IOT CONTROLLED ELECTRIC GRID AUTOMATION WITH REAL TIME FAULTS AND FEEDER CONTROL SYSTEM

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Abstract- The distribution stations and grids for the electrical transmission of power performs a key role in effective power transmission for domestic, industrial and commercial sectors. There is the importance for the safety measures and effective management of parameters.

The existing method of grid monitoring is done with SCADA and also there are different methods are used to monitor and control over the grid parameters but these methods facing with a lot of drawbacks and limitation in technology.

KEYWORDS: IOT, NODE MCU, RELAYS, SCADA, SENSORS.

I .INTRODUCTION:

The Smart grid is a digitally enabled electrical grid, it can gather information and acts according to the behavior of a equipments. Smart grid can perform both long and local distribution tasks efficiently by the usage of various modern technologies.

The internet of things for the application of monitoring and controlling a grid is a best way of solution for the drawbacks found in SCADA and other way of monitoring a grid parameter. In this project we are using IOT hardware module with different sensors and switching units to sense the parameters and also to control the actions of Transformers and feeders. The IOT hardware module is designed with a wireless chip and microcontroller functionality inside the module.

The Smart Grid is feasible to interface the input as well as output as a different input sensor to monitor the important parameters like working temperature of transformer, rain detection, lightning detection, cooling oil of Transformer level detection, joint Arc detection and also the High Tension bending or collapse detection. The output using electromagnetic switch we are using action of controlling the feeders and Transformers.

The temperature sensor senses the working condition of the transformer to a safe limit and whenever the temperature exceeds the predefined value the sensor sends the information to the input pin of IOT module. Oil detection sensor recognizes the safe level of the cooling oil in the distribution transformer and whenever there is a leakage in the level and safe level limit goes down the sensor immediately sense and provide signal to the IOT module.

The rain detection unit senses the rain in the location of grid or substation and intimate to the focal point their is a raining takes place in the location of grid. The Lightning detector circuit identifies the heavy rain if there is some lightning created nearby the location of a grid. Immediately

the intimation is provided to the focal point using IOT.

There are some joints are found in the distribution station, sometime the joints create a carbon deposition and creating arc in the circuit. This ARC detects and intimate to the focal point similarly a high tension Tower provided with a bend sensor or a Flexi sensor goes to detect in case of any bending or collapsing takes place and an immediate alert indication is provided to the control room using IOT Technology.

II. METHODOLOGY:

A smart grid is an electricity supply network that uses digital communications technology to detect and react to local changes in usage. Testing and programming IOT module unit is more efficient transmission of electricity quicker restoration of electricity after power disturbances reduced operations management costs for utilities.

Smart sensors and IOT are the key driving forces that push sensor interface circuits and systems to address smart functions as well as to overcome obstacles arising from specifications applications. The method of using relay is that it takes a relatively small amount of power to operate relay coil. Wireless WI-FI is a type of wireless network technology used for connecting to internet.

IOT module is a tiny device that is responsible for connecting virtually anything to wireless technology and they can impact success of IOT applications. The power supply circuit is used to supply stable output voltage.IOT technology connects smart devices and physical objects essentially to create a remotely controlled network for constant communication and data exchange.

Assembling and testing provides installation and electrification of components. The design methodology consists of following steps: Step 1: The IOT module unit can be tested and designed for programming. Step 2: The designing module helps in testing of interfacing of all sensors.

Step3: Electromagnetic relay switching circuits can be designed and tested using this method. Step 4: The design helps in connecting wireless Wi-Fi connectivity to IOT module and can be tested. Step 5: The design tests the IOT module and helps to send a sample signal. Step 6: It helps in designing of power supply circuit to test different circuits.

Step 7: The module helps in implementing of a IOT app to a mobile. Step 8: By this module we can test and also assemble project module. III. WORKING OF PROJECT PCB PREPARATION Printed Circuit Board, popularly known as PCB, PCB is a piece of plastic insulating board, on one side of which a complete layout diagram of an electronic circuit consisting of copper silver conducting paths is printed by a special photo etching process.

ii) Construction: The steps involved in the manufacturing of PCB are as follows: 1) Design and preparation 2) Pattern Design 3) Resist Application 4) Etching 5) Clearing and resist remover 6) Finishing 1) Design and preparation: Artwork should be prepared on transparent polystyrene film using block ink or adhesive tapes and pads. In modern technique screen printing method is used for art working of PCB. This is the primary step in fabricating the PCB.

2) Pattern Design: In industrial work, pattern is usually transformed to the surface of the laminate

by means of screen printing or by photographic method. 3) Resist application: Adhesive tapes and pads which have high chemical resistance and excellent adhesion can be attached to copper clad laminate. 4) Etching: Etching sol can be prepared using available etchers like ferric Chloride, cupric chloride etc. Ferric chloride is popularly used.

Etching can be carried out in a spray etching chambers. Few drops of HCL can be added to FECL3 to spread a etching action. The Etching process may take 30-40 min depending upon the PCB. 5) Clearing and Resist Removal: After etching, board should be washed under running water and then dried by applying turpentine pads or spirit, the tapes can be cleaned off from PCB, Now printed pattern will be clearly visible.

