

Develop A Electricity Utility Network Using GIS

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ABSTRACT:

GIS is a growing discipline in the field of information technology and is providing better solutions for the representation of the geographical data. Basically GIS means “A system for capturing, storing, checking, integrating, manipulating, analysing and displaying data which are spatially referenced to the Earth. This is normally considered to involve a spatially referenced computer database and appropriate applications software”. **The main objective of this paper is to Develop a Electricity utility Network Using GIS.** The problem statement are following

- Difficulty in fault management : time consuming and man power consuming.
 - Frequent thefts of electricity in current system.
 - Inefficient supply of electricity.
- Unsystematic network expansion.

The geographical data is used for the purpose of studying and analyzing the current situation of any geographical region so that other aspects can also be analyzed surrounding that region, which may or may not be included in the attribute data. Hence it is being incorporated in different fields of research and analysis. In the field of managing electric power transmission and distribution GIS plays a strong role for both traditional and smart grid networks. when smart grid is applied over the electric network that time managing data using GIS becomes essential.

EGIS(Electric network geographic system) provides some important functionalities just like as

- Show complete network distribution system of area.
- Information about the Main power distribution centers and the sub power stations in local area.
- Information about the every pole located in the area and the connections supplied from that pole.
- Information about the connections supplied from the transformers located in particular colonies.

Key Words: Geoserver, Arcgis, Autocad, SQL server, map(information), wireless toolkit.

I. INTRODUCTION

The spectacular growth of the use of digital Geoinformation in parallel with the advances in Information Technology (IT), collecting in-situ data have been dramatically improved using handheld devices. This practice was being made by hand with paper and then manually entered into Geographic Information System (GIS) databases once in the office, which is time-consuming. Traditionally, collecting and using data in the field was a paper-based process with multiple points of data entry without accessing to real-time information. The processes of field data collection and editing have been time consuming. Geographic data has traveled into the field in the form of paper maps. Field edits were performed using sketches and notes on paper maps and forms. Once back in the office, these field edits were deciphered and manually entered into the GIS database [1]. The result has been that GIS data has often not been as up-to-date or accurate as it could have been. ESRI's developments in mobile GIS have enabled GIS to be taken into the field as digital maps on compact, systems providing field access to enterprise geographic information. This enables organizations to add real-time information to their database and applications, speeding up analysis, display, and decision making by using up-to-date, more accurate spatial data. Firefighters, police officers, engineering crews, surveyors, utility workers, soldiers, census workers, field biologists, and others, use E- GIS to complete the following tasks:

- **Field Mapping**—Create, edit, and use GIS maps in the field.
- **Asset Inventories**—Create and maintain an inventory of asset locations and attribute information.
- **Asset Maintenance**—Update asset location and condition and schedule maintenance.

- **Inspections**—maintain digital records and locations of field assets for legal code compliance and ticketing.

EGIS(Electric network geographic system) provides the utility company with the ability to monitor smart grid networks and perform queries concerning the network health. The system can display the complete network and highlight assets that have changed or that are malfunctioned. When projecting this feature upon the whole network it becomes clear that EGIS can show the entire state of the grid in an easy-to-understand realistic model.

EGIS(Electric network geographic system) is a complementary partner when transitioning to smart grid networks that can contribute in the conversion of the grid from a passive system to an intelligent interactive one. Utilities can monitor the construction progress, efficiently route crews and most importantly, provide the best analysis for the optimum location for repeaters, sensors, and new communication backbones.

GIS is a growing discipline in the field of information technology and is providing better solutions for the representation of the geographical data. Basically GIS means “A system for capturing, storing, checking, integrating, manipulating, analysing and displaying data which are spatially referenced to the Earth. This is normally considered to involve a spatially referenced computer database and appropriate applications software”[2].

GIS is playing a vital role in the field of planning and analysis with respect to the geographically organized demographic information to improve decision making (Asia Pacific, The monthly magazine on Geographic Information Science, December 2006), as:

- Site Location Analysis
- Target Marketing.
- Consumer Potential.

The GIS system can help identify how many electric poles are in your electric system and detailed information about each electric pole.

For example: age of pole, height of pole, if a street light is on the pole, number of transformers attached to a specific electric pole if any, and the size of the transformer, etc.

