International Journal of Modern Science and Technology *Vol. 2, No. S1, 2017. Page 71-75.*
http://www.ijmst.co/ ***ISSN: 2456-0235.***

Research Article

Prioritized Energy Optimal Management for Home-to-Home using Various Green Energy Resources

S. Sivasakthi, R. Pazhanimurugan

Department of Electrical and Electronics Engineering, Arasu Engineering College, Kumbakonam - 612501. India.

Corresponding author's e-mail: sakthibharathi276@gmail.com; rpmuruganmail@gmail.com

Abstract

This paper proposed a prioritized energy optimal management for home-to-home in smart grid. As this proposed mechanism configures the prioritized optimal energy, if there is a surplus of energy from the energy provider of home, the energy broker in smart grid distributes the optimal energy to the requesting user for the purpose of maximizing the user's payoff. We propose a various green energy sources method that can improve performance. This method collects data from green power storage system and smart meters by internet. In order to deploy power in smart grids, the control system collects data and analyze it by cloud computing. The green power storage system can predict the power status and control the system to work. Smart meters will collect user's data and send it to cloud computing servers, and then it will predict the power status of green storage system and provide extra energy to smart grid. If the green power storage system cannot supply the users enough energy, it can extend the number or variety of green energy sources to increase the provided energy.

Keywords: Smart grid; Green energy; Home to Home system; Prioritized energy usage.

Introduction

The smart grid has an effect on information and communications technology (ICT) to autonomously aggregate and operate on meter data, for the benefit of improve availability, robustness, economic efficiency and sustainability [1,2]. Therefore in order to enhance the capabilities of a smart grid, an energy optimal management approach is to consider the case where several energy providers exchange surplus energy with one another when the users are shortage of energy. In particular, as minimizing the loss of the energy transfer in the smart grid, it is important to manage the energy optimal delivery through an economic cost, Therefore this paper proposes the problem in view of the energy broker for energy optimal management between the home energy provider and the energy-requesting subscriber and analyzes the level of payoff in view of subscriber when receiving the energy accordingly. In these years, smart grid becomes a popular study for saving energy, improving the efficiency of power supply, and so on. Smart grid is composed of two parts: electric equipment and communication equipment. The electric equipments are deployed for the remote users or to generate the electric power. In addition, the communication equipments including the sensors are used to exchange the information or data of the power utilization state. The sensor will monitor the data from several places. Then the communication module or devices transmit the data or information by network, e.g. smart meters.

The main objective of the paper relays on prioritization of energy usage comparing the power availability from the grid and the renewables.

Proposed System

Management for home-to-home

The energy subscriber is able to receive the required energy from the most adjacent energy provider to request the surplus energy. By this time, receiving the energy from the nearest provider in view of the energy subscriber has several advantages such as the efficient delivered

Received: 10.04.2017; Received after Revision: 13.05.2017; Accepted: 15.05.2017; Published: 17.05.2017

energy without a transmission loss and the economic energy cost.

Prioritized optimization problem

Formulation By allocating a high priority to the nearest provider from the subscriber, the optimal energy is delivered to the energy subscribers. In terms of the role of the energy broker of Fig. 1, this prioritized energy optimal mechanism conducts to maximize the sum of the payoff of the entire subscriber from a social fairness point of view [3].

Smart grid

In these years, smart grid has been one of the applications in IoT. The control system will collect the data from several areas through a communication network [4]. After the analysis by cloud computing, the control system will deploy the energy. In each user, smart meters are used to monitor the energy status. In the control center, the energy deploy system will be based on the analysis from smart meters. In this case, we can improve the effect of the energy providing.

