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Planning and Managing Demand-Side Loads of Smart Distribution Systems with ITMBS

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ABSTRACT

Using this system to manage demand side load, we present an intelligent metering, trading, and billing system. During peak hours, consumers are encouraged to use less energy or to shift their energy consumption off-peak times and the additional solar power generated is directly provided to the grid. Using this system, we can charge the amount per unit charge depending on the demand. We will also be able to provide information about our solar system's energy supply to grid along with load side energy usage information.

Keywords: Demand Side Load Management, Distributed generations, Intelligent Metering, Trading and Billing System, Smart Grids, Smart Distribution System

1. INTRODUCTION

Power markets are experiencing powerful changes around the world. The first step is to introduce new systems in system operation and re-establish the power system. Another is the substantial diversion of renewable energy from conventional systems. It is feasible to re-establish a competitive power market if a vertically integrated utility is economically separated into multiple small generation companies and Reduce electricity bills by creating a competitive power market where these companies and their customers may sell and buy electricity. [1].

It is not uncommon for electricity prices to fluctuate. When exposed to an unsettled electricity price, consumers may change their demand profile to lower their electricity bills by adjusting their consumption from one time slot to another. As part of the project; smart grid technologies will be tested to enhance the power grid infrastructure in Singapore. During 2008, the S&ER Council of Singapore examined initializing its first energy centre with S$38 million. The government has awarded a total of S$7 million to ten projects on intelligent Energy D System [2].

A Demand Side Load Management system is described in our paper, Through two-way communication, ITMBS provides customers with up-to-the-minute price information. [3].

The operating time of home appliances and water heaters equipped with energy storage features can be set by customers according to real-time price variations to shift their consumption and save money.

A micro grid allows customers to participate in a program called direct load control where their air conditioning demands will be changed by To reduce energy consumption and shift peak demand, on and off cycles can be adjusted in real time based on energy prices and weather conditions.[4].

2. DISTRIBUTION SYSTEMS WITH SMART

In combination with coal, oil, natural gas, and mined uranium, they can produce more energy than all renewable resources. There will be more than twice as much solar energy reaching earth's surface each year as what can be extracted from all the earth's non-renewable resources, including coal, oil, gas, and uranium. [5]. This concept combines a variety of technologies, including advanced meter reading, substation automation, and energy management. The vast majority of smart grid developments are based on existing technologies and applied to grid operations in new ways. As a system for automating and delivering energy, a smart grid can monitor and respond to a variety of factors including power plants, customer preferences, and individual appliances.

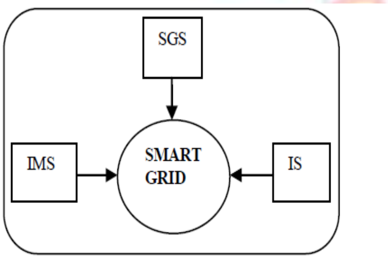

Fig.1 Components Of Smart Distribution System

A .DEMAND SIDE MANAGEMENT SYSTEM

It involves modifying energy use patterns, such as when electricity is consumed or how much electricity is consumed, to encourage customers to reduce their electricity use. The term Demand Side Management (DSM) refers usually to actions taken on the customer's premises that are actively encouraged or conducted by the utility. The term can be done by customers without interacting with the utility [6]. Generally speaking, these are environmental, economic, marketing, or regulatory. As has been mentioned above, but in a slightly different way, the benefits of DSM for consumers, enterprises, utilities, and society can be achieved through:

- Reduction in energy costs for customers
- The need for new power plants, transmission and distribution networks is reduced
- The results of new innovation and technology are long-term jobs and a rise in the competitiveness of local businesses.

B. SUPPLY SIDE MANAGEMENT

Management of electricity supply by the utility at its premises - Usually involves efficiency improvements to reduce technical losses, such as improving fuel efficiency, reducing parasitic loads, reducing transformer leaks, and reducing line losses. The management of generation and distribution systems may also be incorporated including operating the optimal mix of generators to improve fuel efficiency, maintaining a high power factor by shifting generators on and off-line as necessary to keep generator loads at optimum levels, managing the distribution system optimally, managing substations, and managing power distribution routing. [7].

3. PROPOSED SYSTEM

A variety of technologies can be used to capture the sunlight and solar heat, including solar heating, solar photovoltaic's, solar thermal electricity, and artificial photosynthesis.

The Earth's atmosphere, oceans, and land absorb approximately 3.85 Mexajoules (MEJ) of solar energy each year. It is estimated that the amount of solar energy that reaches the planet in one year is about twice as much as the amount of energy derived Combining coal, oil, natural gas, and mined uranium, nonrenewable resources make up more than 90% of global energy use. There is more than twice as much ray energy hitting Earth's surface during an entire year as what can be generated by coal, oil, gas, and uranium combined.

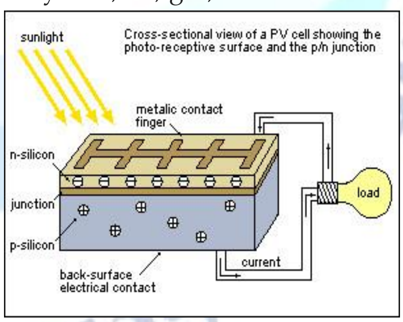

Fig: 2 Working principle of a PV cell

In the electrical world, a battery is composed of a charge source (either one or more electrochemical cells) and an external connection (e.g., flashlights, phones, electric cars).

