ABSTRACT

Power- The increasing crisis in developing countries and hard to produce, handle and distribute without losses. Increase in demand tends to increase production by several methods. Increased production of power leads to increased losses because of improper handling methodology. Handling methodology starts from generation point to end user distribution. Losses happen because of various reasons: some are Technical and Non Technical, some are recoverable and some are non-recoverable. Non recoverable losses are line losses, and because of technical issues losses happening are rare but loss due to these is unavoidable. The entire loss scenario in India is growing in terms of cost during increased power generation.

Growing demand of electricity for entire applications in any country, need to have consistent advanced intelligent energy management and protection system. Many systems are available based on volume of power distributed. However often the load changes without prediction, requiring an advanced and special two-way communication based systems to control the electrical parameters of the generation. Most of the existing systems are reliable for various applications but not perfect for electrical applications. Electrical environment will have lots of disturbances in nature, so, rigid & reliable technologies are to be used to analyze losses.

The probability of fault occurrence on the overhead lines is much more due to their greater lengths and exposure to atmospheric conditions. The transmission lines are protected by using schemes that require communication with relays located at line terminals. The reliability of the communication obviously impacts the dependability of the protection system.

Technical losses are losses that occur in electrical equipments, especially cables, overhead lines and power transformers. Reduction of these losses will extend
the length of the life of the networks. However it is often expensive and difficult to reduce technical losses. Replacement of old equipment is one way to reduce technical losses. To some extent we can increase the life time of the power system equipment, if we can instantaneously monitor, sense and transform information by using effective sensors and wireless communication.

On-line monitoring is one of the main key performance indicators to monitor the transmission lines. Many devices are available to monitor the transmission lines and to acquire the changes in parameters. In order to acquire these parameters, the present research proposes to place the data acquisition systems (DAS) and different sensors at strategic places on the transmission lines, enabling fast and reliable information delivering to the control centers using wireless GSM communication.

Protection is another important key performance indicator to protect the transmission lines. A unique, smart fault analysis and instant tripping to minimize the losses by using wireless RF communication is proposed. The proposed system can be well implemented at lower cost and can further be improved time to time as per the T&D requirement. These latest communication systems can acquire the data quickly and perform the appropriate actions within few cycles.

Technical and Non-technical loss analysis is the third key performance indicator. The proposed research elevates ideas to be implemented to detect these losses by using intelligent relay logic and wireless communication technologies like RF, GSM, Networking, etc. The early research or implementation is focused with one technology for complete T & D applications. The estimated losses in olden days is limited and matched with theoretical calculations, being less number of generation sources involved. Nowadays because of increased demand, generation capacities are increased and placed elsewhere geographically because of many reasons. Several
switching centers and their internal and external networking maximize the losses. These can be timely monitored to isolate faults and avoid pilferage.

Due to large disturbance, like large load variations causes outage of components and power system blackouts. Due to this, the frequency may fall to a dangerous value before the generator turbine governor recovers fully. The decrease in system frequency, will lead to a total system collapse. The work proposed another important key performance indicator called under frequency load shedding for maintaining generation & load and to keep the frequency within the limit to avoid blackouts and grid collapse by using ANFIS technique in MATLAB environment.

An Embedded-based hardware design need to be developed and must acquire data from electrical sensing system. A powerful GSM networking is to be designed to send data from one network to the other, any change in parameters of transmission which are to be sensed to protect the entire generation, transmission and distribution. The proposed methodology consists of a sensing system, signal conditioning electronic circuits, advanced embedded hardware for middle level computing and a powerful computer network for further transmission of data to various places. The above said system can be able to communicate with one grid and performs its subsequent related actions.

The proposed technology is evaluated using real time hardware circuits-electrical, electronics and instrumentation with embedded system as middle level processor and perfect GUI software for computer interface. Real time case studies are presented.

The development of a real time and intelligent system promises to solve energy problems in the long term. This intelligent energy management system not
only helps to reduce energy losses and carbon dioxide emissions but also provides a solid foundation to build tomorrow’s smarter energy infrastructure.