

An Analytical Approach in Support of Using Stored Electric Energy than Grid Supplied Electric Energy for Ensuring Continuity in Small Scale Electricity Demand

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Abstract: Modern human life is closely associated with electric energy of different scales. This electric energy varies from different rates of voltage and power. The required electric energy may be classified into following four categories such as small, low-medium, high-medium, huge. Except huge other three categories can be met from stored electric energy. This ensures uninterrupted use of small electronics equipment by recharging their batteries like mobile phone, walky-talky, toys, watches etc. Evening time lighting, small electric fans etc. can be run from direct 12V of the battery. Extremely required cooling system and elevators can be kept in operation by using suitable inverter. A good amount of energy required to meet the requirements of several days can be kept stored in Lead acid batteries. In urban areas this energy can be stored from supplied grid lines while in rural areas energy can be stored from wide spread solar panels. In cloudy days small diesel generator or Human pedal generator can be used for charging batteries. Strong wind or vigorous current of water can also be used for charging batteries if available.

Keywords: stored energy, continuity, battery, solar panel, charger, inverter.

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I. IMPORTANCE OF ELECTRIC ENERGY

Now a days, it seems like unlimited sources of enjoying life using electric energy. Electricity has as much as importance in human life that we can't imagine life without it. It has become a compulsory need. Using electricity in every sector of the modern civilization has made our life facile, flexible and comfortable. We can better understand the importance of electric energy when there is an interruption in the continuity of electricity. Although In urban areas it is a less amount, lingering interruption keeps a bad impact in rural areas. For not habituating with the violation we develop an idea to use stored energy to reduce & solve the problem.

As we know, for the development of a country or civilization energy is necessary. Different types of energy used in modern times has made the world facilitated with shorter working times. Electricity is the most important form of energy among all the forms of energy like heat energy, chemical energy, gravitational energy, nuclear energy etc. The most important thing about the electrical energy is that it can be converted to different types of energy we daily use. This is a great advantage of electrical energy. Human life is facilitated with heat energy which can be easily achievable from electrical energy. Not only heat energy but also mechanical energy and some other energy are obtained from electrical energy.

Because of cheapness, easy operation & control, electricity is widely used by all kinds of people in different level in society. Electricity can be used in domestic, agriculture, transportation, industrial production, hospitals, research & commercial purpose. The demand for electrical energy is growing with the development of technology. Now, modern life is well informed about the importance of electricity. In this stage of modern era if there is a shortage on the availability of electrical energy, It's just a misfortune for any kind of country or civilization. It mostly happens in under-developing or developed countries like Bangladesh. So our approach to reach in rural areas of such countries where interruption of grid electric power for a simple or smaller reason or no purpose has become a habituate. The habitation of being deprived day by day are making people to lag behind in progress. It's important to find more & more alternative sources of electrical energy.

Any kind of electrical instruments we use is easily controlled by switching on/off. Before 1752, when Benjamin Franklin believed that electricity can be exploited from lightning, people couldn't think about electricity. In the

next many researchers & scientists are really devoted to invent new technologies/pattern on the basis of electrical energy. If electricity wouldn't be discovered, even the single electric bulb for light, think of life, it would be just elegiac in comparison to present era. Electricity is moveable energy. One can use any device run by electric energy anywhere he wants using conductors which is not possible by other form of energy.

II. CLASSIFICATION OF ELECTRIC ENERGY BY REQUIREMENTS:

As we said before in abstract, electrical energy can be classified into four categories according to users' energy requirements: small, low-medium, high medium & high category.

2.1 Small energy requirements:

Electric energy requirements of lower class people are in this category. In remote or outlying areas where electricity supply is not available or it often takes a break for a longer time, electric energy requirements of the people living in those areas are included here. Again the Basic needs for electrical energy of the people can be omitted by small amount of energy which is stored. The people from slum in urban areas who are deprived from the amenities of electric energy can lead their daily life easily with stored energy. For the impoverishment they are incapable of buying electric energy from the Grid. Unexpected load shedding for any kind of disasters like storm, heavy rain, rock rain, lightning etc. can cause a severe situation for the locality. The people who can consume energy are also being deprived for those reasons. In such cases stored electric energy can solve most of the problems arisen related to electrical energy.

The world's most overpopulated countries include Bangladesh as it has 150 million people of which 31% live under below the national poverty line. Their daily income is approximately US\$2 & monthly it becomes 4 to 5 thousands in Bangladeshi taka. They have no lands or 0 to half acre land. In villages every unit of people have some empty or devoid or unnecessary lands or places where they don't have to do work. As the sources of electric energy for getting stored energy they can use the unused lands for developing projects of lower costs which will help to reduce scarcity of electricity. The projects may include Biogas project, wind turbine, solar panel. Human pedaling etc. People living in rugged hilly areas can develop wind & water turbine to generate electricity.

