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TRANSMISSION LINE FAULT AND POWER THEFT DETECTION

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Abstract: Transmission line is the most important part of the power system. Transmission lines a principal amount of power. The requirement of power and its allegiance has grown up exponentially over the modern era, and the major role of a transmission line is to transmit electric power from the source area to the distribution network. In essentially, fault analysis is a very focusing issue in power system engineering to clear fault in short time and re-establish power system as quickly as possible on very minimum interruption. The power theft detection which aims to detect any theft related to electricity. Electrical energy is very important for everyday life. The objective of this project is to design a system to avoid the theft. This model reduces the manual manipulation work and theft control. We must first properly understand the working of different parts that is to be combined together. The technology which we are going to use in our project and the implementation of this system will save a large amount of electricity.

Keywords: Transmission line, distribution network, fault analysis, theft control.

I. INTRODUCTION

The modern electrical system has been experiencing an exponential growth rate. A critical component of this system is the electrical power transmission line that links power generation plants with the end-users. However, due to the long length of the transmission line, faults may occur, which can disrupt the supply of power to consumers. Compared to other parts of the power system, transmission and distribution networks experience high losses. The vulnerability of the electric power infrastructure to various physical events, both natural and malicious, poses a significant threat to the stability and overall performance of the grid. If not detected and cleared quickly, faults in the transmission network can lead to transformer damage, destruction of human life, and even fire outbreaks. Unfortunately, in India, there is currently no real-time system that notifies of faults as they occur on multiple parameters. This increases the risk of damage to connected devices and poses a threat to human life. To prevent such incidents, transmission lines require frequent maintenance, which demands increased manpower. However, frequent line checks may not prevent faults caused by unpredictable events such as tree topples and rainfall. Therefore, there is a need for a fast fault identification and clearance system. In response to the challenges described, the proposed solution is an Internet of Things (IoT) based transmission line with various fault detection and an indication system to notify the respective power stations of any detected faults. Here, the proposed system uses an Arduino nano, Various parameter sensors & Esp8266 sensor to detect the fault in the transmission line and then send the data accordingly to the power stations. The Smart Electric Bill is a complicated platform to the manner we acquire power nowadays. In earlier times the demand for electricity was substantial compared thereto presently. Since the demand for electricity has tremendously increased, a redesign of the present grid system is far needed. With the technology available in these times , the smart grid might be designed in such a fashion , that it uses digital technology to detect and react to local changes in usage. The system will feature a two-way dialog where electricity and knowledge are often exchanged between the buyer and utility. This can increase or decrease the quantity of energy a consumer needs by analyzing the feedback of the two-way dialog.

II. PROBLEM STATEMENT

The overhead transmission line, which often has varieties of small or large disturbances is highly susceptible to interference and it is necessary for fault detection. Fault detection must be able to quickly determine the location of interference as well as to classify type of fault quickly to stabilize the electric power system. It may take long time to detecting of faults as they occur, minimizing the duration of power interruptions and preventing cascading failures. Majority of the power theft occurs in hilly or snow area‟s such as Nepal, Jammu & Kashmir ect. Where it will be difficult to identify.

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III. OBJECTIVE

In This Project We Tried to solve problem consider in transmission any fault (Line to Line fault or Line to ground fault) then that time automatic transmission line electricity power cut so our substation safe by that fault , So This ensures the safety of the power system. The power theft detection which aims to detect any theft related to electricity. Electrical energy is very important for everyday life. The objective of this project is to design a system to avoid the theft.

IV. LITERATURE SURVEY

[1] Akshit Sharma*, Ankit Nirwan*, Ajay Singh Shekhawat proposed "Fault Analysis on Three Phase Transmission Lines and its Detection" Power system failure could lead to instability loss and serious damage to either the defective or nearby healthy equipment. Additionally, the stability proposal is regarded as a crucial element in the management of energy and the planning of power systems. Numerous studies have revealed that up to 90% of faults on most overhead lines are transient, ranging from 70% to 90%. When one or more circuit breakers are immediately tripped to isolate a problem, such as an insulator flashover, the fault is cleared and does not reoccur.

