RESEARCH ARTICLE

INTEGRATION OF RENEWABLE AND NON RENEWABLE ENERGY SOURCE WITH INTELLIGENT POWER MANAGEMENT

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ARTICLE INFO	ABSTRACT
	The NET energy meter using both renewable and non renewable energy. In the renewable energy only solar energy is used for rooftop of the home. Generated solar energy is stored in battery then its voltage is the form of DC converted into AC by using inverter after that it can be used for home appliances. Then excess generated power is given to grid. Whenever battery voltage gradually decreases as consumed by the appliances then after battery level is less than that of required energy for home appliances that time energy is taken from the nonrenewable energy (grid) to loads. Processor will be continuously monitoring the battery voltage, then is this voltage divided into three levels they are high, medium and low. Based on voltage level operation is performed by processor and also simultaneously monitoring pulse from meters. Advanced power management system is real time updating the full information of energies utilized by net home meter to company data base website .billing information of its net home meter then owner can access directly available in website or message send to owner number instead taking the manual bill form the company person. Here not considering the NET energy meter billing instead of its takes the different bill for different energies.

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INTRODUCTION

In this project its using both renewable and non- renewable energy for renewable energy sources consist of wind turbines, Solar panels, Biogas plant and energy derived from Bio fuel. Here its only solar energy used for rooftop of home. The Non-Renewable (grid) energy sources consist of Nuclear Power plants, Thermal Power plants etc. Here it is used the solar and also wind mill. Solar panel absorbed the radiation from sun light it is in form of DC voltage is stored in the battery then its converted in to AC voltage using Inverter after its can used for home appliances. These carbon emanations have offered ascent to a dangerous atmospheric deviation because of consumption of the ozone layer by utilizing nonrenewable vitality. Here first preference is given to solar energy then grid (nonrenewable energy), wherever excess power is generated it is fed back to grid its more profit for customer side and also user can generate energy will be seals for retail rate to electricity company. Here taking the reading is in form counting number of pulses blink in the meters due to loads consumed.

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User is owner of the net meter technique used for his home. Whenever in rainy season or at night timing solar energy will not able to generate more power that time user as to taken from grid same time number of units consumed by user side and simultaneously increases meter reading then directly updating meter1 reading to electricity company website and also another one meter2 used for takes the reading of how much unites is given to grid is counted by ARM, these two meters are used in net energy meter home and also given unique ID number for each home or industry, this both meters reading are real time update directly to the website of the power management company by using GPRS. In this technology always monitoring stored battery voltage by processor AMR lpc2148 in this processor is split the voltage in three levels low, medium and high based on this condition. For low voltage in battery for this situation power is taking from grid, then for medium voltage in battery used by its stored energy and finally for high voltage in this condition excess power is given to grid. Taking IN and OUT of the grid will be having the different price rate in this concept breaking of NET meter billing. User can manually controlling by sending reply message to processor number for different level send messages to user side, then it's doing SMS to processor is consisting GSM.

Whenever in the voltage variation suddenly send message to user (owner) of mobile number then monitor the voltage user as to switch the relays. Previous existing system is NET meter energy in this taking +/- of NET energy from the grid and solar for billing. Then meters reading taken by the manually forever month ends .Methods is NET energy meter technique. Utility Tools used for implementation is two energy meters, 8051 microcontroller, SPDT relays, LCD, solar penal and inverter. Previous existing system is considering NET energy meter, here taking billing is taken in the different for different energies (renewable and non renewable energy) instead of NET of the energies and also modification taking meter reading in this project counting the number pulses consumed based on loads. Increases in speed of the pulses in energy meter on how much loads will consumed. Then recorded by ARM processor then send to company website its stored in data base of individual user continuously updating recorded reading is counting the number of pulses. Real time updating by using GPRS in automatically. In this one more application here two modes one is for GPRS for automatically working and also updating. Another one mode is in the GSM for manual working and switching by the user, message is sent by ARM to user or owner of NET meter of that home .based on that user message user can switch the relay. This paper is organized as follows. Section II is a brief description of methodology. In Section III, we describe implementation. Section IV experimental result and finally section V conclusion and future enhancement.

