Changing Role of Consumers in Imminent Smart Grids

Damanjeet Kaur

UIET, Panjab University, Chandigarh
djkb14@rediffmail.com

Abstract: **In this paper, with the change in existing power system, the changing role of consumers in smart grids is discussed. In conventional power system, consumers are only at receiving end and pay tariff for the energy consumed. Consumers are not contributing in power system except the load growth. They are silent in all parts of power system. Only power agencies have monopoly of controlling power. But the power industry is facing major changes these days. Smart grids is a new concept which is changing the existing power system with additional benefits of self healing, high reliability, incorporation of distributed generation and storage options, enable new products and efficient power usage which further causes less carbon emission. These days power sector is divided into three corporations. These are GENCO, TRANSCO AND DISCO and government hold on power industry is decreasing. In smart grids, consumers can play a vital role at generation, transmission and distribution. At generation, consumers can produce energy with the help of distributed generation sources and integrate it with the grid. While at the transmission, consumers can shut down its load during peak hours because of high unit cost, the problem of transmission can be resolved to some extent. Finally as consumers are at distribution side, their load patterns are responsible for power generation. In smart grids, consumers will definitely play an important role by two way communication with power system by smart meters installations, demand response management, efficient usage of energy which causes less pollutants in cities by reducing low carbon emission. In this paper, the changing role of consumers is discussed at generation, transmission and distribution level.**

1. INTRODUCTION

Consumers are the final end of the distribution system. But these days the existing power system is passing through a changing phase for betterment. The existing power grids are upgraded to meet new challenges of self healing, high reliability, resistant to cyber attacks, integrate a variety of distributed generation sources, minimize operation and maintenance cost and optimize asset etc [1-2]. To achieve this, there is need of more automation, communication and control of power grid. In existing power grids, consumers are playing an important role at distribution system while consumers are silent at generation and transmission system. The load growth at consumer side is responsible for up gradation of existing system or installation of new systems to meet load demand. But in these new grids, consumer will play an important role at generation and transmission system also.

In this paper, the changing role of consumers is discussed by contributing to generation, peak load shaving will help to some extent the transmission system. While at the distribution system, consumers will go for two way communication with power utilities by using adapting smart appliances at their places.

2. CHANGING ROLE OF CONSUMERS

In existing power grids, consumers are playing inert role by simply paying for the consumed energy while in upcoming smart grids, the consumers will play an active role by better managing their electricity usage and costs through real-time information exchange. This is possible with the help of smart meters installation at their places. Which would help end users to communicate the power utilities and power utilities would also have more control on individual energy consumption and other functioning. It will motivate customer to participate in the operations of the grid [3-4].

With two way communication with the power utilities, consumers can help the power sector in many ways as given below:

Distributed Generation Integration

These days' governments are emphasizing of use of distributed generation as source of energy. It is expected that consumer can fulfill its own load demand using these sources and whatever is excessive that can be integrated to grid and consumers will get money for the exported power. In addition to this, it will reduce carbon emission and power losses which are otherwise lost in long distance. So it consumers can benefit in terms of money for the transported power which is also reduces the burden on power system.

Postpone of Upgradtion/Installation of New Networks

As consumers have benefits of distributed generation system in terms of energy and money. It will postpone the upgradation/installation of new networks. By placing smart meters at the consumer premises the information of peak or off-peak hours may be conveyed to consumers. As in smart grids, different tariff plans will be introduced for peak and off hours. So consumers will definitely prefer off peak hours for

energy consumption. It will help in reducing peak hours time. Which further cause postpone of new network installation for some years.

Peak Shifting

Peak shifting can help to reduce the need for network reinforcement, as well as reducing the need to build new power stations or run existing ones at low capacity, which is often inefficient and expensive. Electricity networks are designed for peak load conditions. Although peak occurs for short period of time but system is planned for that. Even the size of generators are selected for that peak. If peak demand can be reduced by shifting some usage to off-peak times, then size of network may go small and additional investments can be saved. This will further per unit cost of energy and finally benefits the consumers in terms of money.

Reducing the costs of decarbonisation, and cleaner city air

By shifting peak and using distrusted energy sources. The ash content of conventional power system can be controlled to some extent which further reduces low carbon emission and clean air of city. But this is more real when we go for smart grids and smart meters at the consumer premises.

3. BENEFITS TO CONSUMERS

There is no doubt that smart grids can deliver benefits to the electricity industry, to consumers, and to wider society. Upcoming smary grids will no doubt solve many problem alnong with more monitoring, control and automation. But consumers will benefit in terms of money and environment. The overall unit cost of energy can be reduced by option of selecting peak or off peak hours for using energy. Power utilities will benefit the most as it will benefit in terms of availability of energy, which is the major burden these days. Consumers will help power utilities for reducing their peak demand by using distributed generation. There should be incentives for distributed generation and energy usage during off-peak hours.

It can be expected that there some direct benefits in terms of money while there some social and environment benefits which are indirect benefits for playing an important role in the power sector. These benefits can be achieved by placing smart appliances and smart meters for metering placed at the premises of consumers. These smart appliances need more automation and on-off from remote position. Otherwise the role of consumers can not expect as they can play.

4. AWARENESS TO CONSUMERS REGARDING SMART GRIDS

As consumers can change the scenario of energy usages so it becomes important to make consumers aware about smart grids. They should understand the benefits of technology and how to use them. Otherwise it can be expected that smart grid development is dependent on power sector and consumers relationship. Smart grids will provide consumers with more information about their energy usage, offering them the opportunity to control their usage to save money. Consumers are interested in monetary gains while other indirect gains can be helpful for better living. To make consumers aware it is required awareness workshops and educate them some basic concepts so that they can change behavior to avoid peak conditions.

5. CONCLUSIONS

In this the importance of consumers in proper functioning of smart grids is discussed. In this paper, various areas where active participation of consumers is required is discussed so that effectiveness of smart grids can be understood in a better manner. It is important to make consumers aware about their changing role in power sector in terms of benefits. The benefits may be self sufficient energy generation, monetary gains by using load during off-peak hours which will further reduce burden on the system.

REFERENCES

[1] H. Brown, S. Suryanarayanan and G. Heydt, “Some Characteristics of Emerging Distribution Systems Considering the Smart Grid Initiative,” *The Electricity Journal,* vol. 23, Issue 5 pp 65-75, June 2010.

[2] 110th Congress of United States, “Smart Grid,” Title XIII, Energy Independence and Security Act of 2007, Washington DC, December 2007.

[3] D. Haughton, G. T. Heydt, “Smart Distribution System Design: Automatic Reconfiguration for Improved Reliability, *Power System Engineering Research Centre*, pp-1-8.

[4] http://www.engage-consulting.co.uk/downloads/pdf/Smart-Grid-A-Great-Consumer-Opportunity.pdf

[5] http://www.consumerfutures.org.uk/files/2013/07/Smart-grids.pdf