# Energy Optimization of Buildings through Sustainable Materials

## V. Baby Shalini, K. Nagasujatha

*Abstract: Worldwide, buildings are accountable for a huge share of electrical energy , materials and water consumption. Buildings and construction causes for 39% of energy related $CO_2$ emissions as per world green building council. Aim of Green building is to reduce emissions and also reduce energy consumption by using energy efficient appliances. green building design features have higher initial costs, but the payback period for the incremental investment is less. eco- friendly buildings can grant indirect cost-effective benefits to both the building owner and society in addition to direct cost savings. In this paper design of green building and analysis has been done with BE opt software by considering different parameters.*

*Keywords: BE opt simulation, Conventional Vs Green Building,$Co_2$ Emissions,, HVAC.*

## I. INTRODUCTION

The technology of Green building plays a vital role in the reduction of electrical energy consumption and $CO_2$ emissions .A building which reduces negative impacts and can create positive impacts with its design and construction on environment is called green building. Our quality of life also improved by green buildings. There are many features which makes a building green are listed below.

1.utilization of electrical energy ,water resources efficiently.
2.installing the renewable resources like solar, wind etc.
3.Utilization of materials which are non-toxic, sustainable and ethical
4.air quality of indoor environment should be good
5.waste reduction by enabling of re-use and recycling.
6.upgrade the building to maintain a good thermal comfort inside .
8.Utilization of energy efficient appliances and materials which consume less energy.

Sustainable buildings typically have lower annual costs for energy, water, maintenance/repair, other operating expenses. With proper orientation of building to receive more day light, walls with lower U values, water-harvesting methods , roof insulation, and more use of efficient appliances can reduce energy needs.

In this paper HVAC-heating ,ventilation and air-conditioning ,lighting is major constraint for power consumption in a building. A properly designed HVAC, using energy efficient lighting equipment reduce power consumption in buildings drastically.

## II. BE OPT SOFTWARE

BEopt simulation is used to design a cost-optimal building towards a zero net energy (ZNE) building. In BEopt, it has three screens. One is geometry screen, second is options screen and third is output window. In this paper BEopt 2.8.0.0 is used to design and analyse the green building. The important parameters considered for green building design are

1.neighbours for building
2.use of PV
3.electrical appliances
4.wall insulating material
5.ceiling material
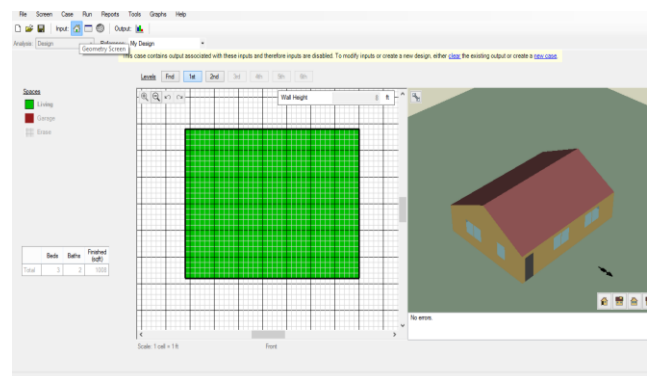
## III. SIMULATION RESULTS OF CONVENTIONAL BUILDING
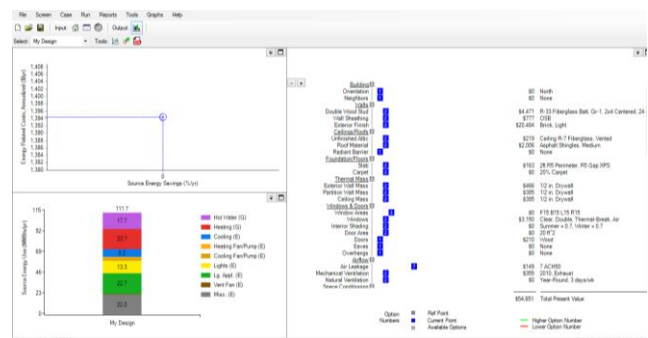


**Fig.1.Design Of Conventional Building**



**Fig.2.Source Energy Use, Annualized Energy Related Costs for Conventional Building**

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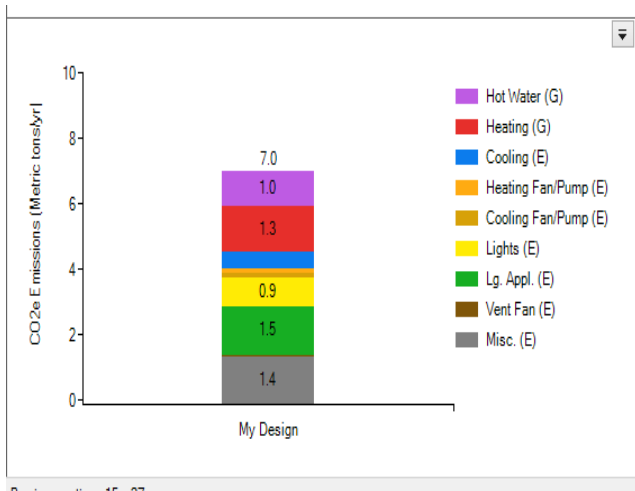*& Sciences Publication*

