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"Zero Energy Building"

Amir Ebrahim Mozneb, Eram Institute of Higher Education in Shiraz

Abstract:

One of the most important contaminating sources in nature is the gases from the burning of fossil fuels, which both production and consumption due to the low technology of production and consumption equipment are always associated with environmental pollution. The need to minimize the use of fossil fuels has created zero-energy buildings in the world after the generation of green buildings with the least energy consumption. net zero energy building is a result of common aim and responsible participation of architects, civil and electrical and mechanical engineers.

Keyword: Zero energy building, air pollution, energy consumption, renewable technologies,

Introduction:

Energy consumption in buildings is a huge concern at European level. Buildings are estimated to account for approximately 40% of primary energy and 36% of greenhouse emissions [1]. In some Member States this share even exceeds 45%, making the building sector the largest end-use sector in Europe.

After the 2007 Climate and Energy package of 20% reduction of buildings primary energy consumption by 2020, 20% increase of renewable energy production and 20% decrease of

greenhouse gas emissions from 1990 levels, new targets have been introduced by the 2030 Climate & Energy framework [2] .

In Iran, the average energy consumption of buildings is more than 5.2 times the global average. Large cities, especially Tehran, have high air pollution, often due to the use of fossil fuels [3].

New ideas have been developed to reduce fossil energy consumption and the use of renewable and clean energy, one of which is zero energy buildings. These buildings can be separated from the energy supply network, thus providing energy locally and through a combination of new energy technologies such as solar, wind and biofuels [4].

In summary, zero-energy buildings are defined as: buildings that balance the use of renewable technologies between consumption and energy production.

To achieve energy efficiency, zero energy design significantly differs from conventional construction performance. Comprehensive 3D simulation tools are available to figure out how building works with a series of design variables. The design variables, the orientation of the building relative to the daily and seasonal solar status, the type of window, the type and position, the type of insulation and the elements of construction, the efficiency of heating equipment, cooling and lighting [5].

History:

The first modern zero energy house was built in 1994 as the home of Mr. Ralph in Freiburg, which produces about 5 times more energy than needed. This home is fully beneficial for solar energy [6].

1. Home of Mr. Ralph in Freiburg

Over the past 20 years, around 200 residential and commercial projects in the world have been designed and built based on this new achievement, and this trend continues to rise with rising energy prices [7].

Examples of zero energy buildings are: TCI building in UAE, Dubai, National Convention Center building in Qatar, Federal-American Building-Renovated, Material and Energy Research Center in Iran, Karaj [8].

2. TCI building in

3. National Convention Center building in

4. Federal-American Building-Renovated

5. Material and Energy Research Center in,

Purpose:

The purpose of the design of zero energy buildings is to use resources more efficiently, complete or significant reduction of fossil energy consumption and greenhouse gas emissions to reduce the negative impact of buildings on the environment [9].

In other words, the aim of ZEB is*:* Minimizing energy loss.

Importance and necessity:

Today, due to the global population growth, the shortage of fossil fuels, the increase in greenhouse gases, and the role of buildings in energy consumption and the destructive effects on the environment, the design of zero-energy buildings has become popular and very important [10].

Discussion:

Build design:

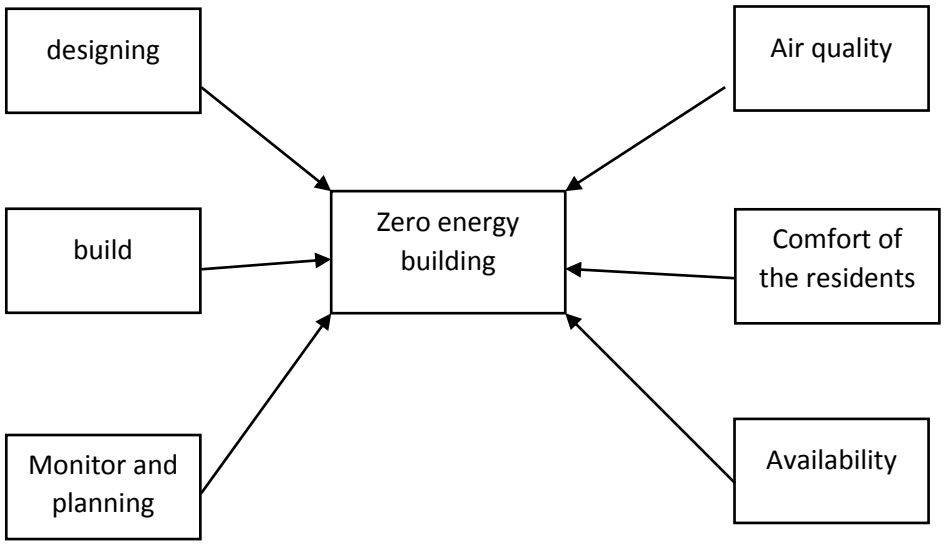
The most cost-effective steps to reduce energy consumption in a building usually occur during the design process. To achieve energy efficiency, zero energy design significantly differs from conventional construction performance. Sunlight and solar heat, prevailing winds, and cold weather underneath a building can provide daytime lighting and internal constant heat with minimal mechanical equipment.