The lower class people are generally day laborers & illiterate. They are far away from the science & technologies. They can't use the life easier technologies for the scarcity of knowledge that's why they are always deprived of any kinds of advantages (energies) like in case of using alternative ways of getting electricity. To get rid of electric problem stored energy is very helpful. They may use an electric bulb & a fan in the evening. To communicate they may use a mobile charger. For the entertainment they may use radio, TV. The electronic devices that consume very small electric energy may be a mobile charger, lamp, electric bulbs, fan, small charger fan, water heater etc. can be run by stored electric energy efficiently. To get stored energy lead acid batteries are very useful & efficient.

The calculation of small energy requirements of a small unit of population per day(24 hours):

Energy consuming devices	No. of device	Voltage in volts	Current required in ampere, I=P/V	Electric power required in Watts (time in hours)	Electric Energy in Wh
Electric bulb(energy saving)	2	220	0.1A, 0.27A	24W, 60W(6h)	144,360
Mobile Charger	1	220	0.0182	4W(1h)	4
Torch light	1	220	0.03636	8W(1h)	8
Small charger Fan & ceiling fan	2	220	0.1136,0.34	25W(2),75W(14h)	50,1050
ater/ice cooker	1	220	1.136	250W(0.5h)	125
Radio, TV(19'' color)	2	220	0.009,0.1818	2W(0.5), 40W(8h)	1,320

Total power =488W & total energy required= 2,062 Wh =2.062 KWh per day

Total Battery required:

For 220Ah 12V rechargeable Lead Acid Battery,

Battery discharge= 50%, Inverter efficiency= 85%, Charge controller efficiency= 90%

The input energy required=12V \times \approx 220 Ah \times 0.50 \times 0.85 \times 0.90= 1009.8Wh

Battery required= $\frac{2,062Wh}{1009.8Wh} = 2.04 \approx 2$

2.2 Low-medium energy requirement:

Electric energy requirements by lower-middle class people in our society can be described by this category whose sources of earning are generally small business, lower level job or lower middle class householders dependent on agricultural lands. The amount of their agricultural lands is half to one & half acre & their monthly income varies from twenty to thirty thousandtaka. Their lifestyle is better than lower class people but they can hardly use new projects & technologies because of amassing money for that purpose over a long period of time. A large number of them is literate & developing in educational sector that's how they are becoming flexible to science & technologies acquiring knowledge.

Using stored electric energy would be more reliable, comfortable & economic than grid electric energy supply as they consume more energy than lower class people. As more consumed energy costs more. The electronic devices used by them can be run by stored energy economically at lower costs. Besides using obligatory energy they feel additional energy requirement. That's why the electronic devices like computer, iron, air cooler, air condition, small motor, freeze, micro-oven, etc. are added to their daily requirements. The calculation of low-medium energy requirements of a small unit of population per day (24 hours):

List of the power consumption of typical household appliances (low-medium):

Energy consuming devices	No. of device	Voltage in volts	Current required in ampere, I=P/V	Electric power required in Watts	time in hours per day	Electric Energy in Wh
Electric bulb (energy saving)	2	220	0.2727, 0.4545	60W, 100W	7h	420, 700
Ceiling fan	2	220	0.3409, 0.3409	75W, 75W	16h/per phone	1200, 1200
TV(25'' color)	1	220	0.682	150W	2h	300
Fridge	1	220	1.818	400W	24h	9600
Rice cooker	1	220	1.1364	250W	45min/60=0.75h	187.5
Electric iron	1	220	4.545	1000W	2h per week/7days =0.286h	286
Smart phone Charger	2	220	0.0318, 0.0318	7W, 7W	1h/phone	7, 7
Desktop computer	1	220	2.045	450W	3h	1350
Internet router	1	220	0.0227	5W	24h	120
Total				2579W		15347.5Wh =15.3475 KWh

Total Battery required:

For 220Ah 12V rechargeable Lead Acid Battery,

Battery discharge= 50%, Inverter efficiency= 85%, Charge controller efficiency= 90%

The input energy required=12V × ≈ 220 Ah × 0.50 × 0.85 × 0.90= 1009.8Wh

$$\text{Battery required} = \frac{15347.5Wh}{1009.8Wh} = 15.198 \approx 15$$

For 220h 24V DC,

Input energy required= 1009.8Wh × 2=2019.6Wh

$$\text{Total Battery required} = \frac{15347.5Wh}{2019.6Wh} = 7.599 \approx 8$$

2.3 High-medium energy requirement:

High-medium energy requirements are needed by middle class people in our society whose livelihood depends on generally various kinds of business, job etc. Besides of essential demands for electric energy, this type of energy requirements supports people's daily life with luxury. As they do medium level job with salary ranged from thirty to fifty thousand taka & householders own a quantitative amount of property, it's very normal that their lifestyle is better than low & lower middle class people. Because of supporting little bit splendor in life people don't support any disturbance & discontinuity in supplying electric energy available. This project may bring a great opportunity for them to get updated to science, new projects & technologies as well as knowledge about all sources of electric energy. Stored electric energy system should be implemented for reducing dependability on grid in case of normal & abnormal situation. This class for energy requirements costs more than other type as the people have been facilitated by additional energy using appliances like air conditioner, micro-oven, small fish or poultry hatchery, or small cattle firm, refrigerator, water pump etc.

