ISHIK UNIVERSITY

FACULTY OF ENGINEERING

Department of INTERIOR DESIGN

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INDS 414 Sustainability and the Interior Environment

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MSc in Sustainable Building Technology

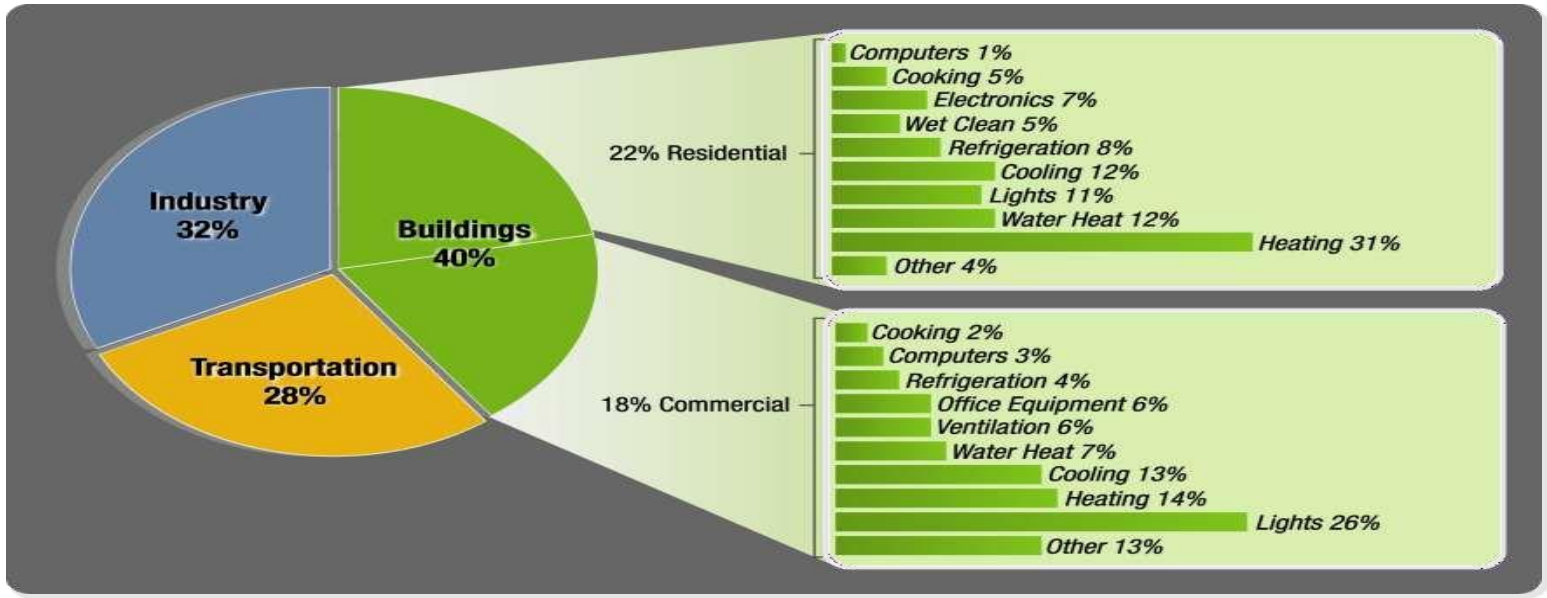
Zero Energy Building ZEB

OVERVIEW

- Introduction
- What is zero energy building
- Why zero energy building
- How to adopt zero energy
- Advantage
- Disadvantage
- Zero energy building in India
- Green building vs zero energy building

Introduction

- Buildings have a significant impact on energy use and the environment. Commercial and residential buildings use almost 40% of the primary energy and approximately 70% of the electricity in the United States.
- ZEB is not a single product or technology; but rather a combination of closely-integrated evolving technologies.



What is zero energy building?

- A zero-energy building is a building with zero net energy consumption.
- The total amount of energy used by the building on an annual basis is roughly equal to the amount of energy generated on the site through renewable sources.
- These buildings consequently contribute less overall greenhouse gas to the atmosphere than similar non-ZNE buildings

Why?

- To overcome energy crisis
- Reduces Energy Consumption
- Reduces Green House Gases (Carbon Emissions) & Global Warming
- Reduces Dependence on Fossil Fuels
- Protects Our Environment for Future Generations

How zero energy can be achieved?

- Site selection & Orientation
- Reduce Heating, Cooling, and Lighting Loads through Climate Responsive Design and Conservation Practices
- Employ Renewable or High Efficiency Energy Sources

Site selection and orientation

- Orientation, layout and location on site will all influence the amount of sun a building receives and therefore its year-round temperatures and comfort
- be flat or north-sloping
- be free of obstructions to the north (and be unlikely to be built out in future)
- be able to accommodate a building with a relatively large north-facing wall or walls for maximum solar gain (as well as north-facing outdoor areas if those are wanted).

