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Use of Renewable Energy Sources in Construction of Green Building

Guduru Venkata[1], Suresh Bhargav[2], Sumit Choudhary[3], B.S.S.P.M Sharma[4]
[1,2,3]*Associate Lecturer, Mewar University*
[4]*Assistant Professor, Mewar University*

Abstract-This paper mainly aims towards the green building concept which includes the renewable sources used for the construction. The green building concept is very much useful in keeping the environment clean which on a certain view even increases the life period of construction. Building materials typically considered to be 'green' include renewable plant materials like straw and mud brick, timber from forests certified to be sustainably managed, recycled materials and other products that are non-toxic, reusable and renewable. The increasing population in a certain way has decreased available free land for new constructions. The choice of products used to build, renovate and operate structures has a significant impact on the environment. When specifying any materials, it is important to consider their life cycle environmental impacts. Wood products have less embodied energy, are responsible for lower air and water pollution, and have a lighter carbon footprint than other commonly used building materials. The paper mainly aims towards the few questions which are very much important in developing the infrastructure of the country.
The materials mainly used for constructing a green building.
The efficiency of the buildings which are made of renewable constructing sources.
The cost effectiveness of the buildings.
Green building mainly explains about the renewable sources used for construction which helps the building to resist towards the atmospheric changes.
Keywords: solar power, wind power, biomass power, geothermal power.

I. INTRODUCTION

A green building is also known as sustainable building, is a structure that is designed, built, renovated, operated or re-used in an ecological and resource efficient manner. A sustainable system generally can be defined in environmental terminology as a living system which continues by virtue of the fact that it does not use up resources faster than they can be naturally replenished. In economic terminology, a sustainable economic system is one in which the expenditures are at least equal or less than the income. In social terminology, a sustainable social system is one in which all members are empowered to contribute, creating a synergistic whole. These separate definitions are inextricably intertwined and interdependent at all scales, from an individual 'body', to a family 'body', a community 'body, a regional 'body' a national 'body' to an international 'body'. It is increasingly clear that decisions made on a personal level have repercussions on the global scale as well as the reverse.

II. GREEN BUILDING – COMPONENTS

A. General Considerations

Energy efficiency is a major concern and an essential component of green building. It has even become a major factor in its success. A green building must always be fitted with solutions that offer enhanced electrical energy management, reduce consumption and contribute to supplying quality energy. Renewable energy sources present the advantage of being available in unlimited quantities. Their use is a way of satisfying our energy needs while conserving the environment. The main forms of renewable energy are solar power, wind power, biomass power, geothermal power, hydraulic power, etc.

III. THE GREEN BUILDING

A. Natural Construction

A natural green building construction must satisfy two additional imperatives: the adaptation of the architecture to the landscape and its measurable data, alongside the use of natural materials, which if possible are renewable. The choice of the site must be made according to natural data. Architectural forms must be inspired by nature, with colors that do not seem artificial. Natural building

techniques use the materials that nature provides. When these materials replace polluting synthetic products which consume a large quantity of energy in their manufacture, their use is highly recommended. The term "natural materials" essentially covers local (renewable) raw materials that can be used according to traditional craft methods or modern techniques.

B. Passive Building

The expression "passive building" refers to a construction standard that can be achieved using various types of construction materials. It can also mean a green building construction that guarantees an interior climate as comfortable in summer as it is in winter without a conventional heating system. Taken from the German word "Passivhaus," this expression concerns both collective and individual habitats. The purpose of the passivhaus is to reduce energy consumption in residential buildings by capturing a passive solar energy contribution, reinforcing building insulation, using renewable energies and recuperating heat.

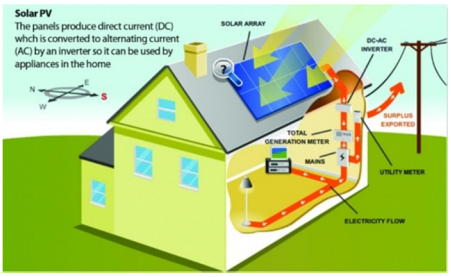
Individual passive houses are often compact. This is one condition for achieving low energy consumption.