List of the power consumption of typical household appliances (high-medium):

Energy consuming devices	No. of device	Voltage in volts	Current required in ampere, I=P/V	Electric power required in Watts	time in hours per day	Electric Energy in Wh
Electric bulb (energysaving)	3	220	0.454, 0.454, 0.272	100, 100, 60	7h	700, 700, 420
Ceiling table fan	3	220	0.3409, 0.3409, 0.1136	75, 75, 25	16, 16, 2	1200, 1200, 50
Color TV	1	220	0.7954	175	2	350
Fridge	1	220	1.82	400	24	9600
Electric iron	1	220	4.54	1000	3h per week/7d=0.4286h	428.6
Smart phone Charger	2	220	0.0318, 0.0318	7, 7	1 phone	14
Desktop computer laptop	2	220	0.454, 0.454	100, 100	3	300, 300
Internet router	1	220	0.0227	5	24	120
Air conditioner	1	220	18.18	4000	6h	24000
Submersible water pump	1	220	1.818	400	0.5h	200
Food Blender	1	220	1.818	400	15min/60=0.25h	100
Micro-oven	1	220	9.77	2150	25min/60=0.42h	903
Small fish or poultry hatchery/cattle firm	1	220	90.9	20,000	24	480,000
Total						520585.6Wh=520.586KWh

Total Battery required:

For 220Ah 24V rechargeable Lead Acid Battery,

Battery discharge= 50%, Inverter efficiency= 85%, Charge controller efficiency= 90%

The input energy required= $24V \times 220 Ah \times 0.50 \times 0.85 \times 0.90 = 2019.6Wh$

Total Battery required= $\frac{520585.6Wh}{2019.6Wh} = 257.76 \approx 258$ For 1000 ah 48v Battery

The input energy required= $48V \times 1000Ah \times 0.50 \times 0.85 \times 0.90 = 18360Wh$

Total Battery required= $\frac{520585.6Wh}{18360Wh} = 28.35 \approx 28$

2.4 High energy requirement:

Stored electric energy project does not support high energy requirements because of its higher cost & unprofitable condition/ deeds. Energy requirements of people from upper middle class & high class are included in this category whose sources of earning are big business or high level job. They better use grid supplied energy or energy from personally developed projects or substations. The problems arisen by discontinuity of electricity supply could be solved by generator, IPS, solar panel, or other alternatives.

III. SOURCES OF ENERGY TO BE STORED IN THE BATTERIES.

There are various ways to store energy in the batteries. They are described below.

3.1 Human pedal generator:

Using human generator electricity generation is possible. To make it well understandable the project would be elaborately described. There are almost every household keeps bicycle for short distance travelling. This can be used to produce electricity. Rotating the bike's pedals placed at cradle will store kinetic energy which further helps to produce power & people will be able to check their performance criteria like total distance, body rhythm etc. If one pedals faster then more amp of electrical current would be produced.

Construction:

DC generator would be mounted with the wheel of the bicycle whose armature coil would rotate producing DC. The apparatus needed for the project are:

- A bicycle in decent condition;
- Bicycle stand or tools like nut, bolt, some wood, screw to make stand;
- 300 Watt DC generator/scooter motor/bicycle dynamo;
- Adjustable V-belt, chain & others to make a couple of bicycle's pedal with the motor;
- Battery charge controller;
- AC inverter;
- Multimeter for measuring voltage level;
- Lead acid batteries as storage;
- Blocking diodes (i.e. zener diodes);
- Terminal blocks & wiring kits etc.

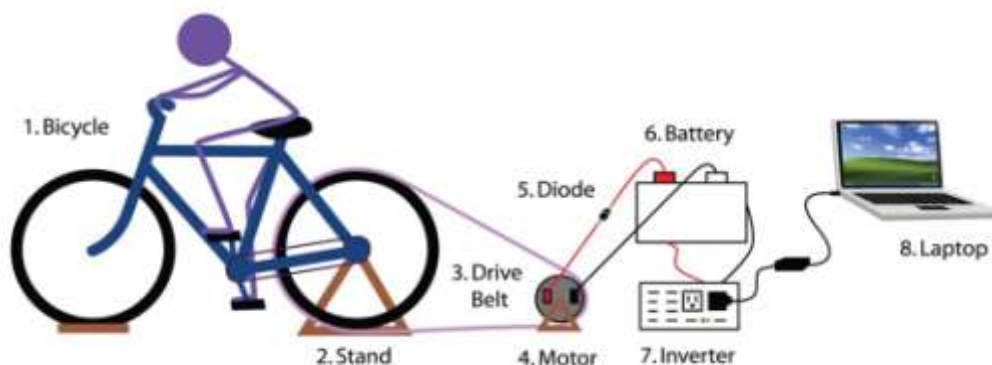


Figure 1: Electricity is being generated from a human pedal generator

Firstly a bicycle stand to be set up in a decent location. People can buy the stand or make with some woods, nuts, bolt & screw at home that can hold bicycle strongly. One can use either wheel of the back or front. Any device from DC generator, car alternator, stepper motor or scooter motor can be used for spinning. Adjustable V-belt, chain & other connecting tools together with bike's wheel will make a coupler with the motor. As dynamo spins with the rotating wheel of the bike, it produces voltage which is proportional to its rpm. As a result current flows through the circuit. A battery charger controller will be used for charging the battery. In this case positive output of the generator will be connected to the input of the charger & vice versa with the ground connection. The batteries will be lead acid battery of rating 12V 18 amp-h. Then an AC inverter or adapters in small scale will be connected with the battery matching its positive & negative terminals to the battery. From inverter power can be used in AC loads.

