Electricity Loss Reduction By Using Big Data

Mrs.N.Abirami[1](Assistant Professor), Ms.M.Gowshikha[2], Ms.J.Aishwarya[3]
[1, 2, 3] Dept of BCA
[1, 2, 3] Sri Krishna Arts and Science College, Coimbatore

Abstract- *The amount of data worldwide is doubling in size every two years. We can use this deluge of data to solve everyday problems. In this paper, we propose utilizing Big Data framework to solve the electricity problem in India by specifically targeting to prevent and reduce electricity theft and minimize transmission and distribution losses, which can be very useful for Electricity Operators like TNEB. Electricity theft is a non-technical loss while transmission and distribution loss is a technical one. India losses almost 20% of generated electricity through transmission and distribution losses.*

A solution to this problem by utilizing the Big Data framework and Smart Meter Analytics is very feasible by a combination of Government Policies and innovations in Big Data Analytics. The industry forecast for India is to have installed 15 million Smart meters by 2020 and there are couple of pilot projects that have already been implemented. Therefore, implementation of the Smart Meters and utilizing the vast amount of data from the Smart Meters by Big Data framework will greatly enable us to reduce both technical and non-technical electricity losses and make India a pioneer in Energy efficiency.

Keywords- energy big data, energy management, loss reduction, smart electric meter

I. INTRODUCTION

Big data is the amount of data that is larger in size, when a data increases beyond our processing limit, then it is said to be Bigdata. Big data are mainly used to harness data from the pre-existed data.The Source of many instruments, appliances,machinery run through electricity, But these electricity do not reach the consumers completely, nearly 20% of electricity is lost during the transmission. The power line loss includes 4-6%. Whereas the factors include electricity theft and unbalanced demand load. The demand load is the amount of electricity required by the consumers. Those data are collected by the power grid.

The network of transmission and distribution facilities makes up the power grid. The power grid transports the electricity to urban and rural areas. But there is no centralized control of the electricity grid.Due to lack of centralized control, there is a large imbalance in the ratio of power consumption/power generation from one state to the next. This imbalance results in wasting of large quantities of power generated.

Energy big data and smart energy management

A major aim of an electric power utility like TNEB is to accurately forecast load requirements. In broad terms, power system load forecasting can be categorized into long-term and short-term functions Long-term load forecasting usually covers from 1 to 10 years ahead (monthly and yearly values) and is explicitly intended for applications in capacity expansion and long-term capital investment return studies.

In this section we mainly focus on the long-term load forecasting with mathematical methods. First, we introduce some basic foundations used with this forecasting.

The data is mainly is collected from the consumer side through smart meters. These meters are used to collect the data from the consumers the data includes amount of units or kWh used by the consumer that includes the period of time. The data collected from smart meters helps distribution companies improve load forecasting, better locate and size substations and transformers, and curb technical losses.

Electricity transmission and distribution (T&D) losses in India and other regions
percent of total electricity generated
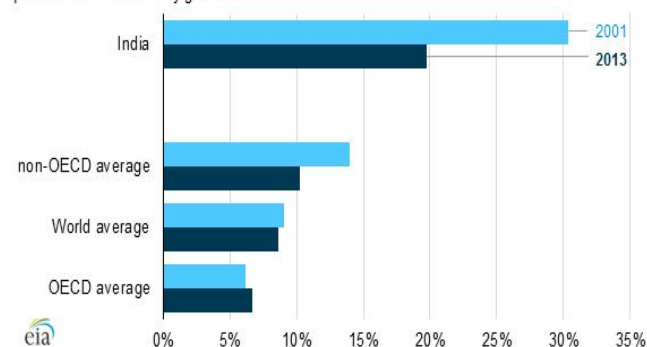
II. ENERGY FORECASTING

The Long-term forecasting is the process of collecting the data for a year. The main purpose of long-term forecasting is used to predict the future power load with real

time accuracy of 1-3% and it predict the Most forecasting methods use statistical techniques or artificial intelligence algorithms such as regression, neural networks, fuzzy logic, and expert systems.

Factors influencing loads expectations play a vital role in calculating the demand load.

Factors influencing loads expectations are very important in calculating the demand load. That includes previous data of weather, climate, temperature, wind speed, rainfall and previous power load, the economic activity that includes the location of industries and companies.