II. COMPONENT OF E-GIS

A working Geographic Information System seamlessly integrates five key components: These are hardware, software, data, people, and method.

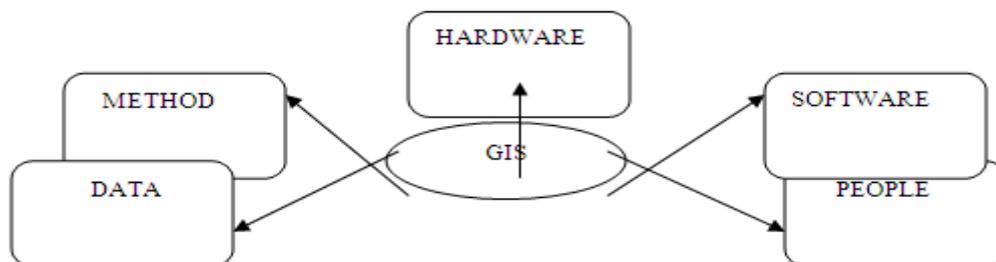


Figure 1: Component of GIS

- **HARDWARE**

Hardware includes the computer on which a GIS operates the monitor on which results are displayed, and a printer for making hard copies of the results. Today, GIS software runs on a wide range of hardware types, from centralized computer servers to desktop computers used in stand-alone or networked configurations. The data files used in GIS are relatively large, so the computer must have a fast processing speed and a large hard drive capable of saving many files.

- **SOFTWARE**

GIS software provides the functions and tools needed to store, analyze, and display geographic information. Key software components include tools for the input and manipulation of geographic information, a database management system (DBMS), tools that support geographic query, analysis, and visualization, and a graphical user interface (GUI) for easy access to tools. The industry leader is ARC/INFO, produced by Environmental Systems Research, Inc. The same company produces a more accessible product, Arc View that is similar to ARC/INFO in many ways[3].

- **DATA**

Possibly the most important component of a GIS is the data. A GIS will integrate spatial data with other data resources and can even use a database management system, used by most organizations to organize and maintain their data, to manage spatial data. There are three ways to obtain the data to be used in a GIS. Geographic data and related tabular data can be collected in-house or produced by digitizing images from aerial photographs or published maps.

- **PEOPLE**

GIS users range from technical specialists who design and maintain the system to those who use it to help them perform their everyday work. The basic techniques of GIS are simple enough to master that even students in elementary schools are learning to use GIS. Because the technology is used in so many ways, experienced GIS users have a tremendous advantage in today's job market

- **METHOD**

A successful GIS operates according to a well-designed plan and business rules, which are the models and operating practices unique to each organization[4].

Application of GIS

For several years, new geographical and urban applications have been emerging in which characteristics of communications and real time have been very important. We are facing a new discipline called telegeomonitoring which can be considered as a discipline characterized by positioning systems, cartography, the exchange of information between different sites and real time spatial decision making [5]

- Utility : Water supply, electricity supply etc.
- Agriculture
- Defence and security
- Infrastructure

III. METHODOLOGY

3.1 Detailed planning

Creation of network

A Utility Geographic Information System (GIS) combines digital maps and data to enhance the quality. Data Collection - Provides a way to convert data from several sources such as paper maps, AutoCad files, information stored in people's heads and new data collected in the field into a common digital and map based format. Firstly we create a network map of HIGH TENTION LINE, LOW TENTION LINE, pole, transformer, grid etc on paper as per requirement through pencil. This network map is scanned by the scanner and this scanned map is deployed on Arcgis software and all coordinate system is adopted through Arcgis.

Preparing Shape file using ARC GIS. The different layer that are prepared using this software are

- Electric Pole Layer,
- LT electric line Layer, and
- HT electric line Layer etc.

The approach is defined by the following below flowchart in section. This flowchart indicates the process of work been carried out.