To build a passive building, the following requirements must be satisfied:
High quality triple-glazed windows;
Building orientation to capture passive solar energy
A dual-flow mechanical ventilation system with a heat recuperation rate of at least 75%. Solar thermal units for hot water requirements.

IV. RENEWABLE ENERGY

A. Solar Power Systems

Solar energy is the source of the water cycle and of wind. The plant kingdom, on which the animal kingdom depends, also uses solar energy by transforming it into chemical energy through photosynthesis. In solar systems connected to the electricity grid, the PV (Photovoltaic) system supplies electricity to the building and any daytime excess may be exported to the grid. Batteries are not required because the grid supplies any extra demand. However, to be independent of the grid supply, battery storage is needed to provide power at night. Solar heating systems can be installed in all types of buildings. Using solar power to pre-heat outside air before it is allowed to enter a building can considerably reduce heating costs both in residential buildings and commercial constructions. Solar heating systems are especially efficient for large buildings such as hospitals, hangars, school and gyms, as well as multi-story residential buildings. To make solar electricity available on a large scale, scientists and engineers around the world have been trying to develop a low-cost solar cell for many years. Such cells must be very efficient and easy to manufacture, with a high yield. The vast majority of solar heating systems require the installation of solar walls. Such equipment can be installed on new or existing buildings. Solar walls require very little maintenance, feature no liquids or detachable parts other than the ventilators connected to the ventilation system. Moreover, solar walls can operate under cloudy conditions and at night time, even if their efficiency is much less. The ROI is two years due to the energy savings they produce.

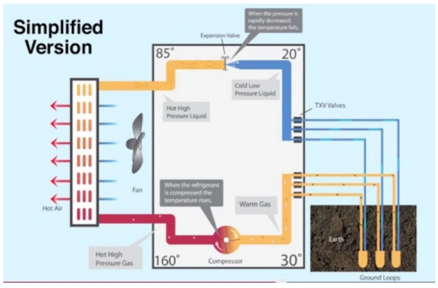


B. Geothermal Power

If you're looking to cool your home in the summer, for example, one of the uses of geothermal energy technologies is to allow you in hot times to take heat from your house, send it down pipes into the ground (where it naturally cools), and return it to your house (where it helps bring down the temperature inside). The technology typically uses a liquid like antifreeze as a carrier of that heat, which is moved about in a closed-loop piping system. One of the other main uses of geothermal energy is the same concept but in reverse in cold months. Geothermal energy technology is used to bring warmer temperatures into your home without using fossil

fuels, just by tapping into a heat exchange deep below the surface of the earth.

How it works



1St we will drill the copper pipes into the ground below 5 feet where temperature is constant. We use copper pipes because it has a superior heat transfer properties. Each bore hole is drilled vertically and spaced 7 feet apart. This prevents the ground loop interference. Each bore hole has 7 foot diameter cylinder they uses this area together the earth energy. Now coming to simplified version of how heat pump works when heating your home all heat pumps have one compressor and one expansion valve that manipulate refrigerant. A refrigerant has two phases' gases and liquid. Refrigerant work on basic principal that if you rise the pressure you rise the temperature and if you lower the pressure you lower the temperature. It all done by compressor and expansion valve. Let's say refrigerant started its journey in gases stage and enter into the compressor at a temperature of 30 degrees the compressor compress the gas which increases the pressure and rises its temperature to 160 degrees and refrigerant travelled to coil where fan blows across it air blowing across it will absorb heat energy and distribute it throughout the home. As the refrigerant lease the coil it condensed back to liquid state and moves towards the expansion valve at a temperature of 85 degree. Expansion valve is basically a dam with small hole when refrigerant pass though the expansion valve the pressure rapidly fall and temperature decreases to 20 degrees and then it moves towards TXV Valves this valves control the amount of refrigerant distributed to each ground loop then the refrigerant is piped out to the vertical bore holes where it beings its transformation back into gas. As transition back to its gases state and then it absorb heat energy from the earth and travels back to the compressor where this engines process is repeated. When cooling is desired this process is reversed.

