

Role of Technology on Power Distribution in Rural India

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Abstract: India has a high and fast growing needs. Also, it is a known fact that the development in Urban Area takes place with the development of Rural Area. A large amount of development has taken place in Urban area and is still continuing but not much concentration is given to the Rural Area. Due to this, migration for Rural to Urban is increasing year on year. Hence, this study is done to understand whether there can be improvement in Power Distribution in Rural Area and how Technology can be used.

Keywords: GW: Gigawatts

LED: Light Emitting Diode

AC: Alternating Current

DC: Direct Current

SCADA: Supervisory Control and Data Acquisition

Introduction

India is the fifth largest producer and consumer of electricity with a capacity of 302 gigawatts (GW). But almost 30 crore people in the country are still waiting to harness the benefit of electricity. With the huge development happening in India, very less concentration is given in the development of Rural Sector. Even today 68% of Indian population live in rural area. In spite of this, major focus is on development of Urban. Undoubtedly, rural sector plays an important role in development of the country. Hence there is a need to study the progress of Rural Area in India.

Literature Review

History

Electric power distribution only became necessary in the 1880s when electricity started being generated at power stations. Before that electricity was usually generated where it was used. The first power distribution systems installed in European and US cities were used to supply lighting: arc lighting running on very high voltage (usually higher than 3000 volt) alternating current (AC) or direct current (DC), and incandescent lighting running on low voltage (100 volt) direct current. Both were supplanting gas lighting systems, with arc lighting taking over large area/street lighting, and incandescent lighting replacing gas for business and residential lighting.

Due to the high voltages used in arc lighting, a single generating station could supply a long string of lights, up to 7-mile (11 km) long circuits, since the capacity of a wire is proportional to the square of the current travelling on it, each doubling of the voltage would allow the same size cable to transmit the same amount of power four times the distance for a given power loss. Direct current indoor incandescent lighting systems (for example the first Edison Pearl Street Station installed in 1882), had difficulty supplying customers more than a mile away due to the low 110 volt system being used throughout the system, from the generators to the final use. The Edison DC system needed thick copper conductor cables, and the generating plants needed to be within about 1.5 miles (2.4 km) of the farthest customer to avoid excessively large and expensive conductors.

In today's world a stable power supply is considered a basic necessity, almost a fundamental right. The power sector has witnessed admirable improvements over the last few years across the entire value chain, from fuel supply (highest coal production growth in over two decades), to generation (highest ever capacity addition), transmission (highest ever increase in transmission lines) and consumption (over 2.3 crore LED bulbs distributed). The weakest link in the value chain is distribution. The distribution of power generation through different sources, however, is uneven.

The thermal power contribution to this is around 63%, followed by hydropower contributing around 25%. The share of nuclear power is the smallest with 3%, and the power generation through renewable sources contributes the remaining 9%. The distribution of power generation amongst various states and regions in India is also highly uneven. The reason behind this uneven distribution is that India has over 200 billion tons of coal deposits. Thus, the generation is mainly dominated by coal-based thermal power plant.

Rural Electrification

Rural electrification is the process of bringing electrical power to (that is, electrifying) rural and remote areas. Electricity is used not only for lighting and household purposes, but it also allows for mechanization of many farming operations, such as threshing, milking, and hoisting grain for storage. In areas facing labor shortages, this allows for greater productivity at reduced cost. One famous program was the New Deal's Rural Electrification Administration in the United States, which pioneered many of the schemes still practiced in other countries.

At least a billion people worldwide still lack household electric power - a population equal to that of the entire world in the early 19th century.

As of the mid 2010s an estimated 200 to 300 million people in India (15 to 20 percent of the total population) lack electricity. Many more receive only intermittent and poor quality electric power.

Objective of the Study

1. To study the Power Distribution system in India
2. To study the application of information system to effectively distribute Power in Rural area

Problem of the Study

1. Information Technology is not used to monitor Power Distribution
2. Power Distribution does not use effective Information Technology solution

Hypothesis of the Study

H₀: Technology can be used for effective Power Distribution in Rural India

H₁: Technology cannot be used for effective Power Distribution in Rural India

Research Methodology

Coverage

The focus of this research paper is on individuals living in Rural Area.

Data Collection

The study includes secondary data gathered using Non-Written Materials e.g Media, TV etc, Industry statistics and Reports, Newspapers.

Data Analysis

Hypotheses will be tested using Qualitative Techniques

Finding and Interpretation

Electric power distribution is the final stage in the delivery of electric power; it carries electricity from the transmission system to individual consumers. Distribution substations connect to the transmission system and lower the transmission voltage to medium voltage ranging between 2 kV and 35 kV with the use of transformers. Primary distribution lines carry this medium voltage power to distribution transformers located near the customer's premises. Distribution transformers again lower the voltage to the utilization voltage of household appliances and typically feed several customers through secondary distribution lines at this voltage.

India has achieved only 67.3% overall electrification (urban and rural together). More than 75 million households (45% of the total rural households) are yet to be electrified. About 19,909 villages are yet to be electrified. However, not all electrified villages are getting quality power and it is estimated that nearly 33% of the population may be facing under-electrification, accessing less than 50kWh of electricity per month/household.

Existing distribution systems have certain inherent inefficiencies due to their legacy. Most systems are monitored manually. Hence, distribution of power remains uneven. Application of Information Technology in this area can prove to be efficient for capturing data and keeping record of Power distribution. Therefore, the Information System suggested is SCADA (Supervisory Control and Data Acquisition) Systems.

A SCADA system for a power distribution application is a typically a PC-based software package. Data is collected from the electrical distribution system, with most of the data originating at substations. Depending on its size and complexity, a substation will have a varying number of controllers and operator interface points.

In a typical configuration, a substation is controlled and monitored in real time by a Programmable Logic Controller (PLC) and by certain specialized devices such as circuit breakers and power monitors. Data from the PLC and the devices is then transmitted to a PC-based SCADA node located at the substation.

One or more PCs are located at various centralized control and monitoring points. The links between the substation PCs and the central station PCs are generally Ethernet-based and are implemented via the Internet, an intranet and/or some version of cloud computing. In addition to data collection, SCADA systems typically allow commands to be issued from central control and monitoring points to substations. If desired and as circumstances allow, these commands can enable full remote control.

Conclusions

An Information Technology solution for power distribution needs to be considered for achieving uniform distribution of power all over India. Any radical change of an age old system is only possible if all the actors in the system are involved and the system is simple, transparent and responsive.

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