Electric power company utilizes forecasts expect the amount of energy electricity to meet future load. Several techniques have been employed for forecasts in the past; these based on different statistical methods, for instance, regression, time series, exponential smoothing Electric power company utilizes forecasts expect the amount of energy electricity to meet future load. Several techniques have been employed for forecasts in the past; these based on different statistical methods, for instance, regression, time series, exponential smoothing Electric power company utilizes forecasts expect the amount of energy electricity to meet future load. Several techniques have been employed for forecasts in the past; these based on different statistical methods, for instance, regression, time series, exponential smoothing Electric power company utilizes forecasts expect the amount of energy electricity to meet future load. Several techniques have been employed for forecasts in the past; these based on different statistical methods, for instance, regression, time series, exponential smoothing Electric power company utilizes forecasts expect the amount of energy electricity to meet future load. Several techniques have been employed for forecasts in the past; these based on different statistical methods, for instance, regression, time series, exponential

Smoothing Electric power company utilizes forecasts expect the amount of energy electricity to meet future load. Several techniques have been employed for forecasts in the past; these based on different statistical methods, for instance, regression, time series, exponential smoothing Electric power company utilizes forecasts expect the amount of energy electricity to meet future load. Several techniques have been employed for forecasts in the past; these based on different statistical methods, for instance, regression, time series, exponential smoothing Electric Power Company uses forecasts to detect the amount of energy electricity to meet future load. Several techniques have been employed for forecasts in the past; these based on different statistical

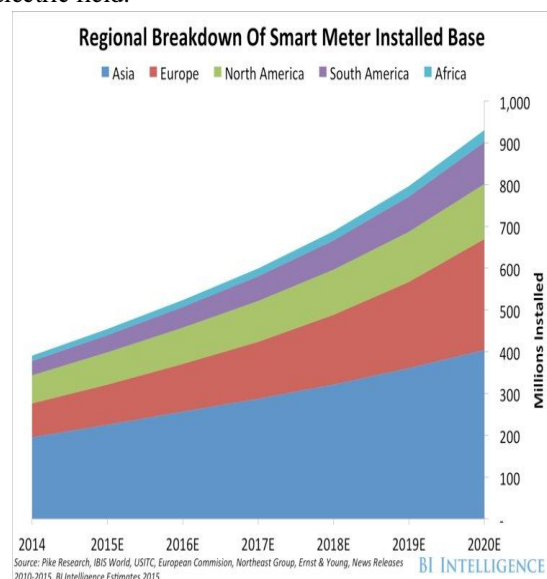methods, for instance, regression, time series, exponential smoothing.

Since the weather place an important role in forecasting of power. So with the help of weather data that is collected, we can have the predictions based on the power load that is required for the consumers. The data from the smart meter and the long term predictions can give us the better predictions of the power load that is required for the consumers.

Factors influencing loads expectations play a vital role in calculating the demand load.

III. SMART ELECTRIC METER

Smart electric meter is a device which is used to track and record the consumption of electricity in a house. This was being used as a replacement for old basic analog   meters which is used to measure the electric consumption. Smart meter is a new high-tech device. Using smart meter, we can capture the data about the consumption of electricity and then transfer it back to the electric company. This can used to get an accurate and quick measurement of the data of the electric consumption.

This eliminate the unnecessary need for the monthly visit from meter readers also there are concerns that smart meter are collecting about the unnecessary information about the hourly use of the electric consumption, this may be a risk to privacy. Smart meter is one of the advanced technologies in the electric field.
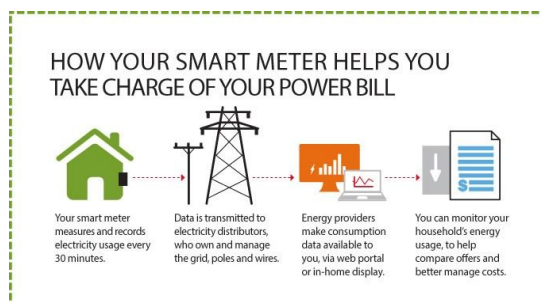

Regional Breakdown Of Smart Meter Installed Base

Source: Pike Research, IBIS World, USITC, European Commision, Northeast Group, Ernst & Young, News Releases 2010-2015, BI Intelligence Estimates 2015

This is more vibrant and time saving technology to calculate the consumption of electricity.The data can be easily transferred to the electric companies.

Specifications

Smart meter records the amount of electricity which we use every for every 30 minutes this information gets stored on the smart meter and it is transmitted to your energy supplier. The transmission interval of data depends on how much you are preparing to share it. Smart meter doesn't use the internet to communicate.

This network is used to allow your smart electricity meter to communicate with each other as well as with your in-home display. Smart meter use WAN connection in order for communication. Smart meter consists of an RF transmitter; the frequency of operation is typically in the 902 MHz and 2.4 GHz bands. Power output is typically 1 watt in the 902 MHz band and much less in the 2.4 GHz band. The integrity range of the transmitter in smart electric meter is much localized.