C. Wind Power

Wind energy is a dynamic if invisible resource—the energy available in a moving mass of air. From grain grinding by simple wind-driven machines in ancient cultures to modern electricity-generating devices, the wind has been tapped to work for us. Wind power is extracted from air flow using wind turbines or sails to produce mechanical or electrical power. Windmills are used for their mechanical **p**ower, windpumps for water pumping, and sails to propel ships. If you have enough wind resource in your area and the situation is right, small wind electric systems are one of the most cost-effective home-based renewable energy systems -- with zero emissions and pollution. Wind is a cubic energy resource. As the wind speed increases, the power available increases cubically. This means that it's very important to get into higher wind speeds, and the way we do that is with taller towers. Regardless of the turbine or tower type, going higher is the tried-and-true, reliable way to increase performance in a wind generator. And the most common mistake in wind electricity is installing a turbine on a short tower. The swept area of a wind turbine is the second most important factor (after the wind resource itself) that determines energy production. The circle "swept" by the blades is the collector area. It's not possible to get a large amount of energy out of a small collector area. Betz' theorem says we can only get about 60% of the energy out of the wind before we start slowing it down too much and actually decreasing performance. In the real world, well-designed machines can achieve about half of that. Turbines can be divided by orientation, directionality, generating mode, and by other characteristics. Horizontal-axis wind turbines (HAWTs) are the most common and effective orientation. Vertical-axis wind turbines (VAWTs) may appeal to the uninitiated, but continue to disappoint as far as performance and longevity—both of the machines and the companies. Upwind (the wind hits the turbine before it hits the tower) and downwind (the wind hits the tower before it hits the turbine) designs can both be very effective. Generating devices generally fall into one of three categories. Most home-scale turbines use permanent magnet generators (PMGs), which typically have fixed coils of copper wire and rotating groups of magnets that pass by them. Some older machines use wound-field alternators, which use a small amount of the wind energy to create electro-magnetism in the rotating part of the alternator. Induction motor/generators use conventional induction motors, but

have the wind push them beyond their normal operating speed, which takes them from using electricity to making electricity. Three basic tower types are used for residential wind-electric systems. Freestanding towers are the most expensive, but can be installed in very close quarters, and are perhaps the safest to install and maintain. Tilt-up towers allow all maintenance and repair to be done on the ground, but require a large open area for installation and use. Fixed-guyed towers include lattice and pole styles that do not tilt, and must be climbed for installation and service. These are typically the least costly, and need a moderate area for installation. A wind-electric system is much more than just the wind generator and tower. Also required are transmission wiring, electronic controls, batteries if storage or backup is desired, an inverter for household AC or grid-interconnect, as well as metering, overcurrent protection, and other standard electrical components. All appropriate components should be chosen for compatibility and functionality—it takes a whole system to make wind electricity.

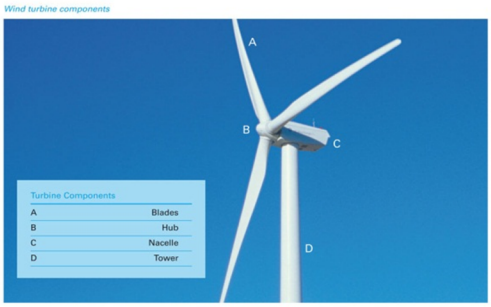
Small wind electric systems can:

