



## A Review on Power Distribution Scheme Using Smart Meter

Vrushali B. Shende<sup>1</sup>, Tejaswini S. Powale<sup>1</sup>, Yogesh P. Bawangade<sup>1</sup>, Prof. M. D. Ghatole<sup>2</sup>

<sup>1</sup>UG Scholar, Electrical Engineering, DES's COET, Dhamangaon (Rly.), Maharashtra, India

<sup>2</sup>Assistant Professor, Electrical Engineering, DES's COET, Dhamangaon (Rly.), Maharashtra, India

### ABSTRACT

Smart meters, are the core part of smart grid system, it is active field of research for its huge potential in efficient power distribution and load management. In this work, different economic energy consumption schemes for consumers and power outage reduction schemes for distribution utility companies using smart meter are provided which will improve the quality of service.

Additionally, several energy management schemes that are applicable at customer and distributor end are also provided. This includes keeping the monthly bill within a preset limit and being notified of tariff slabs as energy is being consumed. The proposed techniques further include energy consumption within the assigned load limit or sanctioned load. By implementing these techniques it is possible to minimize the existing power outage problems and to provide uninterrupted power at a useful level. These schemes provide economic benefit to the consumer and an effective load management strategy for distribution companies.

**Keywords:** Implementation Factors, Power Management, Power Outage Reduction, Smart Mete

### I. INTRODUCTION

Smart grid is an efficient and effective power transmission and distribution system. Smart meters at customer areas represent the core part of the intelligence and automatic control system of smart grid infrastructure. Smart meters are used in cost effective energy management schemes for consumers and power distribution companies. Where there is a large deficit between energy generation and demand, smart meters offer the potential of providing economic usage of energy for customers and smart management of distribution system so as to reduce the impact of the energy deficit. With increase in energy tariff attached with energy deficit, customers will look for possibilities

to reduce their electricity costs and expecting a good quality of service from the distribution companies. By installing smart meters at the customer areas, customers can use various options to optimize electricity usage and minimize energy expense.

These energy management schemes are applicable at customer as well as distributor end also. This includes keeping the monthly bill within a preset limit and informed about the tariff slabs to the consumers. The proposed techniques further include energy consumption within the assigned load limit or sanctioned load. Additionally, it is possible by implementing the proposed techniques

to reduce existing power outage problems and to provide uninterrupted power to the consumers.

**II. SMART METER FOR ECONOMIC ENERGY USAGE**

The permissible daily limit consumers can regulate his/her energy usage by using smart meter based usage management schemes which are as follow:

1. Fixed budget for electric bill,
2. Electricity cost management according to price slabs, and
3. Sanctioned load monitoring.
4. Above schemes are described in details in the following subsections.

**2.1: Fixed Budget for Electric Bill**

A smart meter can be used to help the consumer to plan a monthly budget for electricity usage. The consumer will give his/her allocated budget as an input to the meter and the meter will calculate the available energy units based on the current tariff rate. Based on the available units, the meter will calculate the daily average permissible unit. For each day, the meter will determine the consumed energy units for that day and raise an alarm if that consumed energy is higher than the regular value. Thus, the consumer will be informed of his/her daily position on consumed energy units and will regulate the energy consumption for the remaining days of the month so that the total consumed energy is within the selected budget set at the start of the month.

**2.2: Electricity Cost Management According To Price Slabs**

If the distribution utility company will define the tariff rates in increasing order for the consumption of electricity as shown in below table:

As per this tariff structure, the consumers will have to pay higher tariff rates in increasing order as his energy consumption increases and crosses over to the higher price slabs. By using smart meters the customers will become more energy conscious as it can provides the alerts to consumers when the energy consumption is goes towards the next higher tariff rate. By using the smart meters the customers can keep their energy consumption within an allowable limit.

**Table 1.** Price Slabs for Energy Consumption in Increasing Order

Category	Per Unit Rate(Rs.)
Life Line: From 1 To 50 Units	2.5
First Step: From 1 To 75 Units	3.5
Second Step: From 76 To 200 Units	5.8
Third Step: From 201 To 300 Units	7.2
Fourth Step: From 301 To 400 Units	7.8
Fifth Step: From 401 To 600	8
Sixth Step: A 600 Units	9.1

**2.3: Sanctioned Load Monitoring**

The customers of power distribution companies are allotted numerous levels of allowable sanctioned loads according to their demands whenever they promise to a particular company. The sanctioned load involves a assumed agreement that customer will not cross the sanctioned load. However, there is no facility for watching in work customer loads and penalty for above the sanctioned load.

