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Automatic Changeover Switch and Partial Load Shedding

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ABSTRACT: A distribution system connects all the individual loads in a given locality to the transmission lines. In the shedding process, under a main power station there are several sub-stations who perform power-cut for a certain period of time to control the shortage of electrical energy used by the people of the locality. Workers form the electrical authority are engaged in the substations who attend the calls and directions from the main power station & as per the upper levels direction, power system of some area are cut down by the workers for a period of time. And then after the completion of those areas' shedding some other areas are cut-off. In this way the shortage of electrical energy is covered up by the electrical authority. This paper deals with designing such a computerized Load Shedding Controller (LSC) which will reduce manual effort for controlling the load shedding time interlude in a systematic way. Also this system alerts people before performing partial load shedding or fully loads shedding.

KEYWORDS: load shedding, substations , Node MCU, Mobile app

I. INTRODUCTION

Load-shedding is a process by which the electrical authority handles the dearth of the electrical power being consumed by the society. Shedding is done to minimize the load being consumed by the society through several substations which are connected to the main power station. When the frequency of the power generator falls down, it fails to generate the required power. As a result the authority lacks the scheduled amount of power & this leads the authority to perform a shedding. And the main station orders the sub-stations to cut some of the feeders for a certain period of time & thus the shedding procedure continues. To ensure that the system is stable and available during disturbances, manufacturing facilities equipped with on-site generation, generally utilize some type of load shedding scheme.

In recent years, conventional under frequency and PLC-based load shedding schemes have been integrated with computerized power management systems to provide an "automated" load shedding system. It can provide faster and optimal load relief by utilizing actual operating conditions and knowledge of past system disturbances. The main theme behind the proposed method is to develop a computerized procedure for controlling the load-shedding time period in a systematic way so that in the shedding management process, manual work may be minimized. This computerized shedding scheme will be easy to operate and having fewer complexities with a proper user friendly interface provided with the system. The function of an electric power system is to connect the power stations to the consumers' loads by means of interconnected system of transmission & distribution networks. Therefore an electrical power system consists of three principal components: Power Station Transmission Lines and Distribution Systems. The transmission lines are the connecting link between the power station & distribution systems.

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II. PROBLEM STATEMENT

In the shedding process, under a main power station there are several sub-stations who perform power-cut for a certain period of time to control the shortage of electrical energy used by the people of the locality. Workers form the electrical authority are engaged in the substations who attend the calls and directions from the main power station & as per the upper levels direction, power system of some area are cut down by the workers for a period of time. And then after the completion of those areas' shedding some other areas are cut-off. In this way the shortage of electrical energy is covered up by the electrical authority. This paper deals with designing such a computerized Load Shedding Controller (LSC) which will reduce manual effort for controlling the load shedding time interlude in a systematic way. Also this system alerts people before performing partial load shedding or fully loads shedding.

III. LITERATURE SURVEY

Vitality is the essential need for the financial improvement of a nation. Numerous capacities important to display day living toil to end when the supply of vitality stops. It is basically difficult to gauge the real greatness of the job that vitality has played in working up present-day human progress. In this cutting edge world, the reliance on power is so much that it has turned into a PART and PARCEL of our life. So we have to spare more and more electrical power. Thus, the heap shedding control framework, which was prior done physically, now-a-days, is controlled by a PC based framework, created to some more degree to guide the general public to a more helpful life. This paper [1] centers around building up a modernized method for controlling the heap shedding framework where manual work will be limited by choosing the feeder, substation and span of shedding time by the client 'Re-enactment results', utilizing the above proposed show, checks the reasonableness of picking such a computerized load shedding framework.
In [2], creators present a savvy remote dispersed load shedding framework for non-crisis situations. In power transformer areas where SCADA framework can't be utilized, the proposed arrangement gives a sensible elective that joins the utilization of microcontrollers and existing GSM foundation to send early cautioning SMS messages to clients encouraging them to proactively decrease their capacity utilization before framework limit is come to and methodical power shutdown happens. A tale correspondence convention and message set have been conceived to deal with the informing between the transformer locales, where the microcontrollers are found and where the estimations happen, and the focal preparing site where the database server is facilitated. Additionally, the framework sends cautioning messages to the endusers cell phones that are utilized as correspondence terminals. The framework has been actualized and tried by means of various test results.

Vitality is the fundamental need for the financial advancement of a nation. Vitality generation is all the more expensive which is outlandish for us, so we ought to disseminate the vitality as most extreme client's correct. Presently multi day's heap shedding is a typical popular expression in our nation, thus the business doesn't proceed with the creation, the point of our exploration is to proceed with power stream in industry and load-shed the client as a parity condition. Subsequently, the heap shedding control framework, which was prior done physically, now-a-days, is controlled by a PC based framework, created to some more degree to guide the general public to a more advantageous life. Paper [3] centers around building up a microcontroller based method for controlling the heap shedding framework where manual work will be limited by choosing the feeder, substation and term of shedding time by the client, simple to distinguish blame utilizing microcontroller, to precede mechanical power for compelling assembling, over load cut for Transmission line security.

