

Study On Net Zero Energy Building

Vansola Nirali¹, Vikas Bhavsar²

¹PG Student M.E. (Civil) Infrastructure Engineering, L.D.R.P Institute of Technology & Research Gandhinagar

²Ass. Professor, Dept of Civil Engineering, L.D.R.P Institute of Technology & Research, Gandhinagar

Abstract: It is reported that 30 to 40% of all of the primary energy used worldwide is used in buildings. This high energy use may directly or indirectly affects the environment. Also it causes climatic changes, degrades the environment and increases the air pollution. Hence it is necessary to reduce the energy consumption in the building and necessary steps to be taken to make the buildings more environmentally sustainable. In recent years, zero energy building concepts is developed to overcome this problem. The zero energy building uses natural energy sources to meet the energy requirements of the building. In this work, we have carried out a study to analyze the performance of a zero energy building and found that it is possible to have such building in India.

Keywords: Building Energy Consumption, Climatic Change, Zero Energy Building

I. INTRODUCTION

India is the developing country and has become one of the major energy consumers in the world. High consumption of resources is one of the major issues in our country. The heavy consumption of resources is not only extremely costly but also extremely bad to the environment. Energy efficient building is the one of the superior way to building a better future. The net zero energy buildings use the Renewable Energy Resources. The source of energy which can be used again and again without threatening the nature so much is known as Renewable Energy Resources. Sunrays, wind, rain, tidal energy and geothermal heat are some examples of Renewable Energy Resources. Some activities like reuse of paper, growing organic food, and reduce the use of water and electricity have over the years proved to be useful, but none of them have provided a proper solution to this recent problem the way Zero Energy Homes have. Unlike typical households that consume vigorous amount of energy, (NZEBS) produce the equal amount of energy they consume resulting in zero net energy consumption. The cost of energy of a net zero energy building does not increase with time relative to the similar non-renewable energy building. Net zero energy buildings saving 50% to 70% energy with compare to typical residential buildings. This project is more comfortable, more reliable sustainable and better for the environment.

II. METHODOLOGY

This dissertation is carried out for the total amount of energy used by the building on an annual basis is equal to the amount of renewable energy created on the site or in other. Residential building is selected for the research. Segment wise suggested option for net zero energy building such as Rain Water Harvesting system, sewage treatment plant, solar water heating, photovoltaic system, geothermal heat pump. A combination of technologies has facilitated the availability of NZEBs. In the energy performance of building, advance improvement in lighting systems, energy, systems of heating and cooling load, and control has lowered new building energy requirements. Further advances and specialization of production methods like a geothermal system and system which is used solar panels have subjected for sufficient sources of renewable energy.

SOLAR POWER SYSTEM:

In this system solar panel is placed on the terrace or roof of building. The solar panels convert the sun's energy into electricity which is either stored or used in building. Benefits Of Solar Power System.

- The energy and heat from the sun is free and unlimited.
- Operational cost is almost negligible.
- Renewable clean power that is available every day of the year, even cloudy days produce some Power.
- Can be installed virtually anywhere in a field to on a building.
- Used batteries to store extra power for use at night.
- Solar power system requires very little maintenance and last for many years.

SOLAR WATER HEATER:

Solar water heater is a device which provides hot water for bathing, washing, cleaning, etc. using solar energy. It is generally installed at the terrace or where sunlight is available and heats water during day time which storage in an insulated storage tank for use when required including mornings.

A solar water heater comprise of an array of solar collectors to collect solar energy and an insulated tank to store hot water. Both are connected to each other. During the day time water in solar collectors gets heated which is either pumped or flown automatically on thermo syphon principle to the storage tank. Hot water then stored in the tank can be used for various applications.

RAIN WATER HARVESTING:

It is a technique of collection and storage of rain water into natural reservoirs or tanks, or the infiltration of surface water in to subsurface Aquifers (before it is lost as surface runoff). Volume of water can be harvested.