Lower your electricity bills by 50%–90%

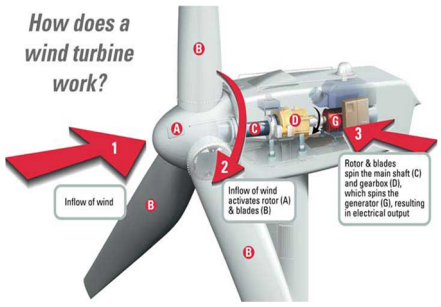
Help you avoid the high costs of having utility power lines extended to a remote location

Help uninterruptible power supplies ride through extended utility outages

1) Parts Of A Wind Turbine:



a) Blades: Lifts and rotates when wind is blown over them, causing the rotor to spin. Most turbines have either two or three blades.
b) Hub: In simple designs, the blades are directly bolted to the hub and hence are stalled. The hub is fixed to the rotor shaft which drives the generator directly or through a gearbox.
c) Nacelle: Sits atop the tower and contains the gear box, low- and high-speed shafts, generator, controller, and brake. Some nacelles are large enough for a helicopter to land on.
d) Tower: Made from tubular steel (shown here), concrete, or steel lattice. Supports the structure of the turbine. Because wind speed increases with height, taller towers enable turbines to capture more energy and generate more electricity.



e) Biomass: Biomass is generated by photosynthesis, where solar energy is stored by plants in the form of carbohydrates, as they use the carbon dioxide in the atmosphere.

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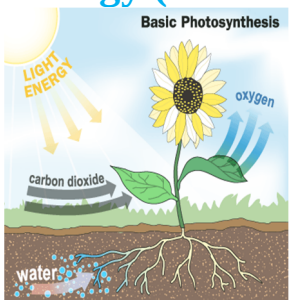

Cost of a green building

Usually, the ecological properties of a building are considered as an additional cost. In this vision of things, the construction of a green building is inevitably more expensive that a less eco-efficient solution, as it implies the use of high quality materials, high efficiency materials and a more complex work flow. The approach that consists in considering that the payment of a supplement is inevitable to make a project eco-sound is now fading away to allow more holistic designs and a global vision of project costs and benefits.

Today, research scientists, architects and owners observe that a program that is oriented to sustainable development from the outset may enable us to discover techniques that will bring environmental and social benefits without additional costs. For example, by simply orienting a building to exploit its windows and capture passive solar heat as much as possible, promoters and architects can create their designs with a mind to consume less energy, increase the sustainable development aspects and improve daylight penetration, which can increase employee productivity without incurring additional construction costs.

A green building can even help the owner eliminate expenditure from the outset. The choice of cooling equipment is a good example. In this way, if heat losses on an eco-construction project are reduced to a minimum through efficient lighting and the building envelope is eco-efficient, the building will need a much smaller cooling capacity. This can therefore avoid having to install an additional cooling system and can even reduce the project budget significantly.

All India (Anticipated) Power Supply Position in FY2014-15

Region	Energy		
	Requirement (MU)	Availability (MU)	Surplus(+)/Deficit(-)
Western	288,062	289,029	+0.3%
Southern	298,180	260,366	-12.7%
Northern	328,944	318,837	-3.1%
North-Eastern	14,823	12,248	-17.4%
Eastern	118,663	114,677	-3.4%
All India	1,048,672	995,157	-5.1%

V. CONCLUSION

Green building reduces energy consumptions in numerous ways. Decrease embodies energy of the building through efficient design,use of recycled and local materials and recycling construction waste. Green building design reduces energy consumption over its lifetime. Strategically placing windows and skylight can eliminate the need for electrical lighting during the day. High quality insulation reduces temperature regulation costs in both summer and winter. Green building consumes less water as compared to conventional building. And from above table that is "All Indian Power supply Position in FY2014-15" we can see that how much energy is required and how much energy we are available with and from that table we can conclude that India is not in a situation to provide energy what is needed so whoever financially strong can make a green building by using renewable energy sources and we can avoid this problem.