To enhance vitality productivity (EE) in electrical cable correspondence (PLC) frameworks, we proposed a dynamic load based PLC framework show as another model for EE boost and a vitality proficient asset designation methodology advancing burden impedance, transmission control and subchannel allotment as the improvement contentions. Since the heap impedance at collectors is impacted by attributes of an electrical cable station, enhancing the heap impedance is required to maximally instigate a got power while thinking about the station qualities. We looked to augment arrange EE while fulfilling requirements that transmission intensity of a transmitter can't be surpassed by its greatest breaking point and least nature of administration ought to be ensured. Along these lines, we contemplated a situation streamlining the three contentions dependent on symmetrical recurrence division multiplexing downlink systems with the non-white Gaussian commotion divert in multi-recipient PLC frameworks. Utilizing nonlinear fragmentary programming and Lagrange double technique, we gave a tractable arrangement as an iterative calculation acquiring the ideal estimation of the contentions. Reenactment results demonstrated that the proposed framework is more vitality proficient contrasted with benchmark plans, and EE is extraordinarily enhanced by the synergistic impacts of the impedance streamlining and the subchannel portion system. [4]

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Voltage direction dispersion transformer (VRDT) is an answer for keep up supply voltage to its ostensible incentive in the electrical appropriation frameworks. The structure introduced in this examination is the new age of VRDT furnished with an on load tap changer (OLTC), which empowers voltage alteration under stacked condition without intrusion. The OLTC utilized is a blend of fast resistor-type innovation with vacuum tubes. The framework is altogether protected and has an extensive variety of switchable flows from 30 to 100 A with no critical extra misfortunes. This progressed VRDT is planned, made, tried and running effectively in the dissemination networks. [5]
Mutupe and et al [6] discusses a system that detects electricity theft remotely, and a mechanism of curbing electricity theft. The approach used is that the electric current supplied from a distribution transformer is monitored at the distribution transformer side and at the consumer's side, as well. The difference in electrical current monitored from the distribution and consumer sides is used to establish whether electricity theft has occurred or not. The communication between the two monitoring units is based on the use of wireless technology. The reporting of electricity theft is established using the Wi-Fi space.

Energy meter is the key component of electricity supply system whose reliable functioning is very important for accurate billing, controlling and monitoring of electricity consumption. The current meter reading process is time consuming, involves human intervention and it may involve the errors caused by humans. In paper [7], Dr. S. Sayyad et al propose an automated system design, which automates the electricity meter reading by incorporating the IoT (Internet of Things) technology in electricity energy meter. In current electricity metering system, meter tampering can be done easily for the purpose of electricity theft. In proposed system, Theft Detection unit connected to energy meter will identify theft attempts and notify to the server side on immediate basis so that further action could be taken. This automated system provides accuracy in billing and also enables the consumers to do power optimization by providing electricity consumption information on frequent basis through android application. This automated systems also introduce automated disconnection of the electricity in the case of any tampering happens or in case where consumer fails to pay the electricity bill on time.

Electricity theft (or pilferage) leads to commercial-loss involving: tampering of energy-meters to miss-lead bill-information or direct-connections to power-lines. It's impossible to read the Commercial-losses by employing good-old power-system analysis-techniques because of the weak information of commercial and the genuine loads in the market-system, which is insufficient-for any valuable calculations of persisting losses. The hard efforts to find commercial-losses are in-accurate since the figures are redundant in the records of detected cases, rather than by actual measurement of the electrical-power system. Employment of proposed system may lead to the betterment of power utilization. All the civilians are affected by power pilferage where, the detection and reporting illegitimate-activities might surely provide a hand to reduce the price paid which would be full-filled successfully by the proposed system involving 'automated message alert' and 'load-cutoff' whenever tampering attempts are made to energy-meters [8].

