Studies on Zero Energy Building

Vivek Gupta
B.E., (Civil Engineering),
Saveetha School of Engineering
Saveetha School of Medical and Technical Sciences, Chennai
Chennai – 602 105, TN, India

M. Kalpana
Assistant Professor ,Civil Engineering
Saveetha School of Engineering
Saveetha School of Medical and Technical Sciences, Chennai
Chennai – 602 105, TN, India

Abstract
It is reported that 30% to 40% of all primary energy used in buildings worldwide is used. This high use of energy can affect the environment directly or indirectly. It also causes climate change, the environment is degraded and air pollution is increased. It is therefore necessary to reduce the building's energy consumption and to take the necessary steps to make the buildings more environmentally sustainable. To overcome this problem, zero energy building concepts have been developed in recent years. The zero-energy building uses natural sources of energy to meet the building's energy requirements. We have carried out a stud in this work to analyze the performance of a zero-energy building and found that such building is possible in India.

Keywords : Building, energy consumption, climatic change, zero energy building

1. INTRODUCTION
India is the developing country and has become one of the world's leading energy consumers. This is due to industrial growth and globalization that increases consumers ' energy demand. The literature reports that urban areas contribute 70% and that housing and property development contribute 40% to GHG emissions. Some of researchers reported that the buildings contribute about 51% of the world's air pollution, 42% of GHG emissions, 51% of water pollution and 49% of solid waste to the environment [1].

2. LITERATURE REVIEW

According to statistics provided by the Indian Government's Ministry of Statistics and Program Implementation, per capital energy consumption increased nearly five times in three decades during 1980-2010[2]. This is because the living standards in urban areas and advanced energy consumption from households to industry have improved..Indian buildings' energy consumption accounts for at least 30to40 percent of total energy consumption, and this demand grows at 11to12 percent annually[4]. Most of this energy is us ed to heat, cool, light and other appliances[5]. The buildings are also the main generators of greenhouse gasses (GHG) and pose a environmental threat..This is an alarming issue and it is therefore necessary to develop energy to efficient buildings that would make it easier to minimize energy consumption and reduce GHG. Buildings in India have been dev eloped in recent years to reduce energy consumption, water requirements and technologies to recycle used water for secondary use. Nicolae carry out a simulate work on design of a zero-energy office building with a mixed type of ventilation system that sure occupant thermal comfort in accordance with the ASHRAE Standard In India, with rational energy consumption and minimal impact on the environment. The reading uses easily accessible building materials and air conditioning to meet the needs [6].Isamu suggested that the idea of a LCCO2 home is to reduce the annual energy consumption and increase the use of solar energy so that the generation of photo voltaic (PV) energy exceeds the total energy consumption of the home substantially .He reported that annual PV CO2 absorption exceeds annual CO2 emissions due to energy consumption .He simulated the house's annual energy use and CO2 balance and used an input to output analysis and accumulation method to evaluate the house's embodied CO2.He reported that the material added to improve energy efficiency and CO2 emissions during manufacturing and construction periods have a positive effect on the reduction of homes ' LCCO2[7].Reshmi Banerjee suggests that the Net Zero Energy Building (ZEB) does not increase the amount of atmospheric greenhouse gases .In th\is interact between the building grid, the Net zero-energy building become an activation part of renewable energy infrastructure and we observation that an increasing no. of buildings meet the standard, increasing confidence of zero energy building objective given current building technology and designed approaches [8].Masa Noguchil developed a prototype of Eco Terra housing designed to b e efficient in order to minimize negative environmental impact s. The analysis shows that the house has almost zero energy consumption and that the house provides its occupants with a comfortable and healthy living environment indoors[9
].The objective of Mansi Jain's work is to evaluate the govern ance context for the adoption of NZEB through niche formati on in India.Due to the qualities of flexibility, moderate exten t and intensity, the governance context was reported to be marginally supportive of NZEB niche formation.They also rep orted that energy efficiency and renewable energy integrati on tools and strategies are available in building show ever they are not part of a holistic program[10].

Fig. 1 : Prana Building

It is become hotness but tough topic how to facilitate ZERB. In this paper, I present ZERB every design principle based on the analysis of the all energy demand of systems. This architecture is in particular optimize for design of schemes as well as for passive technology and energy simulation analysis and energy balance analysis, followed through the selection of efficiency appliances and renewable energy sources for zero energy buildingthe residential buildings. Furthermore.[11]
Prana is develop through ISHRAE to increase awareness of th e used of sustainable resources to increase energy efficiency in the building.
It also shows how each individual can contribute to reducing the carbon footprint in a home or office space without com promising on the comforts and aesthetics that one aspires. T his building can be used as a home or office as it has air cond itioning systems that use geothermal energy i.e. earth air tu nnel system, radiant flooring, efficient water and lighting fixt ures and use local and recyclable material.l. Fig. 2 shows the interiors of prana.

Fig. 2: Interiors of the Prana

3. MATERIALS AND METHODOLOGY:

In this work, we want the zero energy building available in India to be studied and analysed. The study will be conducted on the basis of the need for zero energy building and the method of reducing energy consumption and energy conservation of buildings. This building is efficient and uses heating and power generation from renewable energy sources to operate the electric al and electronic appliances.