6) Finishing: After PCB is cleaned, center of terminals can be center punched and holes can drill over board. The drilling machine can be used to drill the holes. Then terminal points can be lightly tinned. After wards suitable component can be mounted on PCB. iii) Block diagram for implementation of IOT for substation monitoring and controlling _ Fig 1: Diagram for substation monitoring and controlling _ Fig 2: Overview of the project It is comprised of three main components, sensors and actuator networks, an IOT server and user interfaces.

The smart grid network consists of sensor and actuator nodes and IP gateways. The IOT server consists of a message dispatcher, an SG database, a data management unit, a configuration database, configurator unit, user database and a secure access manager. The user interfaces consists of a visualization interface, configuration interface and web service API.

III. WORKING PRINCIPLE:

A substation consists of the transformers which is used to convert voltage between two points voltage correction devices like capacitors, resistors, reactors. These elements are to be carefully monitored for avoiding faults and to maintain uninterrupted transmission of power. Fire sensor, oil level sensor, voltage sensor, temperature sensors are integrated with transformers for detecting the oil level, voltage, temperature and fire.

Fire sensor, voltage sensors, temperature sensors are integrated with capacitors reactor for sensing voltage, temperature and fire. Each sensors are feasible to be interfaced with Node MCU to process substation factors. Micro-controller assigns the address of data to the cluster based cloud storage .These data are send to web application through wireless communication and access from any location.

The concerned authority receives the position of the substation via using IOT. The position of the substation is displayed on LCD. PIN DIAGRAM _ Fig 3: NODE MCU ESP8266 Chip

IV. HARDWARE COMPONENTS:

1) IOT NODE MCU module: ESP8266 is a highly integrated chip & it provides a complete and self-contained Wi-Fi networking functions from other application process. _ Fig 4: IOT NODE MCU

2) Thermistor: It is a type of resister whose resistance is dependent on temperature more than in standard resistor. 3) Electromagnetic relays 6v: A relay is an electrically operated switch in which contacts can be made to operate in the pre – arranged fashion.

In short, a relay is a switch worked by an electromagnet. _ Fig 5: Diagram of Electromagnetic relay 4) Regulator 5V: A full-wave rectifier is a device that has two or more diodes arranged so that load current flows in the same direction during each half cycle of the ac supply. 5) Float sensor: A float switch is a device used to sense the level of liquid within a tank.

When the float ball rises or falls with the liquid to the level of the switch. 6) LDR (Light-controlled variable): LDR is a photo resistor. The resistance of a photo resistor decreases with increasing incident light intensity. 7) Flexi sensor: A Flexi sensor or bend sensor is a sensor measures the amount of deflection or bending.

Usually, the sensor is stuck to the surface and resistance of sensor element is varied by bending the surface. __ Fig 6: Diagram of Flexi sensor

V. RELAY INTERFACE:

Diagram of the Relay Interface The circuit diagram shows the connection of Relay Driver Circuit. When the logic signal from controller or any other circuits like timers op amps is applied to base of the transistor through resistor 10kohm .When base signal is high, transistor saturates and it energizes the relay.

The transistor act as a small signal amplifier resistor of 1 k? is used to provide proper emitter base voltage to turn the transistor to ON state from OFF state. Relay is an electromechanical switch & it works on the principle of energizing an electromagnet. It consists of primary coil, 2 contacts, one is normally open contact "NO"& the other is normally closed contact "NC"& pole normally identified a common.

When relay is in off state the pole (common) is connected to normally closed (NC contact). The load may be a fan or dc motor or heater coil, when transistor starts conducting current starts flowing through the coil. Which develops its own magnetic flux when the strength of current is suitable; whenever a sufficient flux is produced it attracts the pole to make contact with normally open position „NO". Hence the load connected to it performs its operation until the contact is broken.

A diode connected in parallel across the primary coil is to eliminate the effect of back EMF on the transistor. Relays have great application in industry. Using the principle of energizing an Electromagnet we can handle large voltages & current application. Without the risk of shocks.

VI. EXPECTED OUTCOMES:

1) The information provided by smart grid systems also helps the customers to make informed choices about the managing of energy use. 2) Smart Grid is advanced than the normal electrical grid. 3) The grid can be digitalized and detected every change by using IOT. 4) Quick recovery after any sudden breakage/disturbance in lines and feeders. 5) Better demand, supply/demand response. 6) Better power quality. 7) Protective management of electrical network during emergency conditions.

VII. RESULTS:

The IOT technology provides full duplex communication between hardware and user BLYNK application .The communication signal flows over Wi-Fi and with the BLYNK cloud server, the data transmission takes place. On receiving the fault signal no oil in the transformer indicate the signal at blink app that there is no cooling level found in the transformer.

The overheating of cooling oil also gets the signal from temp sensing unit and provides the signal to the IOT app. The rain detection, lightning detector, joint arc detector and tower collapse

detection circuits gets activate in case of fault and provides the signals to the NODE MCU unit across its GPIO pins and the signal alert indications are indicated across the BLYNK app.

The faults can be monitored and in case of need of feeders can be possible to control from BLYNK app with the help of BUTTON icons.

VIII. CONCLUSION:

This technology is the grid of the future solves the unidirectional information flow, energy wastage, reliability problems. Internet of Things is the next step towards a globally and pervasive connection to any communication and computation enabled objects/devices, regardless their assess technology available resources and location.

The paper mentioned has major benefits from the IOT vision, where smart objects or devices are deployed alongside the energy path, from the energy plant to the end consumer. In this paper, we briefly reviewed the main security issues and challenges for the SG and dressed the major required security services.

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