[2] Sibisagar.B, Surya.V.R, VigneshVijayaraghavan, Dr.SuriyaKrishnaan proposed. "Self Regulating Line Fault Detection & Its Location In Transmission Lines" Transmission line faults are one of the main causes of power outages and damage to power transfer equipment. In rural India, restoring a line fault is projected to take seven hours. When a transmission line transmits voltage over the desired voltage, voltage below the desired voltage, or with no current flowing between any two places, one of three things can happen: a fault.The brain is a microcontroller called Arduino UNO of this system, where it regulates how the system as a whole operates. Continuous measurements of voltage, current, and temperature are made using voltage sensors, current sensors, and temperature sensors, accordingly.

[3] Prof. Vikramsingh R. Parihar1* , Shivani Jijankar2 , Anand Dhore3 , Arti Sanganwar4 , Kapil Chalkhure.,proposed "Automatic Fault Detection in Transmission Lines using GSM Technology" There are numerous distinct elements that make up the electric power system. One of these is the transmission system, in which power is delivered to consumers via transmission lines from generating plants and substations. When the insulation of the system fails at any point, a fault is simply described as a collection of unfavourable but unavoidable happenings that might momentarily upset the stable condition of the power system. The fault was properly and precisely indicated and located using a smart GSMbased fault detection.

[4] Sharmili W. Drugkar1 Krishna R. Maske2 Bhagyashree Gadekar Proposed "TRANSMISSION LINE FAULT DETECTION USING GSM TECHNOLOGY" The distribution system and transmission system faults are sufficiently and precisely identified in this article using a smart GSM-based fault detection system. A variety of safety devices, a voltage and current sense section, a microcontroller section, an LED display section, and a GSM (global system for mobile communication) module are all included in the proposed system. This system also gives the information about which type of fault occurred in transmission line such as L-L (line to line), L-G (line to ground), L-L-G (double line to ground) fault, LL-L & L-LL-G (symmetrical fault). And this information is send to the service provider company via SMS using GSM.

[5] S.Chellam*,P.Latha1, K.M.Nivetha2 M.Swathi3 proposed "Fault Detection using GSM Technology in Overhead Distribution Lines" The identification and mitigation of the single line fault in the overhead distribution line are given in this work. Due to the GSM technology being used, distribution lines are being measured, protected, and controlled against various fault conditions. It is tracked how voltage and current change as a result of open and short circuit faults. Thermistor is used to measure the line temperature. The notification will be conveyed by GSM if there is any change in the temperature.

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V. BLOCK DIAGRAM

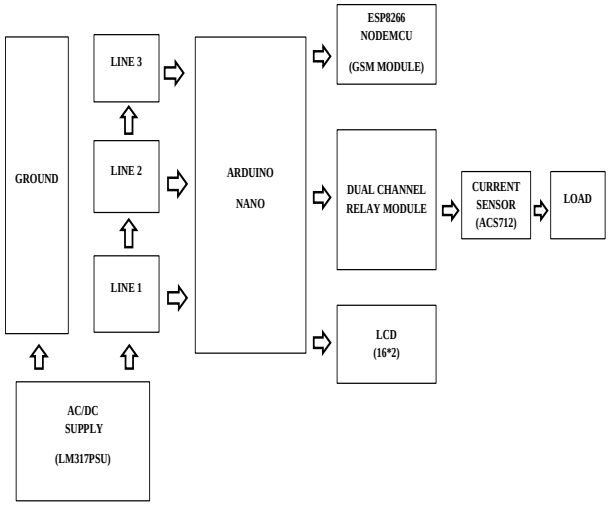

Fig 1. Block Diagram

This Project Full Work On Relay System And Relay is an electrical switch so relay module when received the signal then relay cut the electricity power so this project full principle depend on Relay Principle , The relay is the device that open or closes the contacts to cause the operation of the other electric control.

It detects the intolerable or undesirable condition with an assigned area and gives the commands to the circuit breaker to disconnect the affected area. Thus protects the system from damage.

Electrical power theft is a major problem in power system networks all over the world, which is illegal and should be strictly prohibited. Power theft can be defined as the usage of electrical power without any contract with the supplier.

In order to eliminate power theft, The location of power theft is to be known so that appropriate 8 action will be taken on the legal offenders. Circuit consists of an arduino,GSM,ESP8266 and Current sensor. Meters cannot be used for high currents so current sensing is done by current sensors. One current sensor is used at load side measure of current of load and If load current is increased above set value then alert message will be send to information center this is done by Using IOT power theft detectors or kits has been implemented.