4. RESULTS AND DISCUSSION

Prana is India's first energy efficient home office exhibit now standing at the Bangalore International Exhibition Center (BIE C) and spreading across an area of 3000 sq. Ft. Ft. It includes an entrance deck and a lobby, a meeting room, a living and dining room, a bedroom and a toilet. It is developed in such a way that this building minimizes water and electricity consumption for both comfort and lighting requirements etc. This building uses natural resources to minimize the burden on infrastructure and utilities to reduce emission. It also has renewable energy devices such as solar photo voltaic panel unit, solar cooler added to low water fittings, rainwater harvesting and greener landscaping. Fig.1 show the prana elevation of thr building.

Fig. 3: Solar PV Panels on the roof

Lighting of the building of HVAC System

This unit is equipped with 3 kW capacity solar PV panels and these panels are mounted on the south-
facing tilted roofs to obtain maximum solar power. However, the addition of more solar panels will make the construction more sustainable. Each room in the building is equipped with LE D lights that reduce energy use. The roof glass blocks allow the sunlight to enter the building. The bamboos pergola in the building built shading equipment that was efficient, expensive effect and environmental. friendly. The recycle window and doors are perforate though the clay bricks walls and the poro thermal bricks provide thermal insulation. In the building construction, the steel frame was used as it helps to complete the building in a short time. Fig.3 shows the solar system in the building that supply the building with electrical power. A building's HV AC system is fully designed during the final stages of construction design. In order to achieve comfortable conditions while saving energy, passive solar systems need to be integrated with HVAC systems. It is therefore essential to lay the groundwork for selecting a suitable HVAC system at the design conceptual stage. The prana has solar water heating systems for heating hot

water. The building has a chiller that provides cooling water. A solar refrigerator is installed in the building for cooling purposes. Radiant cooling systems are used in pranna because the y are low energy cooling. The temperature of the chilled water inlet is around 16 degree C which makes the chiller more energy efficient by 21 to 31 percent. The chiller is also equipped with a variable speed compressor that modulates speed based on chill water demand and reduces the chiller's energy consumption. An earth air tunnel system of passive cooling is used and it uses low earth temperatures year. round and provides a very low energy consuming comfort cooling system. The open has deep cantilever slab overall them to the decrease heat ingress into the all building. Fig.3 shows the passive cooling system used in the building.

Interior and furniture

Low volatile organic compound (VOC) paints are used in prana to reduce the emission of VOC. The building's furniture is made of bamboo and other renewable materials. This reduces the impression of carbon foot.

Renewable Energy Resources.

Sun resources **winds** rainfall, sources energy and geothermayl heat are somewhat examples of Renewable all Energy Resources.

The aim of this Research Paper is to focusing on the building to create it a Net Zero by using a Renewable Energy Resources instead of Non Renewable Resources. We could use Solar Energy to collect the energy and Wind Energy, Tidal Energy etc to make the building net zero energy building. We can not used sources of energy at the level due to the lack of technologies.

We could used Wind Energy when the velocity of air is more high. It works only in the open areas. The widely use Renewable Source of energy is Solar Energy. Solar Panel can be used as Solar Photo voltaic cell, solar thermal heater, etc.

Rain Water Harvesting System

The building has a rainwater harvesting system that collects rainwater from the building roof and are collection in refueling the tank .The water ground table below are recharged. The roof pi pes are embedded in radiant cooling pipes with chilled water fl owing through them, giving the place a cooling effect of natural air.

CONCLUSION

The concept of net zero energy will decrease global warm and to help preserve nature. With green approaches, all of aspect of the building was planned, show the latest recycl ed materials in HVAC technology. Also it is necessary to optimize the usage of water, chilled water and hot water and STP and solar energy conversion using suitable energy conversion devices. The building automation system will help in optimizing the above said parameters. The prana building is develop to the demonstrate the feasibility of constructing net zero energy building and demonstrate the functionality of zero [9]energy building in energy saving

Acknowledgment

Authors thank ISHRAE Bangalore Chapter, ACREX Team and BIEC Coordinator of Prana, for giving permission to carryout the study project at Prana, BIEC.

Zero energy buildings simply put are buildings which generate as much energy as they consume over a period.

2.To put in practical term they green buildings which reduce their energy consumption through passive and active measures and then meet

References

[1].Introduction to the National Rating System GRIHA An ass essment tool to help design, construct, operate and m aintain a resource - efficient built environment, Ministry of New and Rene wable Energy, Government of India & TERI – New Delhi Energy and Resources Institute.

[2]Energy Statistics 2011, Ministry of Statistics and Program Implementation, Government of India.

[3]S.G. Dalwadi.Shah, "Energy Efficient Design Impetus Fram ework," Town Plann Institute, India, Vol.9, July - September 2012 - 10

[4]Saket Sarraf, Shilpi Anand Saboo, Shravani Gupta, ECO - III-1041, Final Report, USAID, September 2011.

[5]Energy Assessment Guide for Buildings, USAID ECO - III Project, January 2010.

Nicolae Bajenaru, Andrei Damian, Rodica Frunzulica, Energy Performance Assessment for NZEB Bureau Building un der Specific Climate Conditions,

[7]Sustainable Energy and Environmental Solutions, EENVIR O – YRC 2015, 18 - 20 November 2015, Bucharest, Romania Isamu Ohta, Embodied CO2 Assessment of Zero Life - Cycling.

[8]. That's right.Reshmi Banerjee, Net Zero Energy Building I mportance, International Journal of Advanced Enginee ring Research (IJIRAE), Issue 5, Volume 2, May 2015.

[9] Masa Noguchi, Andreas Athienitis, Véronique Delisle, Jo sef Ayoub & Bradley Berneche, Net Zero Energy Home s of the Future, Renewable Energy Congress, Glasgow.