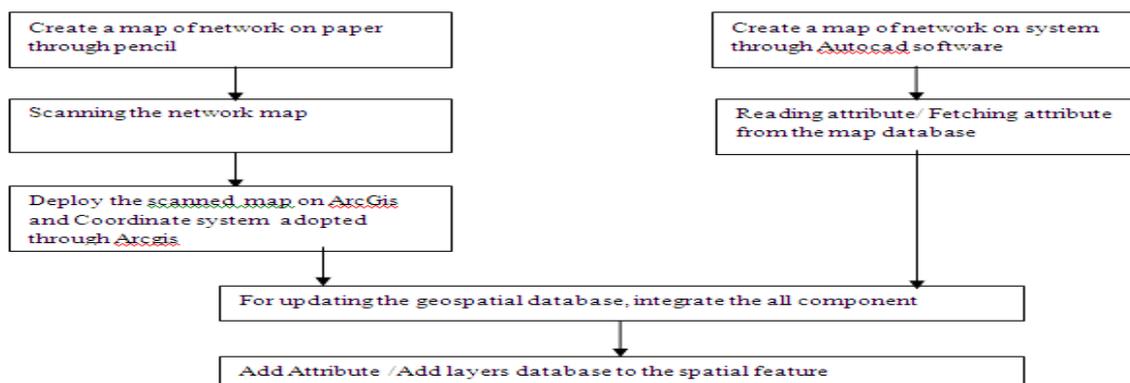


Figure 2: Creation of Geospatial Database

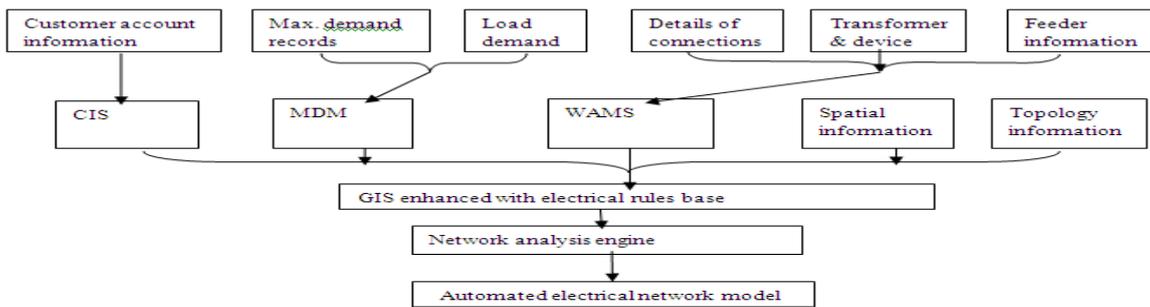


Figure 3: overall methodology

Expectations of Electricity Utility

- Improving ‘Customer Complaints’ logs in Trouble call Management.
- Long Standing faults brought to minimum.
- To Stop Power theft.
- To Provide better services to the consumers.
- To reduce Outage time.
- Good collection & billing System.
- Limiting number of interruption per day a) Breakdown b) Preventive Maintenance c) Load-shedding.

