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Zero Energy Building

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Abstract: ***Decarbonizing the building sector is extremely important to mitigating climate change as the sector contributes 40% of the overall energy consumption and 36% of the total greenhouse gas emissions in the world. Net-zero energy buildings are one of the promising decarbonization attempts due to their potential of decreasing the use of energy and increasing the total share of renewable energy.***
To achieve a net-zero energy building, it is necessary to decrease the energy demand by applying efficiency enhancement measures and using renewable energy sources. Net zero energy buildings can be classified into four models (Net-Zero Site Energy buildings, Net Zero Emissions buildings, Net-Zero Source Energy buildings, and Net-Zero Cost Energy buildings). A variety of technical, financial, and environmental factors should be considered during the decision-making process of net-zero energy building development, justifying the use of multi-criteria decision analysis methods for the design of net-zero energy buildings.
This paper also discussed the contributions of renewable energy generation (hydropower, wind energy, solar, heat pumps, and bioenergy) to the development of net-zero energy buildings and reviewed its role in tackling the decarbonization challenge. Cost-benefit analysis and life cycle assessment of net-zero energy building designs and their challenges were reviewed to shape the priorities of future development. It is important to develop a universal decision instrument for optimum design and operation of net-zero energy buildings
Keywords: Zero Energy Building, Energy Efficiency, Greenhouse gases, Renewable Energy, Grid

I. INTRODUCTION

Zero energy buildings combine energy efficiency and renewable energy generation to consume only as much energy as can be produced onsite through renewable resources over a specified time period. Achieving zero energy is an ambitious yet increasingly achievable goal that is gaining momentum across geographic regions and markets. Private commercial property owners have a growing interest in developing zero energy buildings to meet their corporate goals, and in response to regulatory mandates, federal government agencies and many state and local governments are beginning to move toward zero energy building targets.
Zero energy buildings use a combination of energy efficiency and renewable energy to produce as much energy as they use over the course of a year. By creating their own renewable energy, zero energy buildings lower operating and maintenance costs, help the environment, and increase resiliency during power outages

II. AIM & OBJECTIVES

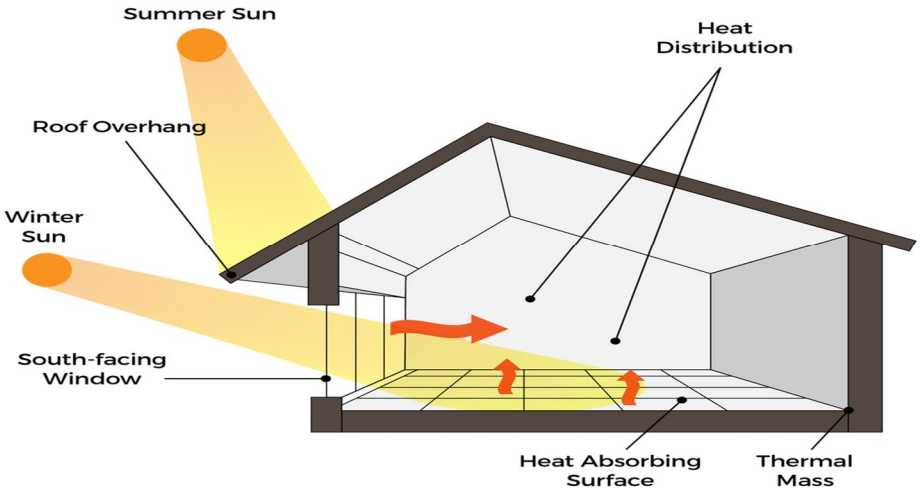
A. Maximize energy efficiency.
B. Reduce energy consumption.
C. To overcome energy crisis.
D. Reduce greenhouse gases (carbon emissions) and global warming.
E. Reduce dependence on fossil fuels.
F. Protects our environment for future generations

III. METHODOLOGY

A. Site selection and Orientation
1) Orientation Layout and location on site will all influence the amount of sun a building receives and therefore, its year-round temperature and comfort.
2) Be flat or north slopping.
3) Be free of obstructions to the South.
4) Be able to accommodate a building with relatively large south facing walls for maximum solar gain

B. Passive Solar Design

1) In passive solar design, windows, walls and floors are made to collect store and distribute solar energy in the form of heat in the winter and reject solar heat in summer.
2) This is passive solar design because, unlike active solar heating systems, it doesn't involve the value of mechanical and electrical devices.
3) Use of thermal mass and phase change materials for slowing indoor air temperature swings, the chimney for enhancing natural ventilation and earth sheltering.