Passive solar design

- In passive solar building 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 the summer
- This is called passive solar design because, unlike active solar heating systems, it does not involve the use of mechanical and electrical devices
- use of thermal mass and phase-change materials for slowing indoor air temperature swings, solar cookers, the solar chimney for enhancing natural ventilation, and earth sheltering.

Building envelope design

- Use high performance building envelopes select walls, roofs, and other assemblies based on long term insulation, air barrier performance, and durability requirements
- Damp proofing
- Waterproofing Membranes
- Insulation Materials
- Water stops
- Drainage Pipe

Employing renewable energy sources

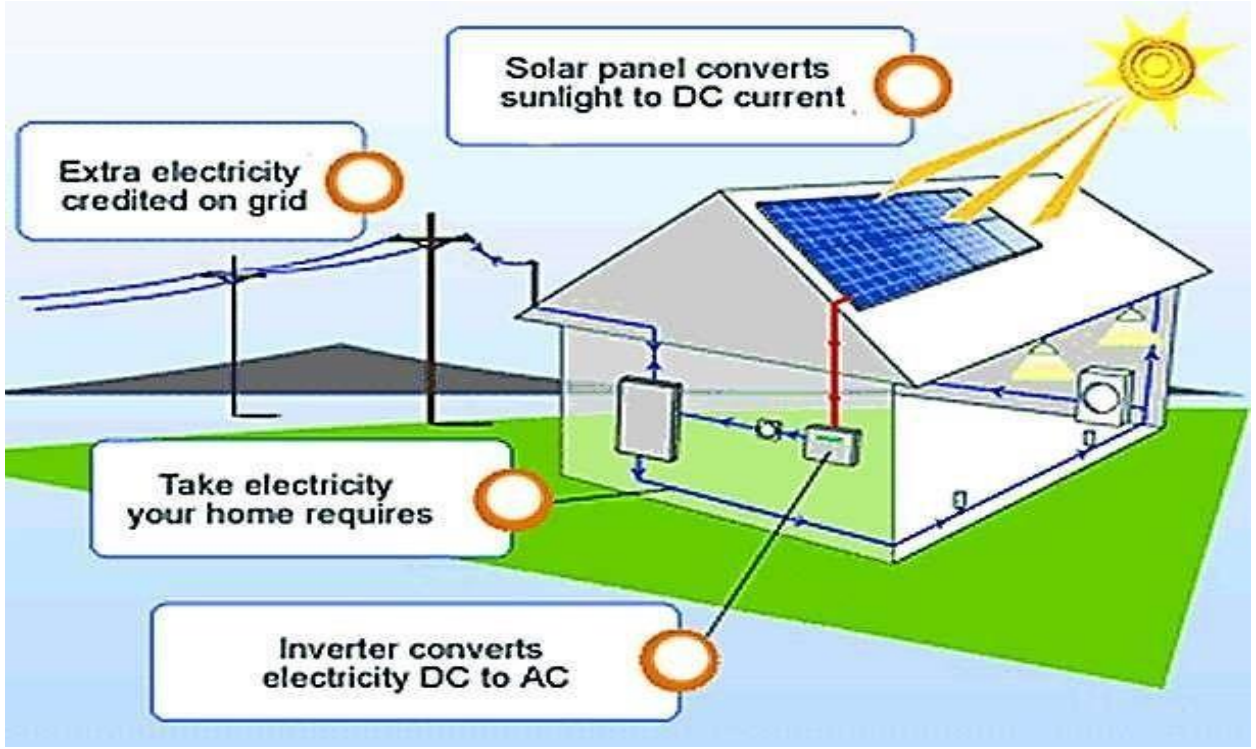
Renewable energy :Renewable energy is energy which is generated from natural sources i.e. sun, wind, rain, tides and can be generated again and again as and when required.

Use of renewable energy can increase energy security and reduce dependence on imported fuels, while reducing or eliminating greenhouse gas emissions associated with energy use.

