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Uncertainty- Aware Of Scheduling Unused Power in Grids To Reduce The Loss In Distribution System – A Review

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ABSTRACT

Growing population and industrializing in countries create huge needs of power for them. But the generation of the power sometimes will not satisfy the need of power. Also some the generated power is wasted without using them in a proper way. We made a long term study for minimizing the power by distributing them equally in all the grids to reduce the loss of the generated power. By reducing this, the energy loss as well as the cost of loss will also reduce. The cost is a convex function of total power consumption, which reflects the fact that each additional unit of power needed to serve demands is more expensive to provision, as demand load increases. The current literature review is on the grids and how the grids can be used properly to reduce the loss and how the network can be rearranged properly. The smart grid is controlled by some communication devices and it is also helpful for the consumers too. The consumer behavior must also change for the proper use of the power. The government of India is also taking more steps for changing the consumer behavior by introducing more useful projects as well as by arranging lot of seminars etc.. delivering the electrical energy more efficiently is also a major task for the reduction of the power loss in the distribution system as well as in the transmission system. More methods and algorithms must be developed to reduce the loss in the transmission and distribution system as well as the generating loss. In this paper an outline of a new method is introduced to reduce the power loss by re arranging the grid network by a smart grid.

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INTRODUCTION

The smart power grid is now a day's considered as a major challenge for harnessing information and communication technologies to enhance the electric grid flexibility and the reliability. The smart power grid will incorporate new technologies that are currently experience rapid progress, such as smart metering, advanced metering, Bi- directional communication, distributed power generation and storage. The ultimate interconnection and real time communication among the consumer and the market/system operator premises will be realized through the communication devices.

The electric power utilities in the world are undergoing a rapid change in the past decades. The new deregulated environment forces individual utilities to reduce operating costs while maintaining the overall system reliability. One of the major costs of an electric utility is the transmission maintenance. Sufficient equipment information is necessary to evaluate the operating conditions of the equipment and due to this an efficient maintenance program can be used.

The electrical power distribution grid is a complex adaptive system with significant amount of uncertainties. The introduction of advanced and new technologies such as renewable energy generation that is the wind farms and solar cells introduces further complexity and challenge to various controllers in the power grids (Tomovska, 2013). New communication technologies must be introduced for the utility of the power by handling them in a good and energy economic manner, otherwise the system will become more complicated and become useless and a time wastage. (Xiaodao Chen, 2013)

So growing the demand comes the need to minimize the loss to achieve mainly two goals.

a. Reduce resource consumption:

Reduce resource consumption is one of the important thing we have to give more importance. Day by day the natural resources are reducing, but the renewable energy is there for the use. Now a days

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in many country the renewable energy resources like wind and solar energy is used more efficiently. One of the major disadvantage of this renewable energy is that the wind will not be there for long time and the sun will not shine in the whole day. Most of the developed countries they depend on this noise and pollution free renewable energy resources.

b. Reduce consumption by the consumers:

Reductions of consumption habit of the consumers are classified into two and they are.

Deliver electrical energy more efficiently:

It is one of the major fact which we have to take under consideration. In some cases efficient delivery will not possible due to the complex network. But by using more advanced devices and technologies efficient delivery is possible. Another way to deliver energy more efficiently is by scheduling the power among the grids as well as among the distribution system. Power scheduling will become very much disturbance for the consumers. So instead of power scheduling we have to go for another more efficient technologies. Power scheduling may cause more in consumer side, but if there is no other way we have to choose it as a method because the demand is increasing now a days but the generation is not that much increased.

Change consumer habits:

Changing consumer habits involves awareness-raising programs, often undertaken by government or activist groups. Simple things, such as turning off lights in unoccupied rooms, or switching off the television at night, setting tasks such as laundry for non-peak hours are a few examples among the possibilities.

The steps taken by the Indian government to reduce power consumption are

- Incandescent bulbs are replaced by CFL bulbs
- Now a days CFL bulbs are going to be replaced by LED
- Star rating is given to all electrical apparatus
- Star rating is given to all electronics apparatus
- Star rating is given to all home appliances

The Kerala State electricity board (KSEB) has also introduced a new project that they received the incandescent lamp from the consumers and they gave the consumers the CFL bulbs.

Intelligent power mains or the "smart grid":

In the future, new technology will better equip the power grid for the demands of tomorrow. More flexible grid management should make the increasing proportion of renewable energy sources compatible with conventional infrastructures associated with the power stations.

The variety and number of these decentralized power plants require a revision in how we manage power grids – the so-called intelligent or "smart grid"

The smart grid will have the following characters

• Improving coordination of energy requirements and generation

• Using modern IT technology, like internet, sensors, control systems and wireless
transmission devices

• "Smart metering" – digital current meters measure current consumption at end
points of the grid

• Shifting household consumption away from peak load periods

• Starting flexible applications such as washing machines outside the peak load periods initiated by the utility provider

Literature review:

In the smart grid infrastructure targets to facilitate the modernization of the classical power grid, utility companies explore demand side management (DSM) technology to control the energy consumption at the user side (Venayagamoorthy, 2009; Lightner, 2010; Masters, 2004; Mohsenian-Rad, 2010; Mohsenian-Rad, 2010). It enables the integration of various renewable energy resources such as solar wind and hydrate energy into the classical electrical power grid.

Demand side management technology can help the energy consuming work load from peak time off-peak time for the purposes such as the load balancing and monetary expense reduction, which is critical in a smart home system. (Tomovska, 2013).