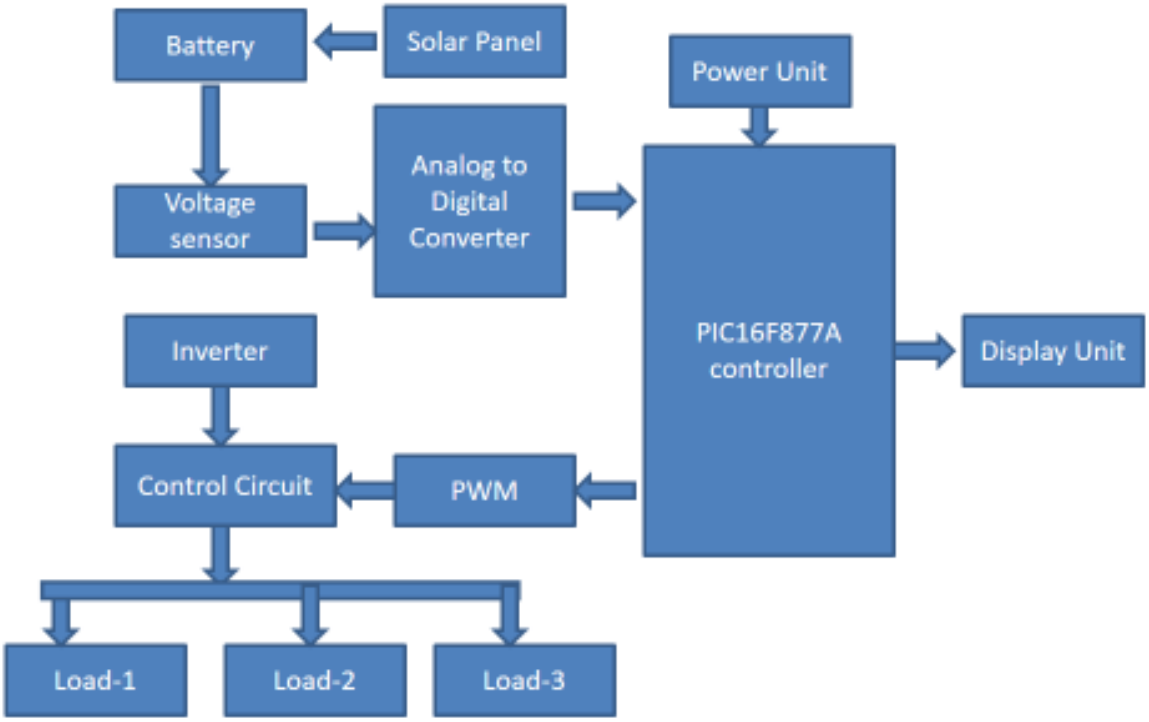

Fig. 1. System model for an energy optimal management for home-to-home in smart grid architecture

Green energy storage system

A research [5] has shown a method, which stored green energy like wind, solar, and so on, is used to supply the extra electric to the smart grid. The advantage of this method is the power distribute of the generator adjustably. In the case of residential and industrial areas, the power consumption of industrial areas was usually much than residential areas. Therefore, by using this method, the power plant can provide more energy to industrial areas without reducing the energy of residential areas. In the literature [6], the study proposed an installation method of various sources of green energy. When the system is installed and configured, the system manager can choose several green power sources effective in this area. Due to green energy is limit by various renewable sources, the system might be invalid. In order to avoid this situation, the system can install various sources of green energy. Besides, the storage system can store the green energy. Therefore, the steps of green energy electricity storage system are as follows; (i) setting various sources of green energy according to different places, then save it to the storage system. The control system will deploy

the power into the smart grid by analysis from cloud computing, (ii) After smart meters upload users' data to the database, the cloud servers will analysis and assist the control system to provide the energy to users, (iii) Cloud servers will analysis charging status in each green storage device. To make the system act for a long time, control system will schedule the work time of devices.

Diversity green power providing method

(i) System module

In this research, the control system is used to schedule the green energy storage devices' working time. Due to the charging time of green energy storage system is affected by renewable sources of the place. In other words, if the schedule of green energy storage devices does not appropriate, it means power might be shortage. Therefore, the method in this research is: First, cloud computing will analysis and choose the higher energy storage device to discharge. Second, if the select one is less than a certain percentage or consumed completely, it will choose a new one. Finally, if the system cannot save the energy for a long time, it means this area is consuming more energy than others. Thus, the control system will send a request to the power plant for changing the power supply [7].

As mentioned above, the method in this research is divided into three parts: power source of the smart grid, smart meter monitoring, and the control system based on cloud computing [8]. Its features are as follows; (i) Power source of the smart grid: The power source comes from green energy device and the power plant. The green energy device is constituted by various green energy, then charge into the energy storage device. (ii) Smart meter monitoring: Each user will install a smart meter to monitor the energy status. Smart meters will return data to the control system, and then deploy the energy. (iii) The control system based on cloud computing: Cloud servers will analyze the green power electricity storage system and monitoring the value of smart meters. In Fig. 2, it shows the system schematic which is proposed in this research.