C. Diagram Of Passive Solar Design

1) Building Envelope Design
2) Use high performance envelopes select walls, roofs and other assemblies based on long term insulation, air barrier performance and durability requirements.
3) Damp proofing
4) Water proofing membranes
5) Insulation materials
6) Water stops
7) Drainage Pipes

D. Sun as a renewable source of Energy

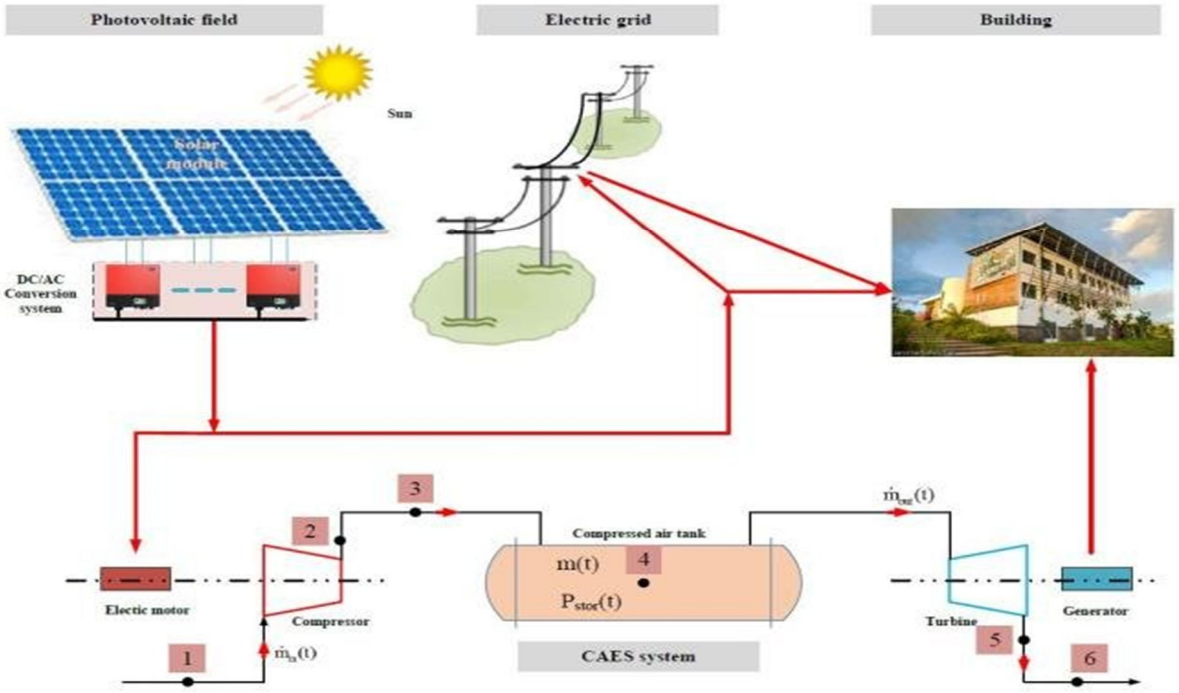
1) Zero energy buildings should be designed to use the sun energy as much as possible for such things as: Generating electricity, heating hot water, and utilising passive space heating
2) Solar panels are placed on the roof top or windows of the building, or anywhere where maximum solar energy is received throughout the year.
3) The energy generated can be used for cooking, heating, generating electricity.

E. Wind as a Renewable Source of Energy

1) In some extreme areas where wind energy is abundant and high, small windmills can also be used to generate electricity for running small equipment's.

F. Net zero Energy Building Connected to Grid

Building connected to power grid can be termed as "Net zero" if their energy consumption is equal to their Energy production over year.



IV. LITERATURE REVIEW

A. Javad Taherahmadi, Younes Noorollahi &Mostafa Panahi

Internationa L Journal Of Sustainable Energy

Buildings are one of the most important emitters of CO2, causing climate change. This fact, together with the finiteness of conventional energy, results in the Zero Energy Building (ZEB) being future buildings.

B. Jin-Hee Kim, Ha-Ryeon Kim& Jun-Tae Kim

1) Analysis of Photovoltaic Applications in Zero Energy Building

A Net Zero Energy Building (NZEB) considerably reduces the building energy load through high efficiency equipment and passive elements such as building orientation, high insulation, natural daylighting, and ventilation in order to achieve zero energy balance with on-site energy production from renewable energy systems applied to the building.

2) Sartori, I.,Napolitano, A.,&Voss, K

Net Zero Energy Buildings

The term Net ZEB, Net Zero Energy Building, indicates a building connected to the energy grids. It is recognized that the sole satisfaction of an annual balance is not sufficient to fully characterize Net ZEBs and the interaction between buildings and energy grids need to be addressed.