SNAPSHOTS OF WORKING APPLICATION

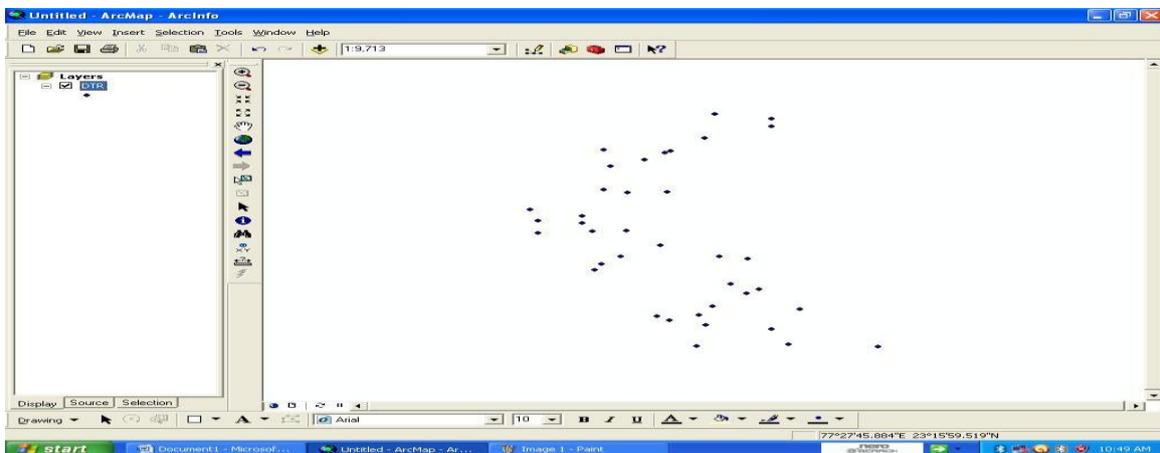
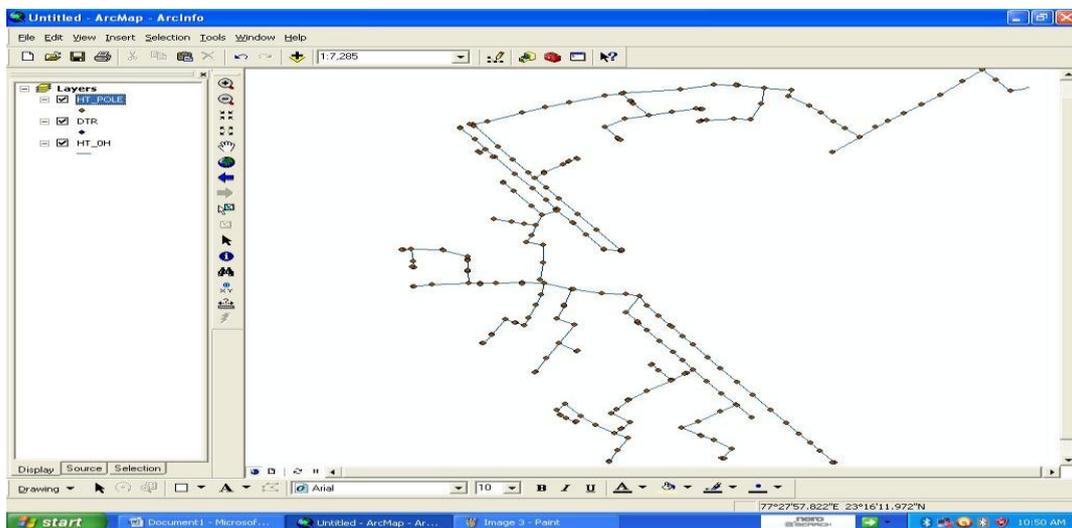