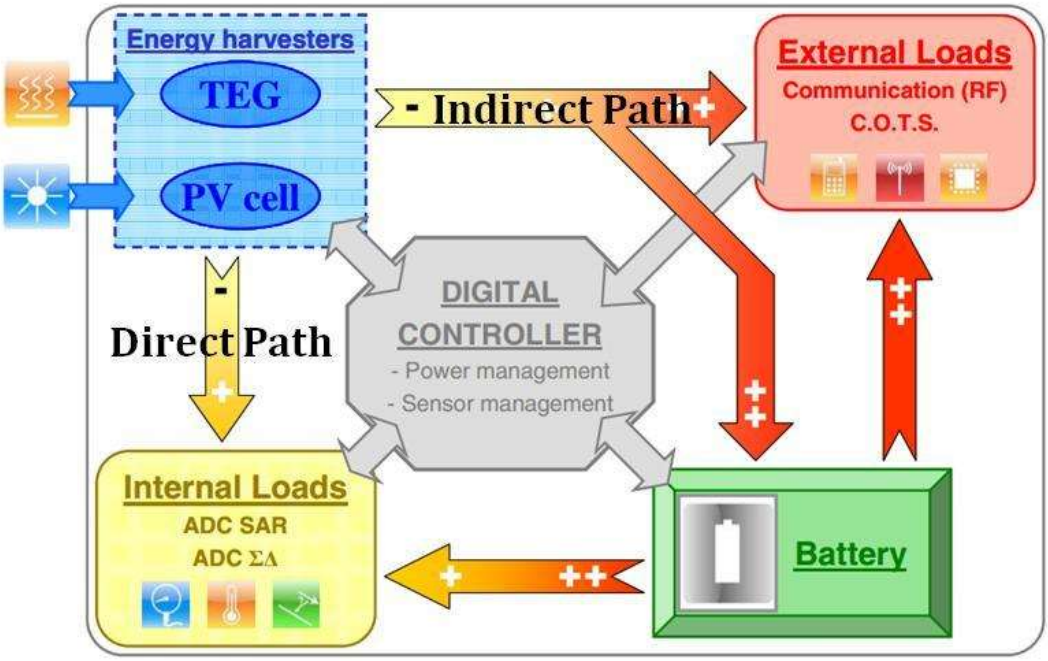

Fig. 2. Various green energy sources in smart grid power network based on cloud schematic

(ii) Algorithm

In this research, to deploy the green energy power, a power providing algorithm is proposed. First, power plants are supply a stable energy. This energy is the average power between users. Next, if the power is not enough for a user, the Green Energy Storage System will choose a battery that can make the energy supply contentedly. Finally, if the Green Energy Storage System cannot offer smart grid system enough power, the control system will request power plants to increase the power supply. With this method, the flow chart in the smart grid system can be shown as Fig. 3.

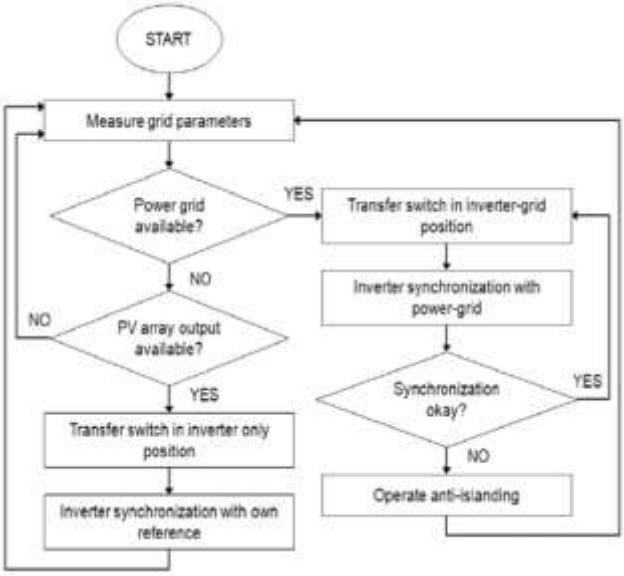

Fig. 3. The flow chart in the smart grid system

Results and Discussion

The simulated output is shown in Fig. 4, the prioritization and usage of the energy either renewable or grid can be made possible with the simulation and similarly the hardware can also be made possible depends upon the requirements and the generations as well. This can be communicated to the system with the help of ZigBee protocol. This paper suggested a prioritized energy optimal management based on the space of energy provision for home-to-home. The more the energy provider is located in the adjacent to the subscribers, the higher user's payoff of receiving the energy is increased. This proposed mechanism proves the increasing user's payoff as shown in the simulation [9].