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VI. CIRCUIT DIAGRAM

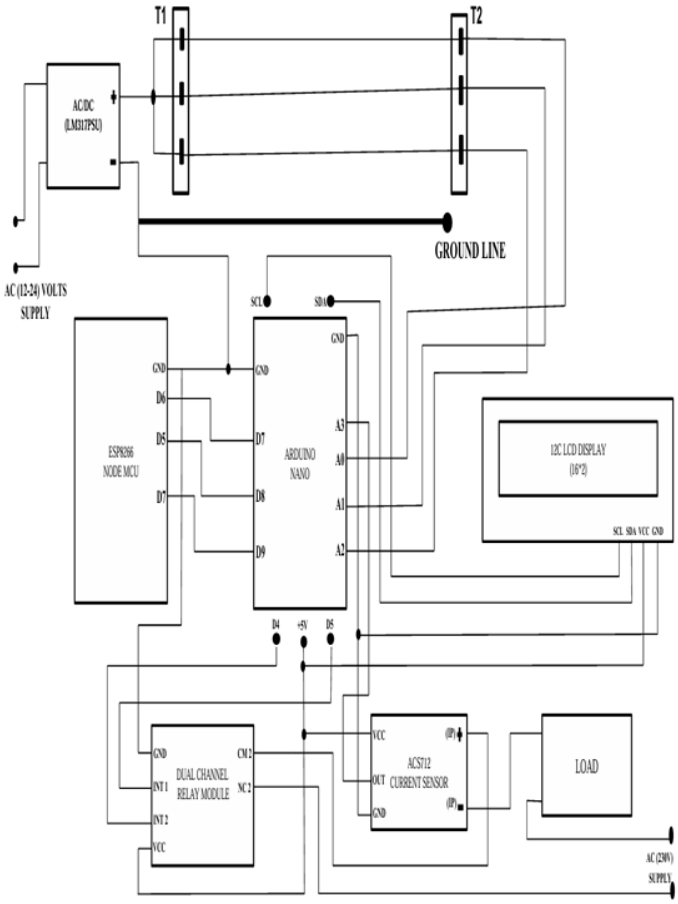

Fig 2. Circuit Diagram

VII. FINAL RESULT

1. Below Fig shows Over all model review of the project.

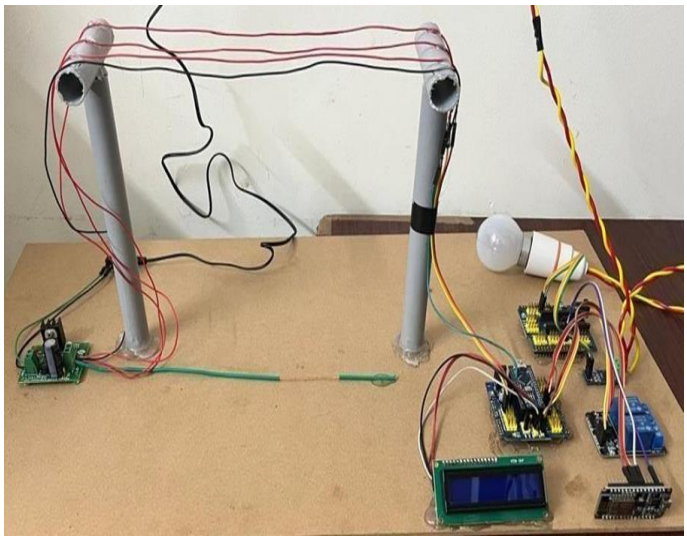

Fig 3. Overall View of Project

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2. When any two lines of the transmission system get short circuited, L-L fault will occurs as shown in fig 7.2 below. Then will be Turned OFF.