There are multiple component in a smart home system. All the household appliances will be there. Plug in electro vehicles, batteries (to store electrical energy) will be there. In this paper each consumers are equipped with smart meters including a scheduling unit. It periodically will receive the new uploaded prices form the electricity board and calculates according to it and sends to the customer. By using this the customer can easily noted about the energy consumption and according to that he can reduce the use of the energy (Tomovska, 2013). This paper is mainly concentrated on the monetary expense of a single customer through optimally scheduling the operation and energy consumption for each appliances under the real time price rate of the environment. (Tomovska, 2013). In this the authors have presented an energy consumption scheduling heuristic to reduce the peak load in individual homes or buildings with reasonable consumption time. In the authors proposed a power scheduling protocol for demand response in smart grid systems.

In this paper (Venayagamoorthy, 2009) a case study for oil refineries are taken. The optimal industrial load control on smart grid is considered for the evaluation of power in the smart grid. The direct graph representation is given for the inter connecting units inside an industrial complex.

In this paper (Xiaodao Chen, 2013) control and

optimization meet the power grid is scheduled of power demands for optimal management. First thing done is formulated and solved the basic control and optimization problem faced by the power grid operator so as to achieve the goals. Real time communication is done between the operator and the consumers with an IP addressable smart metering devices installed at the consumer and the operator sides. The grid operator will have the full control over the consumer appliances. The operator controller receives power demand requests form different consumers, each consumer will have different power requirements.

Existing Systems:

- Cost based distribution system
- Radial Electrical Power Distribution System
- Simple radial system
- Loop-primary system— radial secondary system
- Primary selective system— secondary radial system
- Two-source primary— secondary selective system
- Sparing transformer system
- Simple spot network
- Medium voltage distribution system design

The disadvantages of the existing system are

- Low efficiency
- High energy consumption
- Low flexibility
- User will not be intimated at the time of their utilization level exceeds the particular value
- Power is not allocated for the user
- Low reliability

Objective function:

Residential customer model is included here as per the literature survey. In this model for each a ε A, an energy consumption scheduling vector is defined as

$$\mathbf{X} \triangleq [x_a^1, \ldots, x_a^T],$$

Where T is the scheduling horizon that denotes the number of time units ahead of which the scheduling decision on energy consumption is to be made.

For a pricing structure that releases price information one day ahead, the scheduler arranges the operation of appliances for the next 24 hours. The scheduling horizon is 24 hours in this scenario. The resolution of scheduling horizon can be hours, minutes, or even seconds, depending on the available pricing information and the computing capability of the scheduler in the smart meter. For example, since the

Ameren Illinois Power Corporation releases hourly price information one day ahead, the resolution of scheduling can be set to hourly in this case.

Let L_A^τ denote the value of the energy limit, then the inequality

$$\sum_{a \in A} x_a^\tau \leq L_A^\tau$$

Holds for τ ε T. When the above constraint is violated, the home power network will be tripped out.

Advantages of Smart Grid:

The smart grid have the following advantages

- Power quality of the total network is improved
- Time is saved.
- Power loss is reduced.
- More easy for operating.
- Noise less
- Increase of transmission capability

Proposed System:

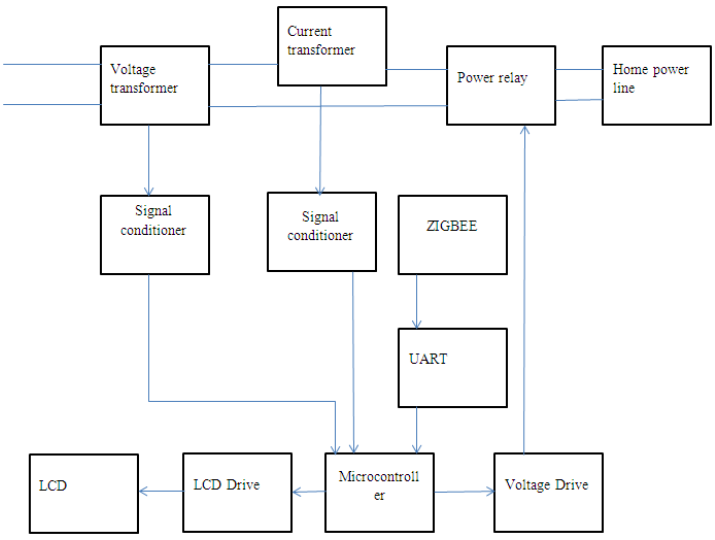

Fig. 1: block diagram distribution side.

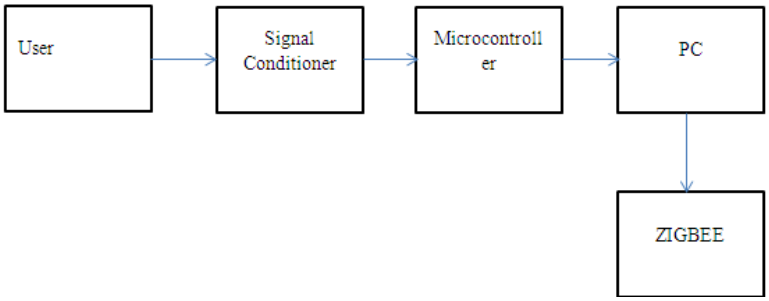

Fig. 2: Block diagram user side.

Conclusion:

Based on the Literature survey the following objective functions will be considered for energy loss in the distribution by the smart grid are All the generated power are not fully utilized. Sometimes the power needed for some area is not sufficient. Some consumers take more power than their rated value and some may take less. The power can be transferred to some other grids when not in use.

So by the above factors the design for the smart grid for the unused power can be fully utilized for reducing the loss in the distribution system.

The proposed system will have all the above functions and an adaptive algorithm and function must be developed. The new developing function must be time saving and economic and also easier for the use.

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