The system has 1 phase and 2 wires and its specified range of operation is about 70% to 120% of reference voltage which is 240 volts. Its frequency is 50Hz +5%. Its accuracy must be 1.0 and should not drift with time of working. Maximum error limit will be at 1% Ib, UPF should be within +/-2%. The variation of the range must be in between 70% to 50%.

HOW YOUR SMART METER HELPS YOU TAKE CHARGE OF YOUR POWER BILL

Your smart meter measures and records electricity usage every 30 minutes.

Data is transmitted to electricity distributors, who own and manage the grid, poles and wires.

Energy providers make consumption data available to you, via web portal or in-home display.

You can monitor your household's energy usage, to help compare offers and better manage costs.

IV. APPLICATIONS

Smart meters can be used in both residential environments and commercial environments this leads to a easy way of calculating data this also eliminates monthly meter readings, monitors the electric system much more faster and better. This is also used as more power efficient than the previous version of manual reading meters. Provides the real time data that is useful for balancing electric loads while reducing power outages.

Smart meters enable dynamic pricing which raise the lower the cost of electricity based on demand but this is more costly to implement in houses so this is harder to implement vast area but this helps to optimize income with existing resource it also avoids the capital expense of building new power plants. Cognizant has worked in smart meters project to implement it in America. Most of the areas in America has been implemented with the smart meters.

The advantages of smart meters are as follows; prevents the need for new power plants that produces greenhouse gases that substantially creates pollution that creates health risks. It helps the customers to know and adjust their routine and habits to lower electricity bills. Smart meter has been established in the years of 20th century and one of the finest inventions of our time using big data in it.

Using big data in smart meter we can do a lot of programs based on the consumption of energy and it also leads to the development and enhancement of data science in the field of electricity. Using the data from a city with the help of Smart meter we can find the approximate usage of the electricity.

Used for other purpose but there are cons in the matter of smart meter with big data. Few of the disadvantages are as follows; It is hard to verify that the new meter which is set up in the customers house is accurate and there is no way to protect the privacy of the personal data collected.

Our personal data can be shared and leaked easily and quickly. So, we can't even imagine about the privacy of our personal time with the electronic appliances in the home and as well as in work place. One of the major drawbacks of implementation of smart meters is its cost; it has some additional fee for the setup of smart meter, so it cannot be implemented in the areas where poor people lead their life.

Other disadvantages include the reality that smart meter put human meter reader out of work so he loses his job, this could hurt the economy up to day many of them lost their jobs due to smart meter. In addition, while it was anticipated that the smart meter could save the consumer money, consumers rarely check their meters because the system is complex. Consequently, customers are unable to make energy consumption charges.

V. CONCLUSION

Thus, the smart meter helps us to create a new way to save the fuel the digital world This idea will not only reduce

the power wastage, it helps us to move forward with development of data science.

Data will continue to grow exponentially. Decreasing costs of sensors and digital equipment's will move more and more operational equipment and devices onto the Internet of Things. Utilities are in an excellent position to capitalize on big data and analytics to gain wisdom and insight into areas where efficiencies can be gained. Analytical solutions allow utilities to mine the data and capture insight from it.The more we grow the technology help us to make our work in reimagined way. In the fast-growing world, the things are changing. We need to utilize the upcoming future in a positive and creative way.

VI. FUTURE ENHANCEMENTS

Distribution systems respond to faults, or short circuits, by sensing the very high fault current and then opening circuit breakers to isolate the fault.Smart grid can help reduce greenhouse gas emissions by up to 211 million metric tons and is much more reliable than a traditional grid.

Smart meters envision the future by providing the data that helps to reduce power loss. Soon this could help us to track the real-time electricity data, using this data we can create more efficient devices that could save electricity.

The smart meters could enter the IOT systems which could help us to development smart home and transfer electricity in a smarter way, as the data keeps growing, we need to use these data in order to create an automated environment that could enhance our day to day lifestyle, our future generations can have a hassle-free data and energy transfer.

REFERENCES

[1] Eugene A. Feinberg and Dora Genethliou"Load forecasting".

[2] Naji Ammar and Marian Suleiman "LONG- TERM LOAD FORECASTING OF POWER SYSTEMS "Research paper"

[3] SK, V.Preethi, Departmentof ECE, Vignans lira institute of technology and science, vadlamudi, guntur

[4] Design and implementation of smart energy meter, published in 2016

[5] Everything's talking to each other: smart meter generate big data for utilities and customer Published in 2016 Volume: 14, issue: 1