Sun as a renewable source of energy

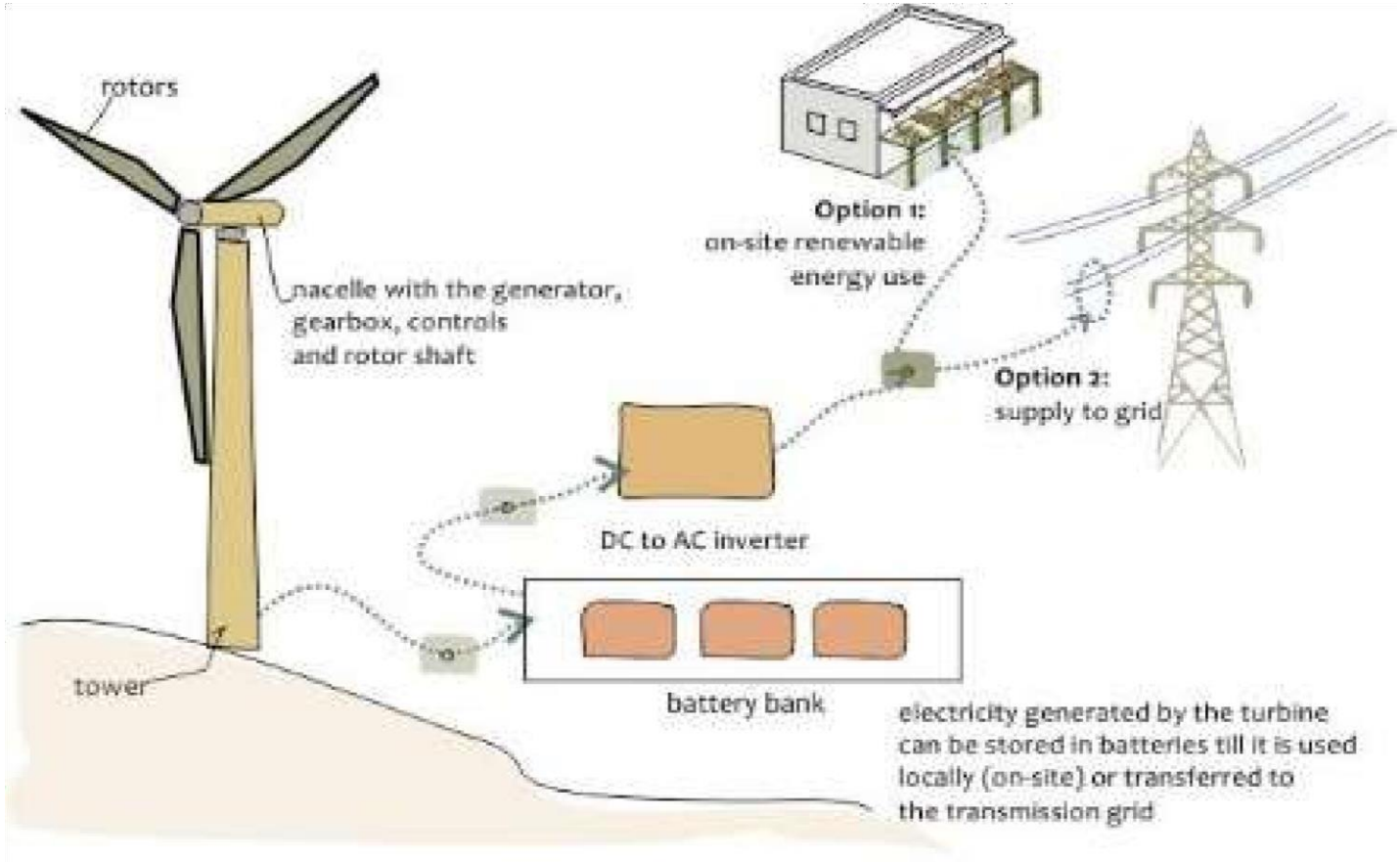
- Zero Energy Homes should be designed to use the sun’s energy as much as possible, for such things as: generating electricity, heating hot water, and utilizing passive solar space heating.
- Solar panels are placed on the rooftop or windows of the building, or anywhere where maximum solar energy is received throughout the year.

- The energy generated can be used for cooking, heating, generating electricity etc.



Wind as a renewable source of energy

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



Advantages

- Isolation for building owners from future energy price increases
- Increased comfort due to more-uniform interior temperatures
- reduced requirement for energy
- Reduced Total cost of ownership due to improved energy efficiency
- Reduced total net monthly cost of living
- Minimized extra cost

Disadvantages

- Initial costs can be higher
- Lack of skills or experience to build ZEBs
- ZEB may not reduce the required power plant capacity.
- Solar energy capture using the house envelope only works in locations unobstructed from the sun.
- Without an optimised thermal envelope the embodied energy, heating and cooling energy and resource usage is higher than needed.

Zero energy buildings in the India

The Indira Paryavaran Bhavan, new delhi

- Constructed with adoption of solar passive design and energy-efficient building materials
- Installed capacity of 930 kW peak power, the building has the largest rooftop solar system among multi-storied buildings in India
- More than 50 per cent area outside the building is a soft area with plantation and grass
- The building has a robotic parking system in the basement that can accommodate 330 cars

Sun carrier omega,bhopal

Sun Carrier Omega is the first company to bring to India the Sun Tracking Intelligent Solar PV System, which generates about 40% more energy than fixed systems.

Sun Carrier Omega has commissioned India's first commercial Net-Zero Energy Building

Akshay urja bhavan panchkula

- This building is being constructed based on solar passive design techniques having Building Integrated Photovoltaic (BIPV) system of 42.50 KW capacity, Solar Chimney, evaporative cooling, cavity walls, Use of Fly ash based bricks water recycling and Energy Efficient Lighting etc.

Zero energy building versus green building

- The goal of green building and sustainable architecture is to use resources more efficiently and reduce a building's negative impact on the environment.
- Zero energy buildings achieve one key green-building goal of completely or very significantly reducing energy use and greenhouse gas emissions for the life of the building.
- Zero energy buildings may or may not be considered "green" in all areas, such as reducing waste, using recycled building materials etc