remained active during DG mode, thereby preventing generator overloading. This confirmed the effectiveness of the intelligent load control strategy.

Furthermore, the integration of the mobile monitoring interface enabled real-time observation of source status, load condition, and system operation. Users were able to monitor the system and verify its working condition easily. The overall system demonstrated safe operation, reliable performance, reduced manual intervention, and efficient power management, making it suitable for small-scale industrial and commercial applications.

4.1 BLOCK DIAGRAM



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Figure 1 represents the block diagram of the proposed system, showing how the EB mains supply and Diesel Generator (DG) are monitored using sensing circuits and processed by the Programmable Logic Controller (PLC). Based on the source condition, the PLC controls the contactors and relay units to perform automatic source switching and load management. The system also includes indicator lamps and mobile monitoring support for real-time status indication and user control.\

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