### III. POWER OUTAGE REDUCTION

Where there is a shortage of electricity production then the gap between production and demand can be minimize by power outage. In the urban areas, the power outage is usually planned by the electricity distribution companies where an alternating hourly pattern of availability of electricity and power outage (termed load shedding) is maintained. The outage situations in rural areas is even poorer as generated electricity is mainly directed toward city and industry areas gives less priority to rural areas.

#### 3.1: Block diagram

Figure 1(A) shows block diagram of wireless implementation and Figure 1 (B) shows the block diagram of wired implementation for proposed load management scheme.

The communication link to support power outage management can be employed by using the wireless or wired arrangement. For wireless implementations, modems are required at the smart meters to set up the link, a local concentrator is used to aggregate the data from multiple smart meters and relays are used for channelize the data to the central substation. As the data rate is likely to low to support the scheme.

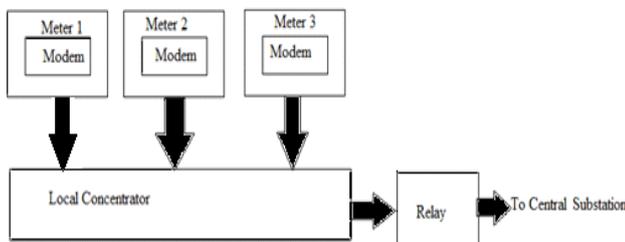


Figure 1(A). Wireless Implementation

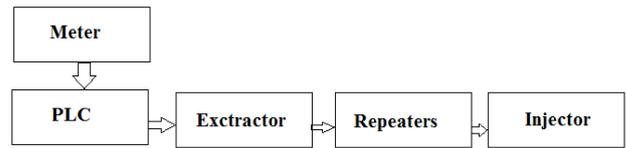


Figure 1(B). Wired Implementation

### IV. REFERENCES

- [1]. Barbato, A. E Inf., Milan, A. Rodolfi, M. Tagliaferri, "Forecasting the Usage of Household Appliances through Power Meter Sensor for Demand Management in the Smart Grid," Smart Grid Communications 2011, pp. 404-409.
- [2]. Di Leo, G. Landi, M. Paciello, V. Pietrosanto, "Smart metering for demand side management," IEEE Instrumentation and Measurement Technology Conference, 2012, pp. 1798-1803.
- [3]. E. Rahman, K. I. Ahmed, R. Mostafa, and F. Khan, "A Novel Smart Metering System for Loss Reduction and Efficient Load Management in the Power Distribution Sector of Bangladesh," ICAEE2013, December 2013, pp. 19-21.
- [4]. J. Zheng, Gao, D. W. Li Lin "Smart Meters in Smart Grid; An Overview," IEEE Green Technoigies Conference2013, pp. 57-64.
- [5]. Marron L.. Osorio, X. Llano, A. Arzuaga, A. Sedian, "Low Voltage Feeder Identification for Smart Grids with Standard Narrowband PLC Smart Meters," 17th IEEE International Symposium on Power Line Communication and Its Applications (ISPLC), 2013, pp. 120-125.
- [6]. Md. N. Hossain, J. Ferdous, Md. F. Fuad, K. M. Ahsan-uz-Zaman and A.Wahed "Power Distribution Scheme Using Smart Meter, Perspective Bangladesh," IEEE Proceeding of

- International Conference on EICT, 2015, pp. 486-491.
- [7]. M. Kuzlu, M. Pipattanasomporn, and S. Rahman, "Hardware Demonstration of Home Energy Management System for Demand Response Applications," *IEEE Tr. on Smart Grid*, vol. 3, no. 4, December 2012, pp. 1704-1711.
- [8]. M. M. Abdullah and B. Dwolatzky, "Smart Demand Side Energy Management Based on Cellular Technology – A way towards Smart Grid Technologies in Africa and Low Budget Economies," *IEEE AFRICON 2009*, September 2009, pp.22-25.
- [9]. Y. Yan, Y. Qian, H. Sharif, and D. Tiper, "A Survey on Smart Grid Communications: Infrastructures Motivations, Requirements and Challenges," *IEEE Communication Survey and Tutorials*, 2012, vol. 15, no.1, pp.5-20.
- [10]. S. Galli, A. Scaglione and Z. Wang, "For the Grid and Through the Grid; The Role of Power Line Communication in the Smart Grid," *Proceeding of the IEEE*, vol. 99, No.6, June 2011, pp. 998-1027.
- [11]. S. I. Khan, Md, F. Rabbi, "An Innovative Financing Mechanism Creating Access to Renewable Energy for Rural People of Bangladesh," *Global Conference on Rural Energy Access*, Addis Ababa, Ethiopia, December 2013, 4-5.