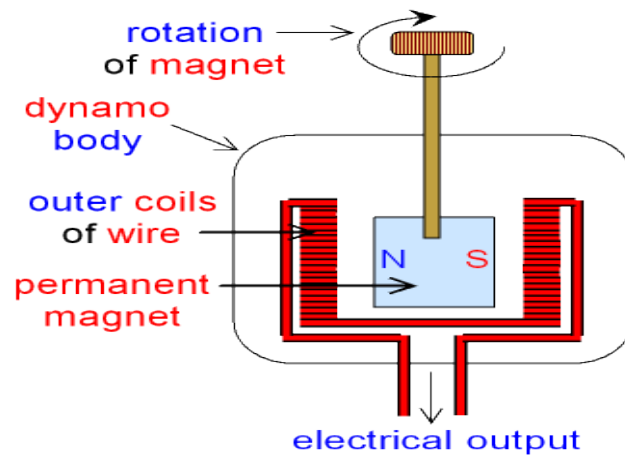


Figure2:A bicycle dynamo & its functions



Figure3: Wooden Stand of bicycle generator



Fig4: (a) AC inverter(b): Battery charger

Working procedure:When the wheel of the bike moves the rotor of the dynamo also moves. As we know, generator or dynamo induces current to the respective circuit by spinning a coil inside the magnetic field producing direct current or rotating magnet inside armature coil producing alternating current. And a potential difference is produced between the ends of coil which induces direct current and though the battery charger controller is stored into battery. It is better to use the back wheel for more rpm as well as voltage although it has some frictional losses. Battery will be charged at approximate 7.5 amps. Again higher the current higher the degree of charging but it will make the pedaling harder. Voltage across the battery may vary within 12V, 14V, 11V etc. while charging. It is better to stop charging if the voltage exceed 14V. For measuring the voltage differentials millimeter can be used. Zener diodes will be very helpful to prevent reverse current flow or overloading situation made accidentally with the charger. So, from battery we can use dc loads directly. Again using inverter working 12V we can produce AC for AC loads. If there is any overload of input voltage & shut off, the inverter will recognize for the protection of appliances.

Energy generated:

Generally A human pedal generator can produce 300 watt. If anyone pedal for 3 hrs in a month it will be 30 days x3 hoursx 300 Watts = 27000 watt-hours, or 27kWh that a small family consumes. Although it will meet 0.9% of energy needed, the amount of energy will be increased with the increasing number of pedaling hours.

Advantages:

- a) It is a fully independent source of energy beyond any of the sources.
- b) Produced electricity is clean.
- c) Beneficial for the health as it helps to lose weight.
- d) Using an old bicycle is great for the environment
- e) It is effective for the mind having peace.
- f) It reduces the dependability on national grid.
- g) It will reduce monthly & yearly cost of consuming energy.

3.2 Solar panels/ Photovoltaic (PV) solar panels:

Solar panels are the another active source for getting stored electric energy. It is an instinctive & effective source of energy because the sunrays are available free of cost. Only cost is applicable for its construction & apparatus. This type of storing energy is effective&also economic. Energy can be supplied directly to the loads by this process besides that of storing system. People from all social classes can build this project as it doesn't require empty land or free spaces. It can be implemented in rooftop where most of daytime keen sunrays exist.

Construction:

Solar cells are small devices to produce electricity from sun's rays. Its one cell can produce very small amount of electric energy. Together with several cells make a panel called solar panel which can produce a large amount of energy. A solar array consists of several solar panels. There are two layers of silicon crystal inside a solar cell. Top layers' atoms are unstable & want to get rid of. The bottom layer has some empty spaces to be filled with electrons. The whole arrangement provides a facility to move electrons from top layer to bottom layer in the presence of sunlight. Then a bunch of electrons move in a same direction. Two metal contacts are placed by the two sides of the array creating an electric circuit.

Installing an array of solar panels on a rooftop comprises the steps:

- i. Requires a primary beam member having a plurality of transverse receptacles;
- ii. Make a couple of a plurality of transverse rails to the transverse receptacles;
- iii. movably support a plurality of panel supports which have a hook portion from the transverse rails;
- iv. engage the hook portion with the solar panels in the preassembled array;
- v. and thenlift the preassembled array of solar panels and position the array onto the rooftop at a location proximate a perimeter of the facility.