In [9], Jadhav et al show that how it is possible to give automatic information to head office about electricity theft. For this magnetic sensor is used to sense magnet which is placed on the meter. The piezo element is used to sense a vibration of a meter. With the electric industry undergoing change, increased attention is being focused on power supply reliability and power quality Power providers and users alike are concerned about reliable power, whether the focus is on interruptions and disturbances or extended outages Monitoring can provide information about power flow and demand and help to identify the cause of power system disturbances The work of this paper is to monitor the power consumed by a model organization such a household consumers from a centrally located point. Monitoring the power means calculating the power consumed exactly by the user at a given time. The power consumed by the user is measured and communicated to the controlling substation whenever needed by the person at the substation. The feedback from the user helps in identifying usages between authorized and unauthorized users which helps in controlling the power theft, one of the major challenges in current scenarios. Communication between user/household and substation can be of wired and wireless

In [10], main purpose is to monitor the power consumed by a model organization such as household consumers, various industries etc. Detection and control of power has been done by calculating the power consumed by the user at a given time with the help of meter. Electricity meter consists theft detection unit which will notify company side in the event of meter tempering or theft practice occur in electricity meter and also it will send information regarding theft detection by using modem and the theft detected will be displayed on the terminal screen or window of the company side, so that they send message to the registered contact number of the customer as a warning. Due to this, customer receive the warning message even though they are continue using the excess power then Electricity board section will cut the power supply of the customer. IOT operation can be performed by Wi-Fi device which sending meter data to the web

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page through the IP address. The IOT based concept are used so that Electricity board section continuously monitor the consumption of power and billing information that is calculated using microcontroller.

IV. PROPOSED SYSTEM

Load shedding strategy in which no load is completely shed and overall power consumption is reduced through inducing power consumption limit to individual consumer can be termed as partial load shedding. This system is divided into two parts: first part describes selection of primary or secondary power line and second part describes load management according to load shedding. These two parts are described one by one.

The block diagram of proposed system for partial load shedding is shown below:

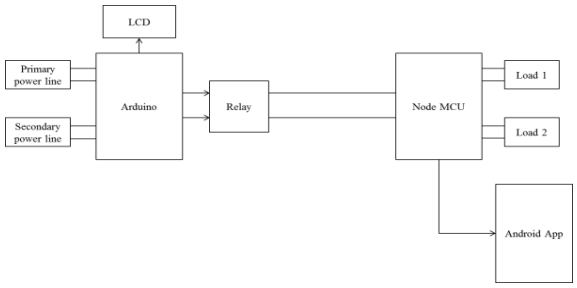

Fig 1 block diagram of partial load shedding management system

Power Line Selection

Voltage of primary power line is calculated by continuously. If voltage level is not in threshold range (here threshold range is in between 225 to 235) then relay connects secondary power line with load line. Otherwise primary power line is connected to load line. LCD interfaced with Arduino displays voltage of primary power line.

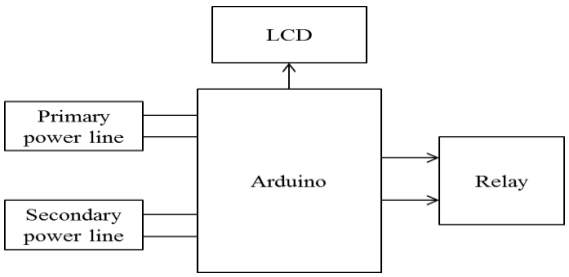

Fig 2 power line selection

Load Management

Status of load shedding is monitored by Node MCU and according to type of load shedding it either switches on or off output load. Android App displays type of load shedding and status of load. As shown in figure 3 if NLS (i.e. No Load Shedding) is effective then both high and low power devices will be on. If PLS (Partial Load Shedding is effective then all high wattage devices are turned off by Node MCU or Node MCU cut down power of HW devices. Similarly for FLS (Full Load Shedding) power of all devices are cut down by Node MCU.

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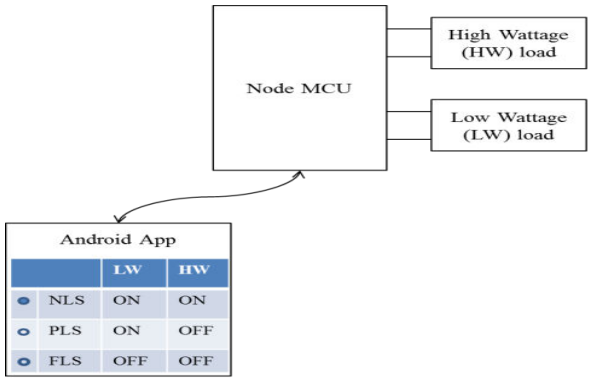

Fig 3 load management

V. CONCLUSION

Energy is the basic necessity for the economic development of a country. Many functions necessary to present-day living grind to halt when the supply of energy stops. It is practically impossible to estimate the actual magnitude of the role that energy has played in building up present-day civilization. So we need to save more & more electrical power. Hence, the load shedding control system, which was earlier done manually, now-a-days, is controlled by a computer based system, developed to some more extent to direct the society to a more convenient life. This paper focuses on developing a computerized procedure for controlling the load-shedding system where manual work will be minimized by selecting type of load shedding.

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