It is a set of ETSI standards that outline the infrastructure for a digital cellular service The standard is used in 24 countries. One of the most important features of GSM is the subscriber identity module card.

Smart cards for smart phones Users are able to continue using their phonebook even if they switch handsets. It is an implementation of the wireless communication between an Arduino and a mobile phone[5].

As of now, the main work on this proposed system is in the serial area and in turning the appliance on and off. It will allow the user to send SMS from the phone and to control the appliance. The reduced current from a current transformer is directly proportional to the circuit current.

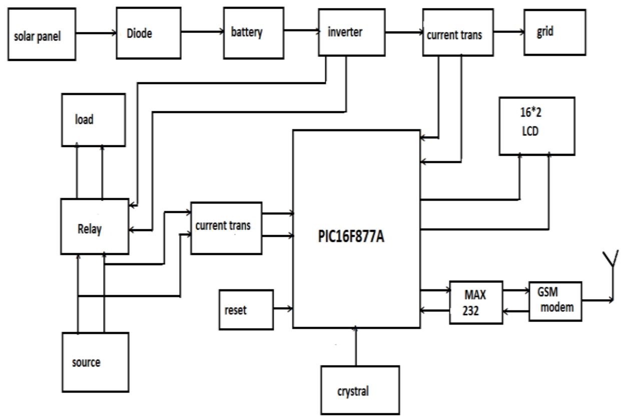

Fig 3. Proposed system Block Diagram

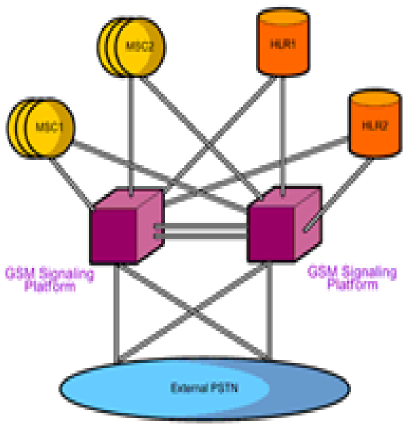

Fig-4: GSM based energy billing system

An accurate current transformer reduces the circuit current in the same proportion as the circuit current.Among the applications of transformers in the electrical power industry is metering and protective relays

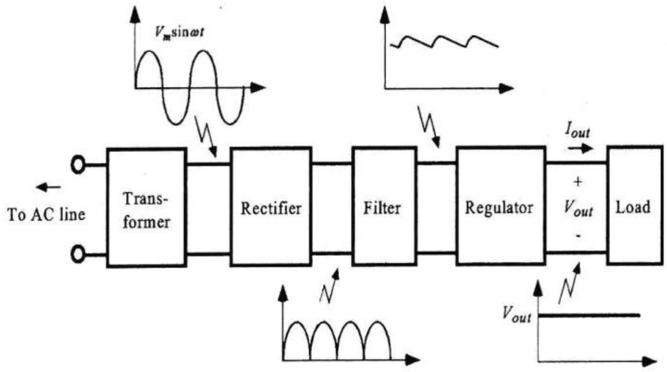

Fig:5 Power Supply Block Diagram

In order to complete the project, power supply is a primary requirement. Power is derived from the mains line for both the base unit and the recharging unit. This is accomplished by using the center tapped secondary of a transformer rated 12V-012V. We get 5V power from this transformer. It is designed using a 7805 positive voltage regulator to provide a regulated +5V output. This voltage regulator has 3 pins and can deliver current of up to 800 milliamps.

An alternating current or voltage is rectified into a unidirectional one through the process of rectification. It is called 'Rectifier' which is used for rectification. Current can only flow through a rectifier during the positive half-cycle of an applied AC voltage. In order to obtain smooth DC power, pulsating DC is obtained by adding additional filter circuits

Operation of the proposed system is the available source is used to meet demand/load. here, additionally consider solar system/panel to generate electrical DC supply and it is connected to battery for storage purpose.

Battery is connected to relay and grid through Inverter and current transformer is connected to PIC microcontroller from available source side & load side.

PIC microcontroller made by microchip technology and it is connected to LCD display & it shows load side usage energy as well as how much electricity is supplied to grid from our solar system

Modules for GSM networks consist of GSM modems connected to a PCB with diverse outputs of microcontrollers, RS232, and USB interfaces to allow direct connection to a computer.

In our project we connect a GSM modem to ARDUINO & so that it sends & receives SMS. The amount of electricity we used from supply mains as well as from our solar system. we are using it to deliver how much generating electricity to grid in terms of UNITS.

All these information is displayed in 16*2 LCD & we are getting SMS through GSM module from PIC microcontroller.

4. CONCLUSION

Display and control functions are provided by the metering system so that real-time market prices can be checked and home appliances can be controlled remotely Through real-time prices for energy storage in the future, consumers can adjust the time when some devices, such as heaters, are operated based on their needs It is a cost-effective and energy-saving method. Thus, prices spikes and system peak loads will automatically be reduced

Conflict of interest statement

Authors declare that they do not have any conflict of interest.

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