MATERIALS AND METHODS

There are basically two types of metering techniques

1. Gross Metering
2. Net Metering

Gross metering

Gross Metering implies that the power that sun light based force PV boards produce is first sent to the electricity grid. Gross metering portrays a metering plan where all sun based power produced is sent out to the outside power organize through an autonomous meter. Keep on having a different meter that records how you utilize power. Gross metering is viewed as a decent approach to urge householders to put resources into sun based, on the grounds that the sum got is extremely self-evident, and it is conceivable to effectively offer a premium rate to householders for sun powered production.
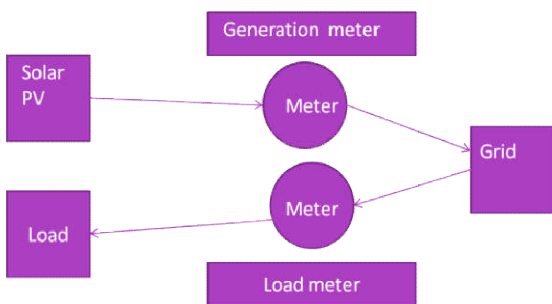

Figure 1. Gross meter

These meters measure the export and import of your power independently. In this manner the Gross Meter really measures the whole yield of your electricity independently to your power utilization. User home does not utilize it as the majority of your sun powered force is sent straight to the electric grid. Another person will be utilizing the power that your sun based force electricity has sent to the matrix - perhaps your adjacent neighbor or somebody up the street, yet you will be paid for this power - and paid for every last bit of it. Along these lines, it comprises of two meters, one meter for generation and one meter for load Figure 1 shown above.

Net metering

Net Metering implies that the power that sun based force electricity produces is first sent to user home appliances. User home uses this power as it is delivered and if there is any abundance power that is not utilized as a part of the home, it is then sent to the power electricity and user as paid for that power at a set rate controlled by every state government. A net metering framework consolidates the era of the nearby planetary group and the family unit's utilization and calculates the net outcome. Net metering is a metering course of action where just "excess" sun powered power is sent to the power system. Energy is first sent to the apparatuses and lights in user home, and rest of the thing, it is traded to the outside power system and its sum recorded.
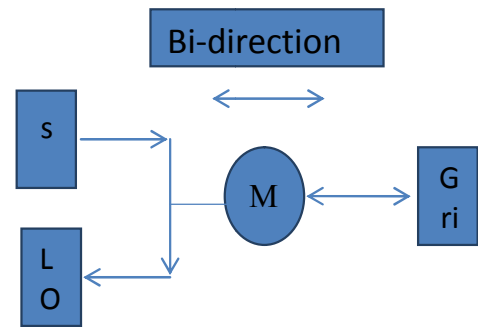

Figure 1.2. Block diagram of net metering technique

Figure 1.2 shown above will be S –solar, LO-loads, M-meter, gri-grid, bidirectional is from solar to loads and grid or from grid to loads.

Methodology related to this project work implementation

Here similar to Net meter technique is used in this project advanced in the intelligent power management. In this two energy meters one is for nonrenewable energy to calculate consumption and other one for renewable energy meter for how much excess energy given to gird. Advancement in this project is real time meters reading send to website and stored in individual data base for each user home. Reading is taken in form counting of number pulses in energy meters on consumed in for loads. One unit (1kwh) is equal to 3200 pulses. Has figure shown in below.

Implementation
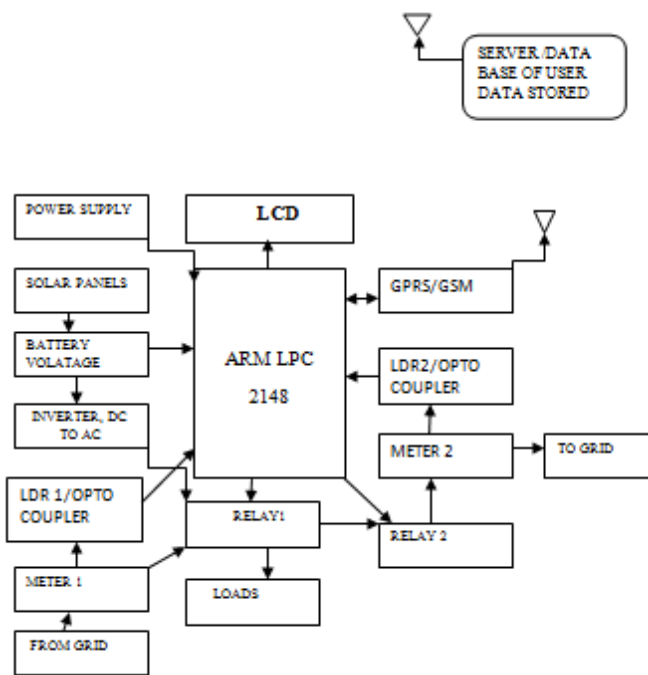
Working Principle of Project Design /Implementation