Let's assume plot of 100sq.m area with height of the rainfall 0.6 m (600mm or 24 inches) so volume of rainfall over the

	Incandescent light bulbs	CFL light bulbs	LED light bulbs
Life span (average)	1,200 hours	8,000 hours	50,000 hours
Watts of electricity used (equivalent to 60 watt bulb)	60 watts	13-15 watts	6-8 watts
Carbon dioxide emissions (30 bulbs per year)	4500 pounds/year	1050 pounds/year	451 pound/year

plot = Area of plot x height of rainfall assuming that only 60% of total rainfall is effectively harvested.

Total volume of water harvested = 100 x 0.6 = 60,000 liters

60% of total volume of water harvested = 60,000 liters x 0.6 = 36,000 liters

HVAC SYSTEM:

HVAC system air is cooled by a chiller system that either chills or heat water. The water is then sent thru copper tubes not under a high pressure to the coils which gets cooled with chilled water and is connected to the blowers at various location in house, thus the house gets chilled. Sometimes 1.5 tons and 2 tons compressors are placed outside, both are factory charged with refrigerant. Attach to each compressor is chiller system. So at a time when there is a single family the 1.5 tons or 2 tons compressor is working automatically depending upon the weather and if there is requirement of higher chilling like there is some function in the house then both compressor starts working simultaneously in random and chills the house.

LED LIGHTS:

Three main types of light Bulbs

- Incandescent light bulbs
- Compact fluorescent light bulbs (CFL)
- Light emitting diodes light bulbs (LED)

III. CONCLUSION

In conclusion, we decided that for making Zero Energy Building, use of solar energy is the best energy source in regards to saving energy and cost efficiency. After brainstorming and researching we came to an agreement that photovoltaic solar panels are the best solution for generation of the electricity in a residential building. The installation of the solar panels initially would be costly, but in the long run the owner of the building would save money on their energy bill. More importantly, in the scarcity of natural resources we would be providing a self-sufficient, energy saving, non-polluting, Zero Energy building. The hollow bricks to be used for the construction of the building walls because they are, they are environmentally friendly, are good thermal and sound insulator which maintains comfortable inside temperature. High reflectance terrace tiles and rock wool insulation of outer walls may be used in order to maintain the inside temperature. UPVC windows with hermetically sealed double glass have to be used in order to achieve the Net Zero Energy concept. Grass paver blocks to be used for the pavement around the building. Reduction in water have been achieved by the use of low- discharge water fixtures, recycling of waste water through sewage treatment plant, rainwater harvesting, use of geothermal cooling for HVAC System

ACKNOWLEDGMENT

The completion of this report gives me the feeling of fulfilment. With immense pleasure I would like to present this report on this dissertation report of **LDRP Institute of Technology and research**. I would like to take this opportunity to bestow my acknowledgement to entire team who has directly or indirectly availed me in making my project feasible and to turn it up to successful piece of work. I take this opportunity to express my gratitude to all those who motivated, encouraged and help me in the project work. I am grateful to my supervisor, **Prof. VIKAS BHAVSAR** for his kind support, guidance and encouragement throughout the project work, also for introducing this topic, which has been very interesting and has given me great insight to future work on this area.

REFERENCES

- [1] Chauhan Pallavi By, Maheshwari Shubhangi, Sagar Shammi, Tandon Shubh, 234UG Student, Department of Civil Engineering, MIT Moradabad, Uttar Pradesh, India, published in International Research Journal of Engineering and Technology
- [2] By, Ahmadi Fardin, Sadeghian Mona, Sohey Imalekpour Kolbadinezhad,
- [3] Feng Shi, Shaosen Wang, Jinjin Huang & Xiaoqiang Hong (2020) Design strategies and energy performance of a net-zero energy house based on natural philosophy, Journal of Asian Architecture and Building Engineering
- [4] A Comparison Between Solar Thermal, PV And Photovoltaic-Thermal (PV/T) Systems By, A.G. Hastens, C. Good; I. Ndrsen; Solar, Published in Norwegian University of Science and Technology (NTNU), Department of Architectural Design, History and Technology, Alfred Getz vie 3, NO-7491 Trondheim, Norway