Zero Energy Buildings in India

A Living Laboratory, CEPT, Ahmedabad, Gujarat

Indira Paryavaran Bhawan, New Delhi

Akshay Urja Bhawan, HAREDA, Panchkula, Haryana

Malankara Tea Plantation, Kottayam, Kerala

GRIDCO, Bhubaneswar, Odisha

Sun Carrier Omega NZEB, Bhopal, MP

Eco Commercial Building (ECB) Bayer Material Science, Greater Noida, UP

V. SCOPE OF PROJECT

A. Isolation for building owners from future energy price increases
B. Increased comfort due to more-uniform interior temperatures
C. Reduced total cost of ownership due to improved energy efficiency
D. Reduced total net monthly cost of living
E. Reduced risk of loss from grid blackouts
F. Minimal to no future energy price increases for building owners reduced requirement for energy austerity and carbon emission taxes

VI. RESULT & CONLUSION

A. Only renewable source of energy is used and CO2 emission free.
B. Insulation along with geothermal cooling keep inside temperature 21-23 degree's Celsius.
C. Net zero energy achieved.
D. Wall windows and ventilation are the main component to be designed.
E. Better thermal comfort to that of conventional building.
F. White colour roof reduces 5-6 degree's Celsius of temperature in the room below the roof.
G. Saving Energy is producing energy.
H. Using abundant source of energy (Sun).

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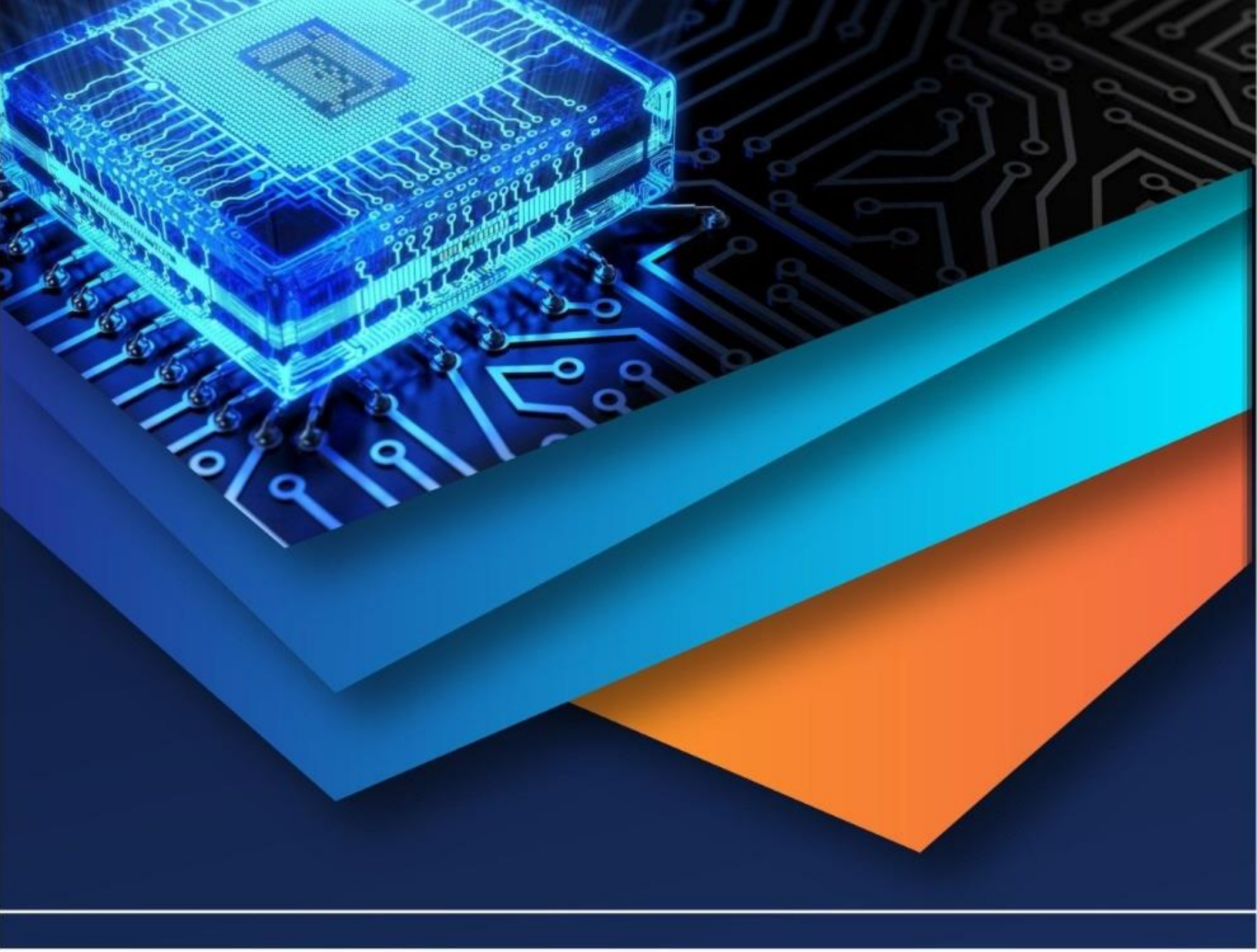

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