Figure 2. Block diagram of net energy meter

Hardware Requirements of This Project

ARM lpc2188, LCD, power supply around 8v, solar panel, inverter circuit, two LDR circuit, two energy meter, and load for any bulb, GSM /GPRS. This all are hardware requirement of this project.

Working principle of NET energy model

The connections are made as shown in figure 2 Power and voltage output of a solar panel are directly proportional to the Intensity of the sunlight. So, using this advantage the excess power can be sent to the grid by the setup shown above. In all the cases the switching action happens by automatically in GPRS mode and manually by GSM mode, by ARM processor by sensing the output battery voltage of solar panels.

Here in this project working in the two mode

1. GPRS based working is automatically.
2. GSM based working is manually.

GPRS mode: full automatically switching is done by ARM

In this mode ARM continuously monitoring of the voltage stored in battery. Battery is charged by the solar panel are directly falling by sunlight. Here in this project battery maximum voltage is 12.3V and 5A. Battery voltage divided in to three levels

1. High voltage level (<11.9 V to <=12.3V)
2. Medium voltage level (<11.6V to <=11.9V)
3. Low voltage level (>=11.6)

1. High voltage level in battery its indicates the voltage level generated energy will be more, then this case power flow from solar to load and grid (excess energy given to grid)In this condition SPDT relay 1 is OFF its indicate power is not taking from grid then another relay 2 is turn ON its indicate power generated excess power flow from solar to load and grid. Working done by ARM automatically then taking pulse counting by ARM by using LDR2 and meter 2. Then meter1 and LDR1 Is not working in this case. Update the recorded counted pulse real time send to company website of data base of the user. More consumed by load in home then battery voltage decreased gradually as the load consumed by load. Then it's become to medium level. Counting KOUT how much excess energy given. The energy is calculated using the formula

Energy (E2) =(X)/3200 KWh (units).
Where X is the number of pulses
Energy (E2) =meter2

2. Medium voltage level in battery its indicate the voltage level be medium in this case power flow from solar to load. In this condition relay 1 and relay 2 is OFF and also energy meter not consumed by both meter 1&2. LDR 1&2 will not count the pulse because meter will not run this case .not update the meter reading its will be stored in buffer of the previous value .simultaneously decreased battery voltage as consumed by load then turns to low level.

3. low voltage level in battery its indicates the voltage level not generate more energy, then this case power flow from gird to load (grid to load) In this condition SPDT relay 1 is ON its indicate power is taking from grid then another relay 2 is turn OFF its indicate power is not generated excess power. Working done by ARM automatically then taking pulse counting by ARM by using LDR1 and meter1. Then meter2and LDR2 Is not working in this case. Update the recorded counted pulse real time send to company website of data base of the user. Battery voltage is low below the threshold voltage in this case energy taking directly from the grid to load. counting the how much energy consumed by load its billing price high different compared to excess energy turns to given to grid. These pulses are fed to the same ARM processor for calculating the energy.

Energy (E1) = (Y)/3200 KWh (units).
Where Y is the number of pulses.
Energy (E1) =meter 1

GSM Mode: full manually is switching is done by owner (user side)

In this case GSM and GPRS not working parallel that way here made two mode, when working in the GSM mode GPRS is running in the back end then not update pulse counting to website. Its working similar to GPRS instead of automatically its work on manually switching is done by user side. Whenever required to check status by sending symbol as ' $ '. It's given what about the present status of the voltage level and also how much consumed units IN and OUT.

1. When high voltage level in battery voltage is continuously monitored by ARM then message as 'high voltage' to user mobile number then reply to switch OFF relay 1 and switch ON relay 2. Send message has KINOFF first then second send KOUT ON. Its indicate that excess power send to gird.

Gradually decreased the battery voltage then turns to medium voltage level. Meter2 is running of pulse is counting by ARM stored is in buffer then turns to server mode it's directly update to company website.