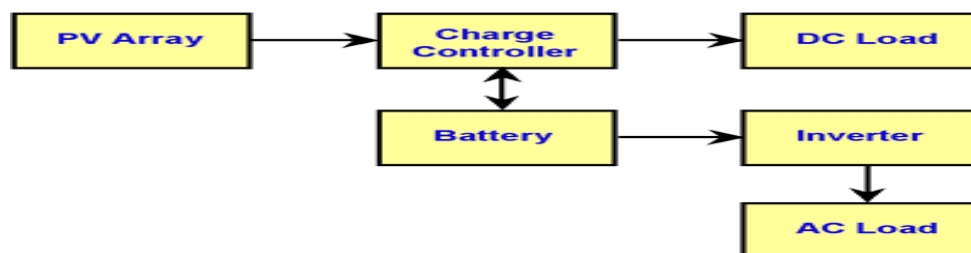


Figure 5:Block Diagram: Solar panel & storage systems

A solar charge controller be connected with solar array which is a system with MOSFET based technology. The term charge controller refers to a device that charge the battery from the solar panels. It helps to protect the battery from overcharged situation using solar module.



Figure 6:Solar charge controller

Then Battery bank to be connected with the charge controller. From battery two lines come out one of which would go to the inverter which can convert DC power to 230 V AC power. Another line would be connected to the DC loads. From inverter power would go to the AC loads through distribution cabinet. At a time two functions are being performed.

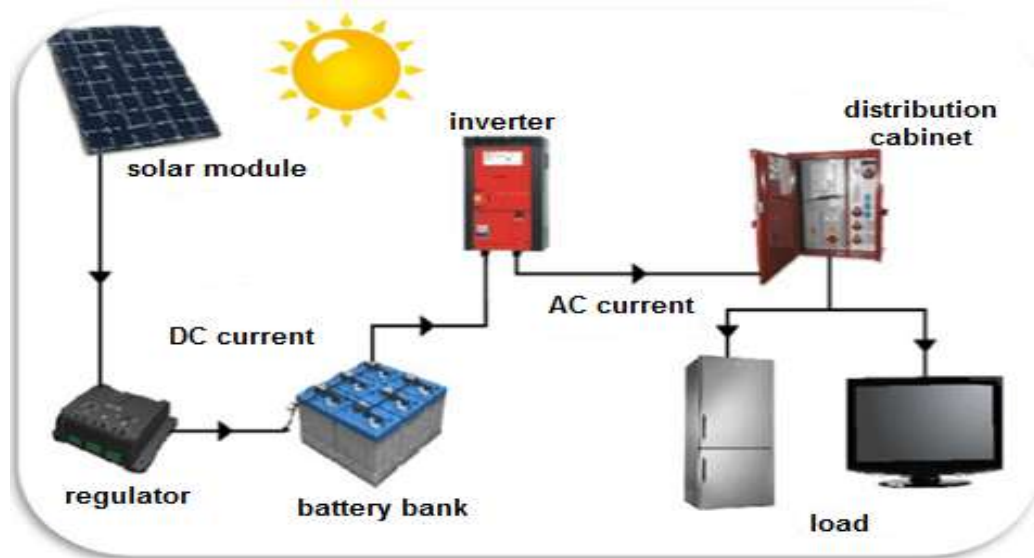


Figure7: Stored energy from solar panels

Working procedure:

At daylight sunlight continuously hits solar panels. Tiny particles of energy called photons released from the sunrays which are gets absorbed by one of electrons from the each electron bonds of silicon crystal of solar cells. The electron gets excited up to a higher level of energy & be free to move. And the freely movements of thousands of such electrons around the crystals produce direct currents. This way solar panels convert energy released from the sun into electric energy. Through charge controller energy becoming stored to battery bank that is direct current (DC). DC loads from house or business are run by DC. An inverter/ DC-AC converter converts the direct current into Alternating current (AC) to be used in AC loads for house, business or industries.

Calculation of Energy to be Generated & Number of solar Panels:

As electricity generation depends on the sun by this process, in sunny days more energy would be produced than in wet days. The number of solar panels will increase with increasing number of energy in KWh. During wet days the energy requirements can be omitted by using alternative sources of energy like human pedal generator or wind turbine etc.

In Asia continent, the sun is like always bright. Using solar panels all classes of energy requirements are possible.

Calculation for low level energy requirement:

For 8 hours in a sunny day power need to be generated from the sun = $\frac{2.062 \text{ KWh}}{8 \text{ hr}} = 0.25 \text{ KW AC}$ per day

Typically a modern solar panel produces about 250W DC in controlled condition. People need to convert 80% of DC into AC power. So, $\frac{0.25 \text{ KW}}{0.8} = 0.3125 \text{ KW} = 312.5 \text{ W DC}$ needed from the solar panels. Again 250W DC panel = 0.250KW

No. of panels needed for the project: $\frac{\text{DC}}{\text{Panel rating}} = \frac{312.5 \text{ W}}{250 \text{ W}} = 1.25$ panels

Calculation for low-medium level energy requirements:

Power needed from the sun = $\frac{15.3475 \text{ KWh}}{8 \text{ hr}} = 1.918 \text{ KW AC}$

In DC that is $\frac{1.918 \text{ KW}}{0.8} = 2.3975 \text{ KW} = 2397.5 \text{ Watt}$

No. of panels needed: $\frac{\text{DC}}{\text{Panel rating}} = \frac{2397.5 \text{ W}}{250 \text{ W}} = 9.59 \text{ panels} \approx 10$ panels