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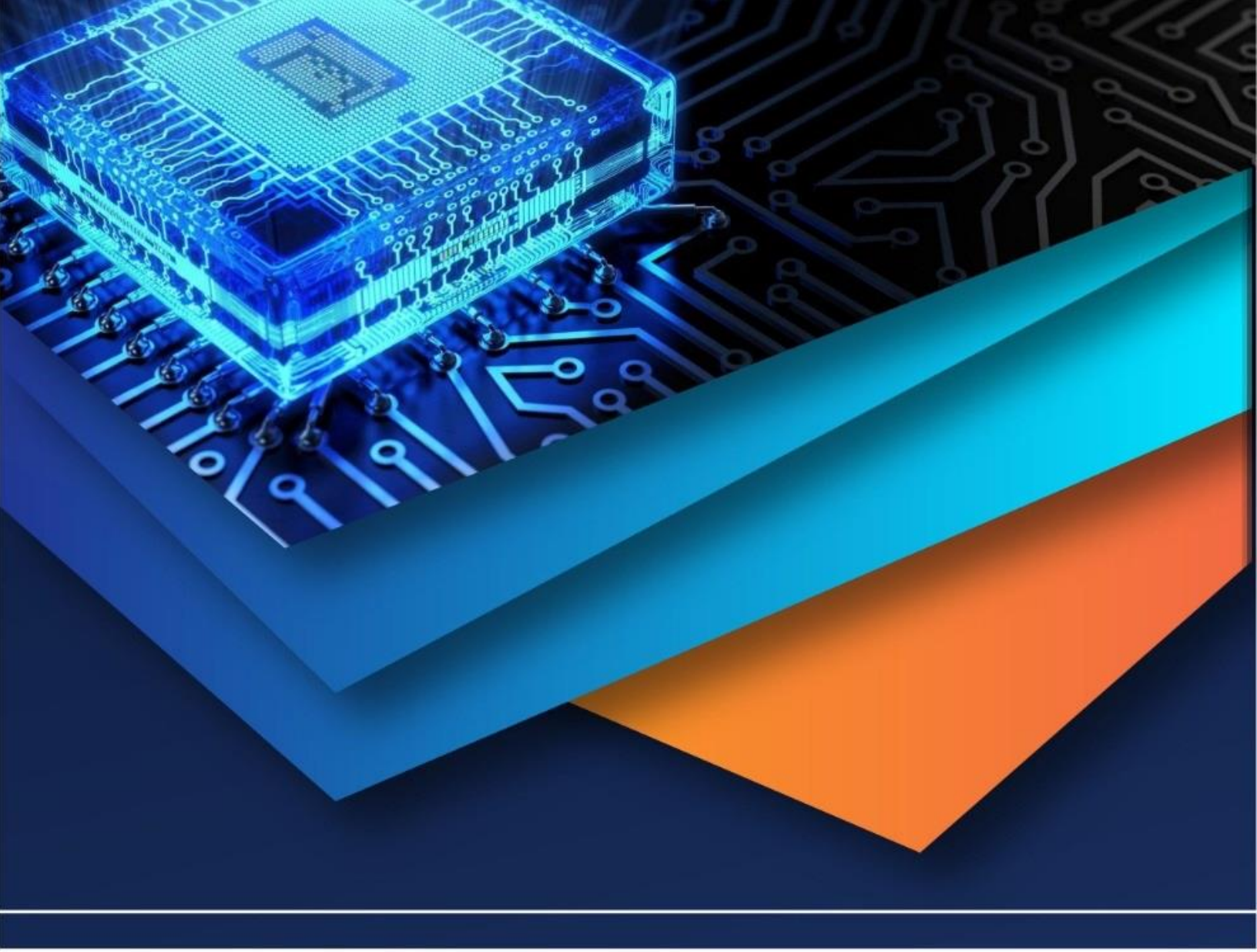

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