2.When medium voltage level in battery voltage is continuously monitored by ARM then message as' medium voltage' to user mobile number then reply to switch OFF relay 1 and switch OFF relay 2. Send message has initially KINOFF first then second send as KOUT OFF. Its indicate that medium power generated by solar energy consumed by load. Gradually decreased the battery voltage then turns to low voltage level.

3.When low voltage level in battery voltage is continuously monitored by ARM then message as 'low voltage' to user mobile number then reply to switch ON relay 1 and second send switch OFF relay 2. Send message has KINON first then second send initially as KOUT OFF. Its indicate that low power generated by solar energy then it's taken from grid to load, consumed by load .meter 1 will run then pulse are store in buffer in ARM then turns server mode its directly update to company website. Principle of working shown in the figure 2.1 In this concept billing will take in different rate for import and export of power. Previously billing will be NET of import and export of the power.
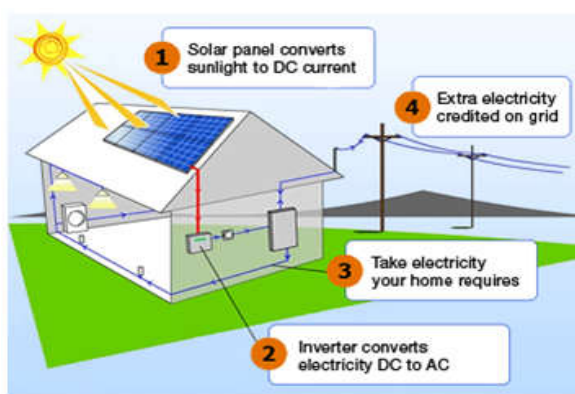

Figure 2.1. NET metering model

Implementation of model

Implementation of this model using two energy meters here battery voltage is monitoring the by voltage divider circuit taken two resisters 1kohm and 4.7kohm parallel .Then this value is converted in to digital value by the ARM processor after that it will taken its three levels conditions power will flow as explained in above. Here it two modes one is automatic mode in GPRS and another one is manual mode in GSM. Reading is uploading in to Hercules tool.

Experimental results

Result for High Voltage

Result is shown below is updated to website its stored data base value of individual unique ID is given for each home here its house name pavan. In its see the voltage high this indicate battery voltage is high its means that excess energy generated then its energy exported to grid (OUT) and also

simultaneously monitoring pulse from meter2 and also calculated cost based on pulse.

Figure 2.3. Implementation picture

Table 1. Experimental result for high voltage

For each pulse is equal to 4 rupees then pulse is increases it's automatically multiplied by 4rupees with corresponding counted pulses. For an example counted is 3pulses then it's multiplied 4 rupees then total cost is 12 rupees (3*4=12). Real time updating the pulses to data base .real time calculating how energy is given to grid then also calculating cost. Home owner will get more profit this can be monitor by the owner using unique ID for login to website to monitor detail information about IN and OUT of energy then cost of its. Amount is directly sending at every month end to owner account. Only one meter is running at a time in this case meter2 is running taking OUT reading then the meter1 will remains constant.

Result for Low Voltage

In this case battery voltage is low then energy is imported from gird for home appliances. Here meter1 is monitoring pulses but not in meter 2. Energy taken from grid is IN then pulses is counting from 3 to 4 that time OUT will be remains constant. Table 2 shown result for low voltage.

Table 2. Experimental Result for Low Voltage

Result for Medium Voltage

In this case battery voltage is medium then it's not takes place import and export of the energy. here two energy meter will be meter1 and meter2 will not takes place pulses count this indicate its only use the solar energy to home appliances .

Flow of energy

Solar to loads and grid –for high voltage level in battery
Solar to loads –for medium voltage level in battery
Grid to loads –for low voltage in battery

Conclusion and Future

The designed system is easy to implement and very customizable according to the needs. It provides very effective techniques of using the renewable energy resources whenever energy become lesser then loads required that time nonrenewable energy takes to loads. New concept is added for real time updating the full energy consumed information to the website its individual data base is stored in its user detail .The user can easily monitor billing and also power which is taking to the grid or given to the grid of this all this information directly in website .This design is applicable for solar, wind and other renewable energy resources. It gives a very effective method for implementing green energy concept on a larger scale.

Future Enhancement

IOT based Connect and disconnect of the electricity (grid) connection to customers net home is full controlled and monitored by the company persons.

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