For high-medium level energy requirements: Power from sun = $\frac{520.5856 \text{ KWh}}{8 \text{ hr}} = 65.073 \text{ KW AC} = 65.073 \text{ KW} / 0.8 = 81.34 \text{ KW DC} = 81341.5 \text{ W} \approx 258$

By the sequence no. of panels needed: $\frac{81341.5 \text{ W}}{250 \text{ W}} = 325.36 \approx 326$ panels

Advantages:

- Users receive a credit on the electricity bills monthly for the generated electricity from solar facility. It saves 90% of the bills.
- It can be used as renewable energy using bidirectional energy meter. The excess energy to be sold back to the national grid after storing in storage.
- Solar panels produce clean energy with no waste & carbon emissions.
- Solar panel have long lifetime. Replacement cost will be lower.
- The power efficiency of a crystalline silicon is 22 to 23 percent

3.3 Strong wind or vigorous current of water:

Strong wind or vigorous current of water is one of the effective sources of generating & storing electricity. Energy extracted from water & wind flowing fast can be converted into potential energy & kinetic energy respectively which will further help to rotate the turbine. Turbine converts the potential energy & kinetic energy into electric power. The place selected for the project should be hilly areas or rocky areas or where strong wind or forcibly falling water is running. Hilly rivers or Waterfall also be the important energy sources for energy storing.

Apparatus:

- Small turbines
- Generator
- Rectifier
- Voltage regulator/charge controller
- Battery
- Inverter

Construction & Working procedure:

Wind turbine generator:

The turbine consists of blades, hub, Gearbox, generator, pitch system, low-speed shaft, high-speed shaft, controller, wind vane, anemometer, nacelle, tower, basement as shown in the picture:

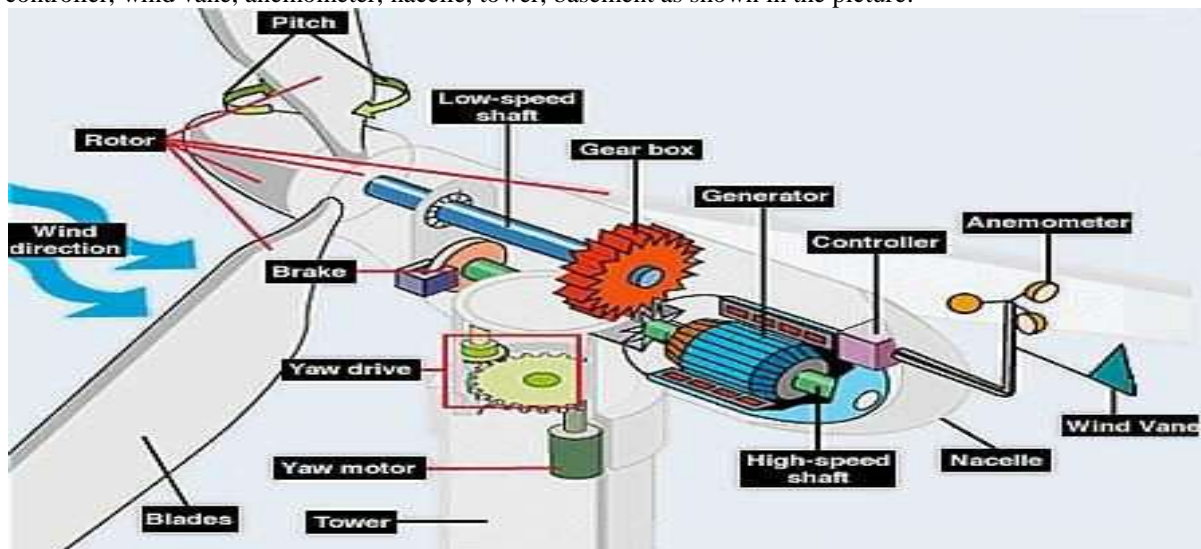


Figure 8 : Electricity production process from wind turbine

There are two types of wind turbines-1) horizontal-axis turbine 2) Vertical-axis turbine. Vertical wind turbine produces less amount of energy over time. It is the main drawback of it that's why horizontal-axis turbine are better to build. The main rotor shaft & generator are mounted at the top of the tower. Most of the turbines require a gearbox which turns the blades' slower rotations into faster rotations that drives the generator with more efficiency. Small turbines have wind vane for showing the direction of the wind.

Hub is the center of the rotor made by hub & blades. Brakes stop the rotor in emergency. The rotor turns the low speed shaft for making rotations at about 30 to 60 rpm & after getting connected with the high speed shaft increases the rotational speed up to 1000 to 1800 rpm. The high speed shaft drives the generator producing electricity. There is an anemometer to measure the speed & send data to controller. The yaw drive

keeps rotor facing in the direction of the wind. Nacelle holds low- & high-speed shaft, gearbox, generator, controller & brakes. The tower is made of steel lattice, concrete etc. Tall tower produce more electricity. While blades are turning, they are pitched to control the rotor speed. A rectifier can be used to produce DC as to store energy in battery. For AC loads it is needed to use inverter.