Figure 4: creation of network of pole



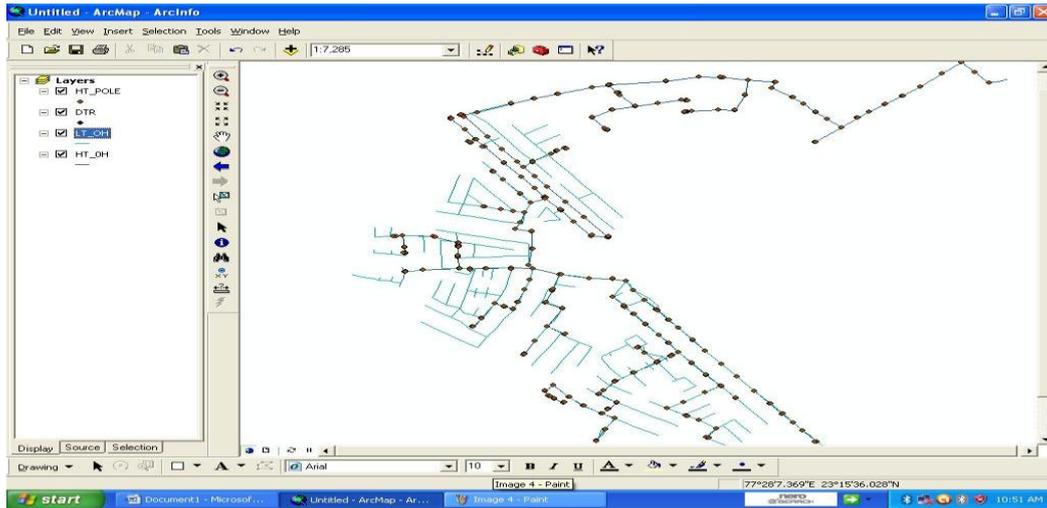


Figure 5: (a) creation of HT (main) line. (b) creation of LT line

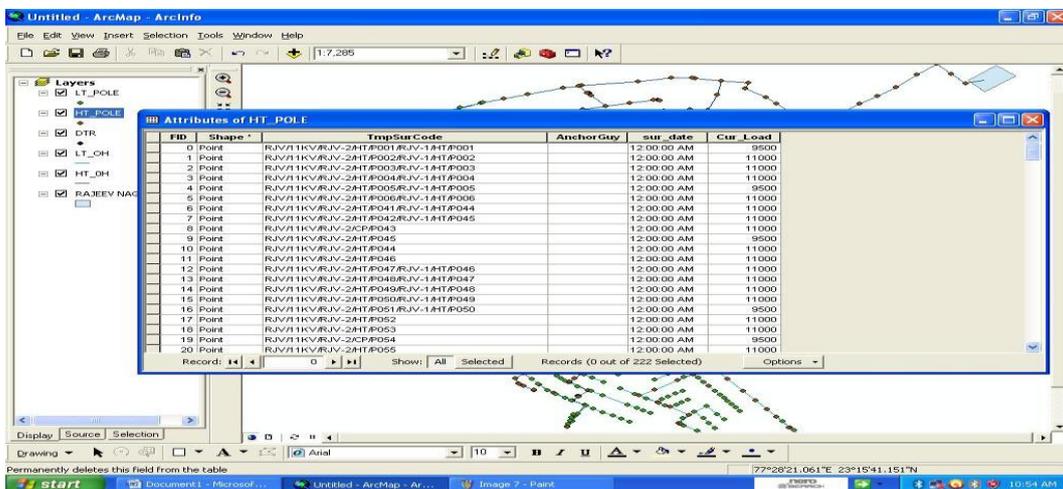
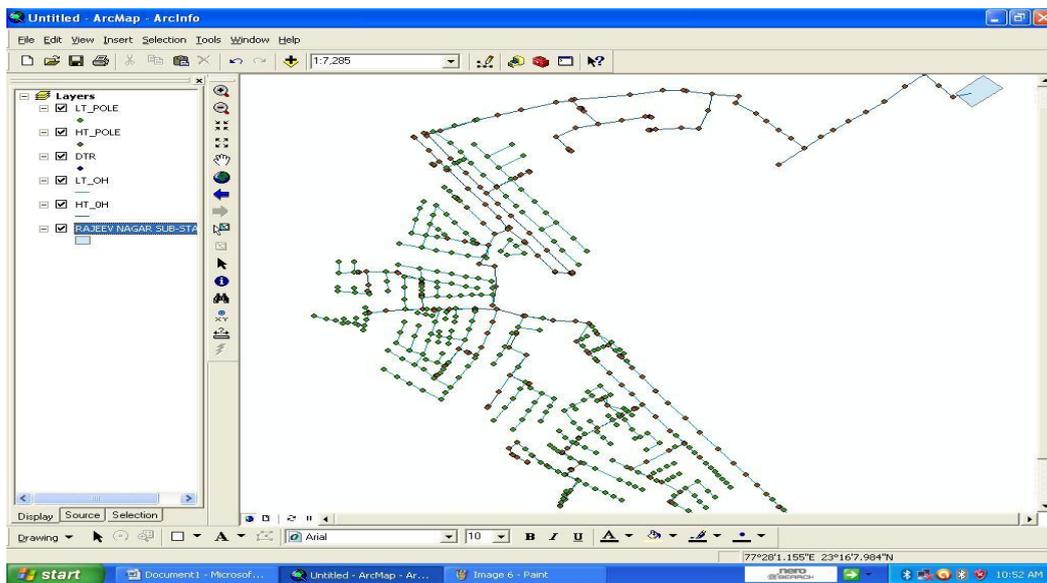


Figure 6: (a) Connection to the grid and distribution of electricity. (b) creation of database