**Fig.3. Co2 Emissions Due To Conventional Building**
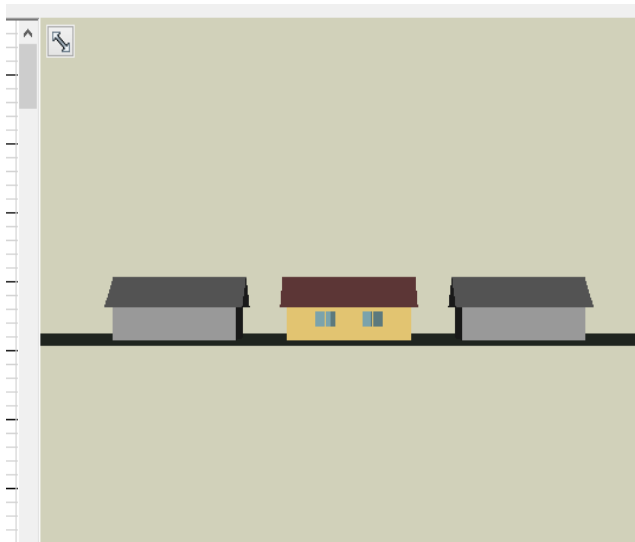
## IV. SIMULATION RESULTS OF GREEN BUILDING



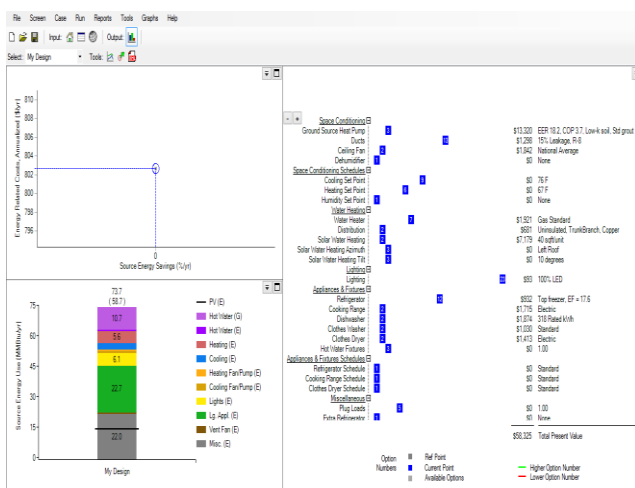**Fig4.Proposed design of Green Building**



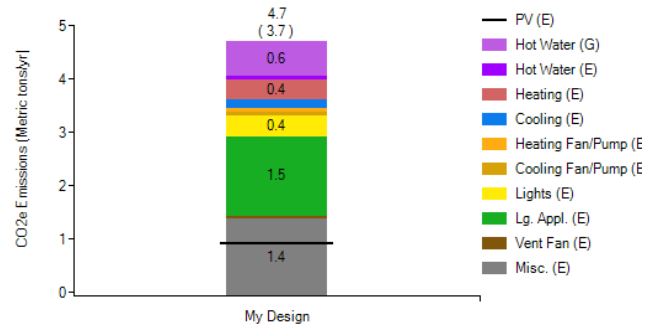**Fig.5.Source Energy Use, Annualized Energy Related Costs For Green Building**



**Fig.6. Co2 Emissions Due To Green Building**

## V. RESULT ANALYSIS

For simulation a building of 1008 sq.ft.is designed .

**Table.1.Comparision Of Conventional And Green Building Simulation**

| Building type | Cost of the building($) | Source energy use(MMbtu /yr) | Energy related cost ,annualzed( $/yr) | $CO_2$ emissio ns(metric tonns/yr) |
|---|---|---|---|---|
| Conventi onal building | 54651 | 111.7 | 1394 | 7.0 |
| Green building | 58325 | 73.7 | 803 | 4.7 |

From the simulation results of conventional and green building we can conclude that:

1.Source energy use is reduced from 111.7 to 73.7 MMbtu/yr. For example by using 100% incandescent lamps in conventional building causes 13.3% of total energy use and using 100% LED in green building causes 6.1% of total energy use.

2.Annualized energy related cost is reduced from 1394 to 803 $/yr

3.$CO_2$ emissions reduced from 7 to 4.7 metric tonns/yr

4.Cost of building is increased from 54651$ to 58325$

## VI. CONCLUSION

From simulation results difference between green building and conventional cost is 58325$-54651$=3674$= Rs . 260854 Annual energy related cost difference is 1394-803=591$=Rs.41,961.

Payback period for the proposed design is 260854/41961=6.2 yrs. Source energy usage i reduced by 65% with construction of green building. In order to save energy and reduce $CO_2$ emissions green building technology is very useful.

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## AUTHORS PROFILE

**Baby Shalini**, Assistant Professor, Department of Electrical and Electronics Engineering,JNTUHCE Jagtial, Telangana, India,shalini815@yahoo.com

**K. Nagasujatha,** Professor, Department of Electrical and Electronics Engineering,JNTUH, Telangana, India,knsjntuh@gmail.com.