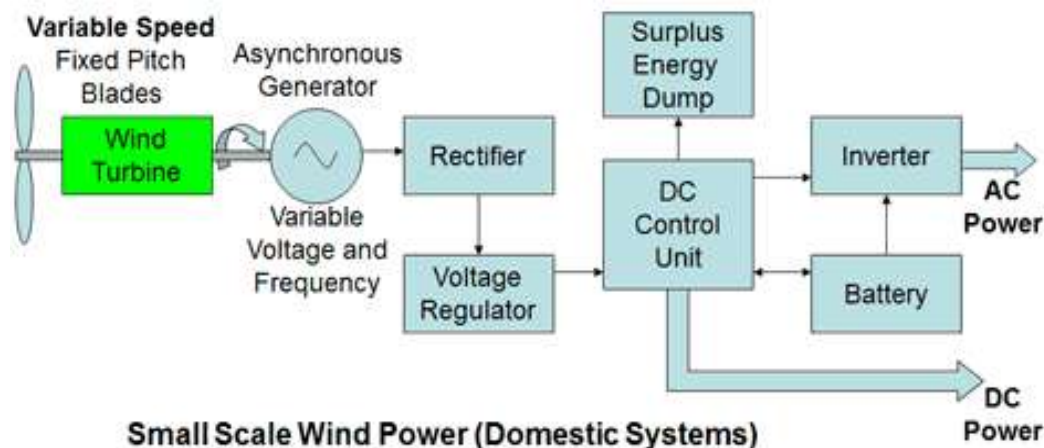


Figure9 : Block diagram of small scale wind turbine generator

Water turbine generator:

The same working procedures are followed by water turbine generator except the turbine functions. Here, small water turbine can be made in home with some woods, nut, bolts & metals. The other parts may be a motor which will be run by the turbine producing electricity, battery as storage, inverter for getting AC, connecting wires etc. Their functions are same as wind turbine generator. People can use natural currents of water or make the currents using pipe or tubes.



Figure 10: small water turbine

Energy generation:

The energy generation will depend on the currents of wind & water. According to Betz's law, the maximum power that can be extracted from wind & water turbine is independent of the design of a wind turbine in open flow & no turbine can capture more than 59.3% of the kinetic energy in wind. 0.593 is known as Betz's co-efficient. In practical any wind turbine achieves 75% to 80% at peak of the Betz's limit.

Advantages:

- a) Three blades turbines have low torque ripple
- b) They have good liability
- c) Wind & water is free of cost & they are renewable energy sources.
- d) Energy from wind is clean. It doesn't produce atmospheric emissions which is the reason of asthma or acid rain or greenhouse gases.

IV. & others: Other sources of getting electricity may include grid, small diesel generator. The energy requirements by all classes we described can be meet more successfully combining two or three projects together like solar panels, wind turbine, & Diesel generator & so on.

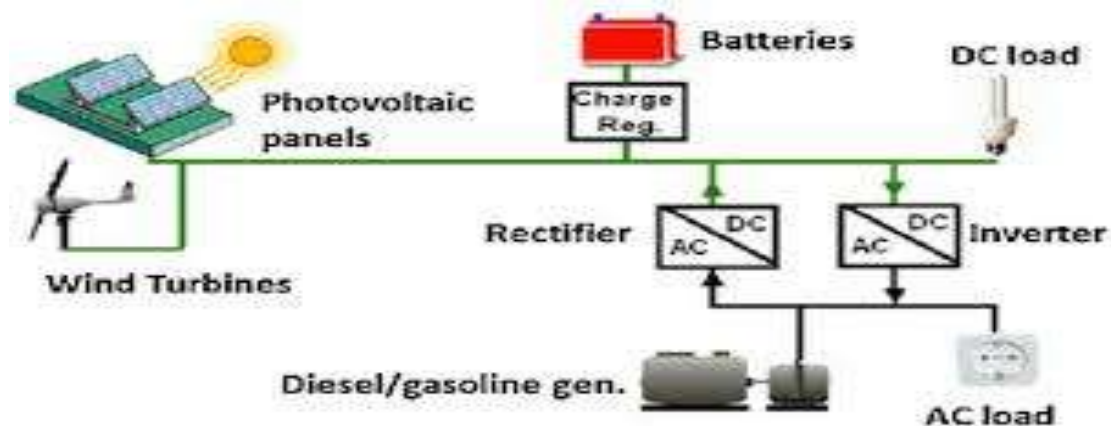


Figure 11: Combined source of energy with solar panels, diesel generator & wind turbine

V. WAYS OF CONVERTING STORED ENERGY IN TO USEABLE MODE:

In three ways people can run their appliances using AC or DC from stored electric energy. Energy storage having 12V DC can be used directly at some appliances like energy saving DC light, DC fan, TV, radio, computer etc. The other way is to convert 12 V DC into DC voltage in higher level which is applicable for the loads consuming high voltage DC. In this case DC to DC converter would be used. Again, using DC to AC inverter 12 DC be converted to 220V AC. All the appliances using AC can be run by this way.