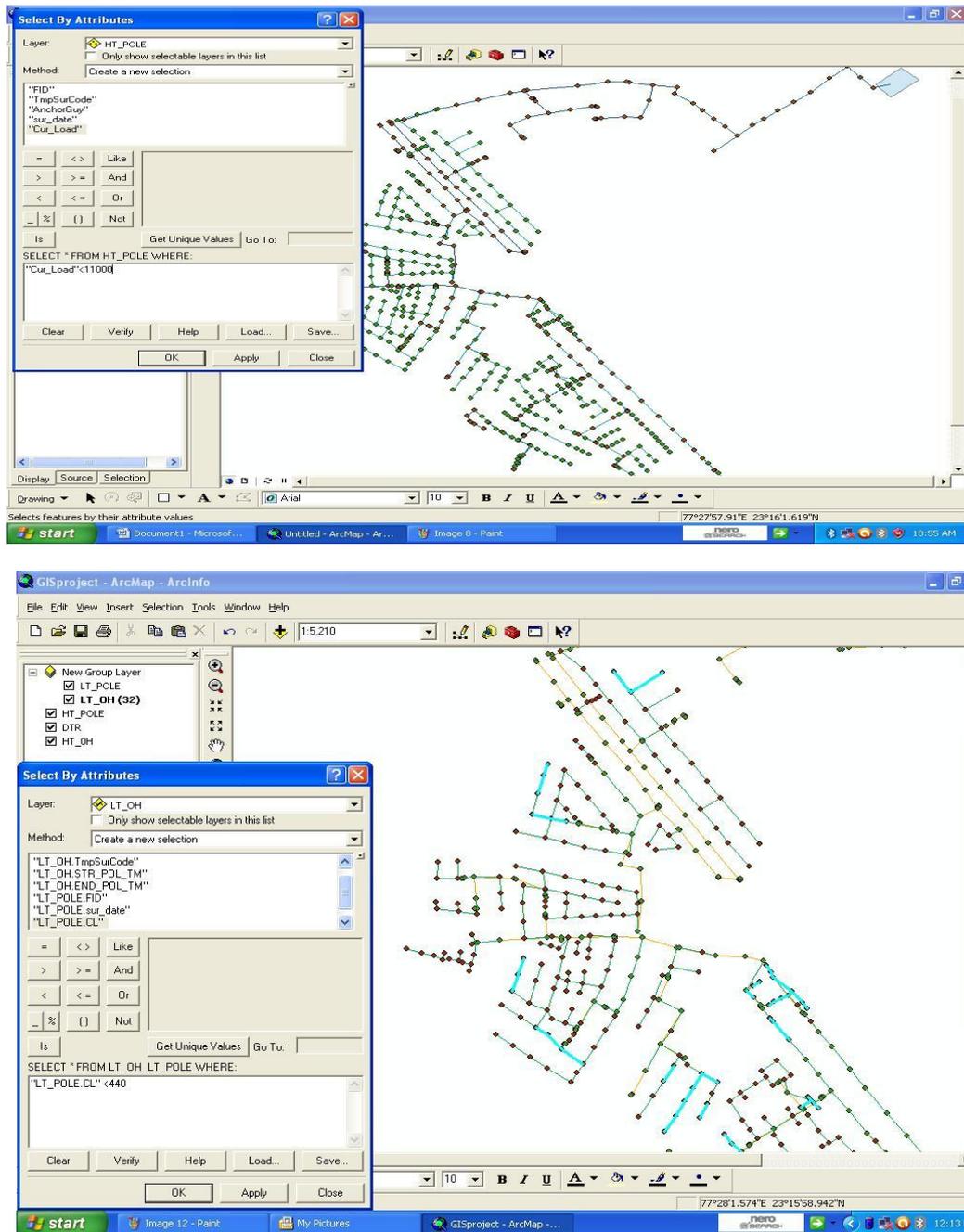


Figure 7: (a) Adding Attribute Name or layers. (b) Complete view of electric utility network after updating.

IV. CONCLUSION

A Electric-GIS enables field-based personnel to capture, store, update, manipulate, analyze, and display geographic information directly in the field. The main purpose of this paper is to develop a Electric-GIS application which supports a functionality such as to create a network of electric utility. It Show complete network distribution system of area, Information about the Main power distribution centers, Information about the sub power stations in local area , Information about the every pole located in the area and the connections supplied from that pole, Information about the connections supplied from the transformers located in particular colonies, Information about the Local power lines which lying in the local area and Information about the Main power line coming from the main station. It also helps to Improving ‘Customer Complaints’ logs in Trouble call Management, Long Standing faults brought to minimum, to Stop Power theft, and to Provide better services to the consumers.

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