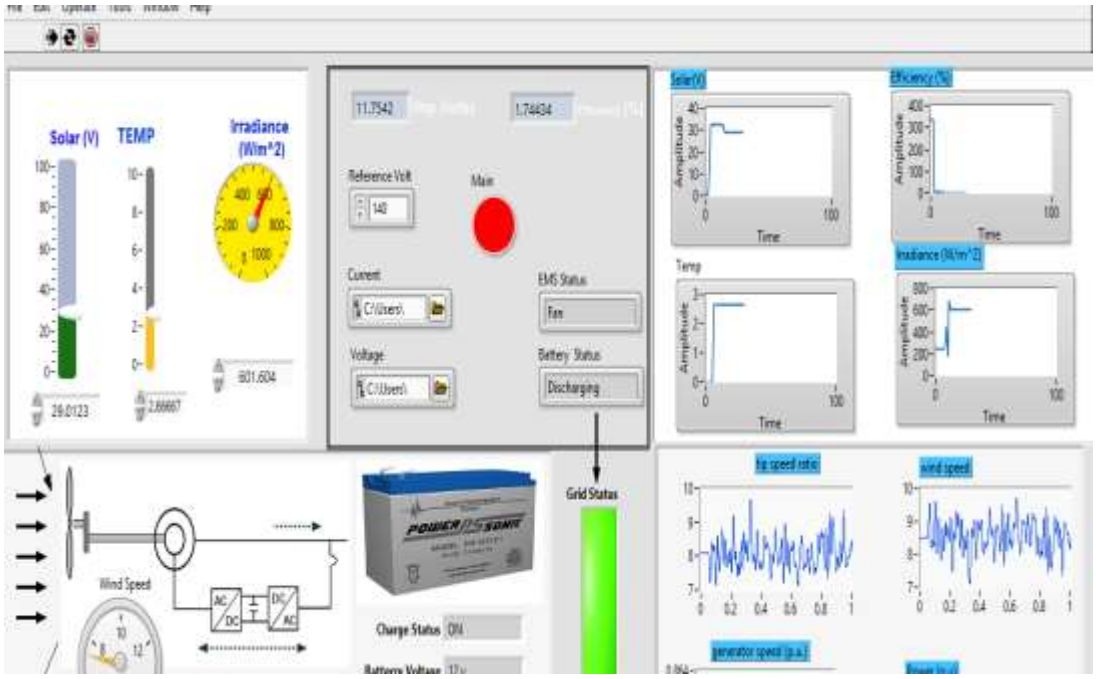

Fig. 4. Simulated outputs

Conclusions

The main target of the smart grid deploys provide energy to the users effectively. Thereby, the power plant can reduce the cost, and the user can also reduce electric fees. With the analysis of cloud computing, the distribution system of the smart grid will deploy the best energy provide from green energy storage system. In the future, this research will improve the performance of the system. Then, the algorithm proposed in this paper will perform a simulation test. Finally, installing and testing the system in real environment. Thereby we can prove this method is feasible.

Conflict of interest

Authors declare there are no conflicts of interest.

References

[1] Chen C, S. Duan. Optimal Integration of Plug-In Hybrid Electric Vehicles in Microgrids. IEEE Trans Industrial Informatics. 2014;10:1917-1927.

[2] Ferreira JC, Monteiro V, Afonso JL. Vehicle-to-Anything Application (V2Anything App) for Electric Vehicles. IEEE Trans Industrial Informatics. 2014;10:1927-1938.

[3] Darabi Z, Ferdowsi M. An Event-Based Simulation Framework to Examine the Response of Power Grid to the Charging Demand of PlugIn Hybrid Electric Vehicles. IEEE Trans Industrial Informatics. 2014;10:313-322.

[4] Kabir MN, Mishra Y, Ledwich G, Dong ZY, Wong KP.Coordinated Control of Grid-Connected Photovoltaic Reactive Power and Battery Energy Storage Systems to Improve the Voltage Profile of a Residential Distribution Feeder. IEEE Trans Industrial Informatics. 2014;10:967-977.

[5] Sun J, Palade V, Wu XJ, Fang W, Wang Z. Solving the Power Economic Dispatch Problem with Generator Constraints by Random Drift Particle Swarm Optimization. IEEE Trans. Industrial Informatics, 2014;10:222-232.

[6] Golshanavaz S, Afsharnia S, Aminifar F. Smart Distribution Grid: Optimal Day-Ahead Scheduling With Reconfigurable Topology. IEEE Trans Smart Grid. 2014;5:2402-2411.

[7] Tani V, Camara MB, Dakyo B, Azzouz V. DC/DC and DC/AC converters control for hybrid electric vehicles energy management ultracapacitors and fuel cell. IEEE Trans Industrial Informatics. 2013;9:686-696.

[8] Abdul Jaleel J, Nazar A, Omega AR. Simulation on Maximum Power Point Tracking (MPPT) of the Photovoltaic Module using LabVIEW. International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering. 2012;1(3):190-199.

[9] Depuru S, Wang L, Devabhaktuni V. Support vector machine based data classification for detection of electricity theft. Proceedings of the in IEEE/PES Power Systems Conference and Exposition, 2011. pp. 1–8.

****