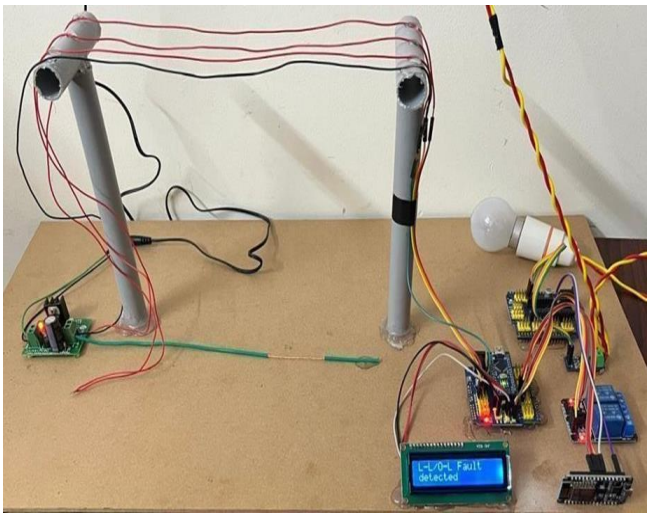

Fig 4. When Line to Line Fault Occurs

3. When any line of the transmission system get touched to ground , L-G fault will occurs as shown in fig 7.3 below. Then will be Turned OFF.

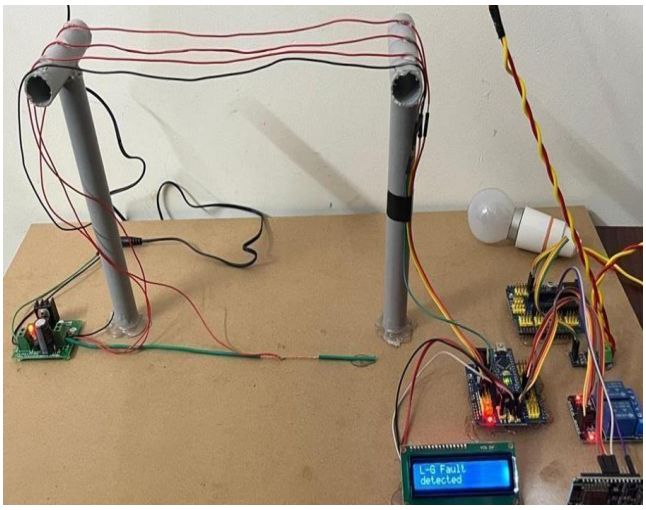

Fig 5. When Line to Ground Fault Occurs

4. When anybody thefts Power through this transmission lines then Power Theft Message will be send to command room shown in Fig 7.4

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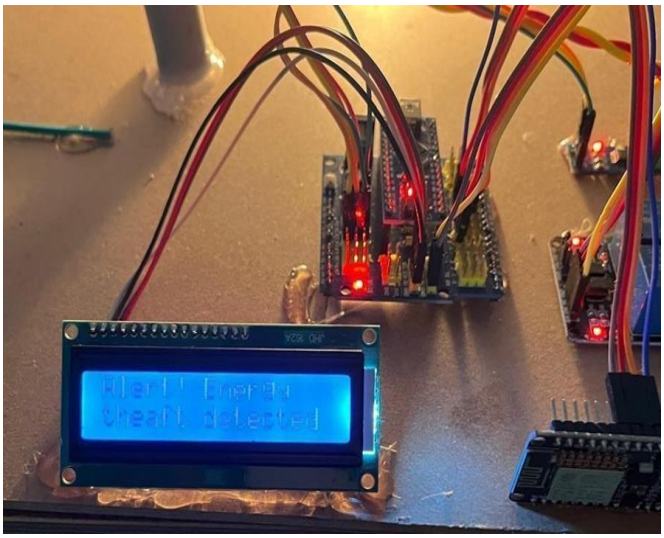

Fig 6. When Power Theft Occurs

VIII. CONCLUSION

In conclusion, the proposed project introduces an Internet of Things (IoT)-based monitoring system for modern electrical power transmission lines. By leveraging Arduino, sensors, and an ESP32 sensor, the system enables the prompt detection of faults in transmission lines and real time notification to the respective power stations. It offers the flexibility for users to set customized thresholds for parameters such as temperature, wind speed, sag, current, and voltage, and receive immediate warning messages if any threshold is exceeded. This advanced monitoring system significantly reduces response times for fault clearance, mitigating the risk of transformer damage and ensuring a reliable power supply to end-users. The integration of IoT technology enhances the efficiency, reliability, and safety of power transmission, addressing the challenges posed by faults and disruptions in the electrical grid. Through the continuous monitoring and early detection of faults, the system contributes to the optimization of transmission line performance and the overall improvement of power transmission networks,as well as power theft alert will be controlled.

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