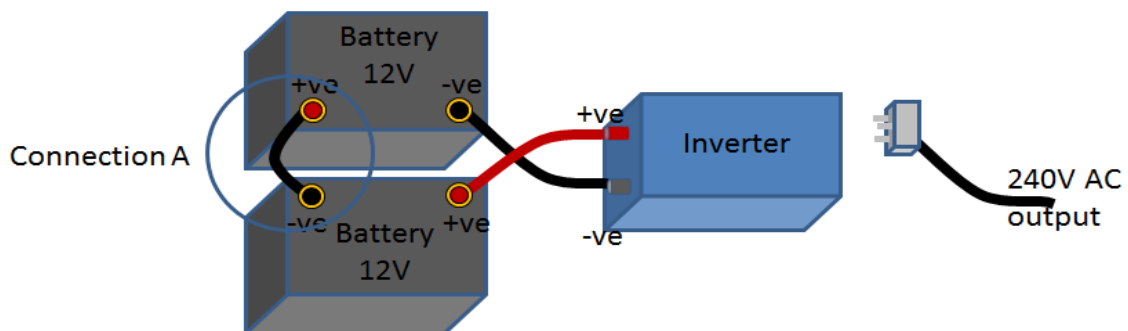


Figure 12: Conventional battery inverter connection

Choosing of an inverter: Most generally AC inverters are modified sine wave inverters. Choosing of an inverter depends upon the watts consumed by the loads. The inverter would be such that it can take the range of voltage inputs which is the output (12V to 14V) of a standard rechargeable battery. The frequency of the output will be at 60 Hz & it is considered as standard frequency over the world. As during transforming from DC to AC power it produces some heat, it is important to keep inverter in an open location for the protection of appliances.

VI. ECONOMICAL EFFECT:

- i. Monthly energy costs of grid electricity will be reduced for every unit of stored energy consumers.
- ii. Although the project requires initially a big amount of investment for developing it, but gradually it will reimburse the cost. Many banks give loan with less interests. People can take loan from banks for the initial cost.
- iii. Total costs of countrywide required energy will be minimized because comparatively less amount of energy need to be generated nationally after implementing the project.
- iv. No. of unit of population having small, low-medium, & high medium energy requirements are respectively
- v. Individually generated energy would help to reduce power deficit over the country. The country does not need to borrow electricity from abroad. So, the country will move forward in the economy.
- vi. As energy storage battery bunch would be used countrywide. In such a way enterprising business surrounding battery can be established over the country. This will keep a great importance in the economy removing poverty & unemployment of young generation.

- vii. Standby losses will be eliminated significantly from home appliances.
- viii. Using stored energy people can run different types of small machines, motors, tools, & instruments for cutting, sewing, stitching & wrapping things in Cottage industry which would help in earning livelihood.
- ix. Constructing projects in wastelands, barren fields, & wetlands would make the best use of the lands.

VII. SOCIAL AND ENVIRONMENTAL EFFECT:

Poor & illiterate people are well introduced with the scarcity of money. Because a large quantity of them are seafarers & day laborers. If there is any lasting convenience (কোনস্থায়ীসুবিধা) with lower cost they would be eager to take in. Setting up this project they would be introduced to the new projects & appliances they would help themselves to become flexible with new things. People will get some ideas about a better life & will be inspired to achieve. This will reduce the difference between upper & lower class people. Power outage is a great problem in villages & rural areas before final exam. Again stored, secure & continuous electricity can remove the Interruption in Children's education. That's how students wouldn't get the chance to be inattentive in study.

When there is no electricity in the hill areas and villages, then electric wire, transformer & other electrical equipment get stolen. It takes a lot of time to set up a village transformer when it is burnt or stolen. If people store the electricity generated from different sources of their own Grid, the problem will be solved easily. For the human development, the essential needs like electricity must be fulfilled. If people are weak here, the rest of the journey of prosperity will be even more difficult. So, the grassroots problem will be tackled in a tough way. The use of radio, internet, TV are increasing day by day which require regular power to run and the electricity stored will help a lot in this regard. In this way they will be updated about various information such as bonus, recharge, mobile banking, bKash etc.

VIII. DISCUSSION

We have discussed about all the possible sources of energy generation by homey. In future, these projects can be expanded group wise. With some unit of people or families a big project can be developed. There are some voluntary clubs in the village who can take these initiatives. They can open the gym or other firm by joint venture from which everyone will be benefitted and the electricity will be generated also.

IX. CONCLUSION

Electricity is the most important utility of a developed country. If the people of a country become self-dependent on using stored electric energy, the day is not far from the day of turning from underdeveloping country (i.e. Bangladesh) to a developed one. This project would help to bring a great change in the progress of the conversion. It must be implemented with the help of the residents as well as the Government. Government can keep a vital role to fulfill the project favoring some facilities to the poor offering loan with very less interests or interest free loan for the project & encouraging people for gathering knowledge & implementing the project. It will set some positive effects on human life as well as in economy & social environment. If the project be implemented over the country, every habitat would seem like a lying lantern & thousands of dwelling lantern would turgid the effulgence reducing the murk of the night.

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