Zero-energy buildings are usually optimized for use with solar-free energy heat, and combined with heat-voltages to stabilize a variety of daily temperatures and are well insulated in most weather conditions. All the technologies needed to build zero energy buildings today are available without order [11].

Zero-energy buildings are built with significant energy saving features. Heating and cooling loads are reduced by the use of highly efficient double insulation systems for high efficiency windows, natural ventilation and other techniques. These characteristics are different depending on the climate zones in which the construction takes place. Water heating loads can be reduced by using fixed water supply devices, heat recovery units in the sewage system, and by using solar water heaters and water efficient heating equipment. In addition, daylight with roof windows or solar panels can provide 100% of daily home lighting [12].

Other factors that have to be considered in the architecture of these buildings are its elasticity and orientation in the acquisition of solar energy and the use of natural lighting of buildings.

The zero energy buildings use both active and inactive at the same time, in addition to these, a smart system monitors all stages of absorption, distribution, consumption and thermal recovery. Technologies in active sectors can include the use of photovoltaic cells, solar water heating, wind turbines, hydroelectric and biomass, in the inactive section could include the use of thermal mass and ventilation, direct and indirect absorption of the sun and shading in the summer.



In the ranking of the use of renewable energy technologies in these buildings, photovoltaic solar panels and solar water heaters are the most commonly used ones [13] .

The history of inactive solar design dates back to the 5th century BC and Greece. When due to the need for wood to build buildings and structures, the cost of meeting the heating needs of burning wood was greatly increased, and the design of homes was shaped by the view of the optimal use of sunlight [14].

The first and last thought in a zero-energy building is the use of solar thermal energy. The first step in this regard is the proper design of the building's orientation in order to maximize the use of sunlight and heat during the year and the last step, determining the location of installation and the number of solar and photoluminescence systems, so that the amount of time that is due to architectural design and building orientation [15].

Complete identification of the potential for the optimal use of the sun in the building and construction site is the first action even before considering the appearance of the building.

Unlike solar-powered solar systems or photovoltaic panels that are active or mechanically controlled sections of the solar system, the inactive solar design is based solely on a proper design and then requires no control and consequently no cost.

Solar relations, wind direction and wind, area of vegetation, gradient of the earth, and similar cases are considered as the main early studies. Base geometry must be used to determine the sun's angle in the winter. For example, the presence of trees in the vicinity of the building can be around 8 degrees Celsius from ambient summer temperatures. These parts are not elements that are reviewed in the computer and in the related software, but they have an important effect on the optimal design of a zero-energy building [16] .

Wind energy is a convenient and low cost alternative to fossil fuels, which has high efficiency and can be used in different situations in order to be compensated. In many European countries, the development of the use of wind turbines has led to the creation of wind farms, which include a large

number of large and small wind turbines alongside a special arrangement in a location prone to energy production.

Urban wind turbines are part of a small-scale renewable energy technology that generates clean, renewable and low-cost energy to reduce home-made gas emissions [17].

Urban wind turbines produce electrical energy at the consumer's premises, so there will be no other power lines. Also, these types of wind turbines are very modern in terms of urban landscape and give a special beauty to urban environments, and in effect translate the concept of "green energy" into urban environments.

In the outdoors, due to the high height of installed turbines and high wind speed, the turbine work efficiency is very high and it is believed that due to the absence of severe winds in urban environments, how can these turbines is it suitable? The mechanism of operation of these turbines is that there is a phenomenon called "wall vortices" that naturally accelerates when the air passes from the facade of the building and rounds up the roof at the highest speed with the utmost speed. Placing the turbine axis at this location will result in the highest efficiency for producing electric energy from the wind [18].

Advantages of zero energy buildings:

- The comfort of the owners of these buildings is due to rising energy prices.
- Interior temperatures are more uniform
- Need less energy
- Balance energy consumption with energy demand
- Reduce monthly net spending
- High reliability for photovoltaic systems has a 25-year warranty and rarely has problems due to climate change.
- Increasing the value of zero-energy buildings compared to traditional buildings by increasing the cost of fossil fuels.

Disadvantages of zero energy buildings:

- High initial expenses and the need for their user training.
- Lack of technical knowledge and abilities to design and construct zero energy buildings
- Reducing the ability to sell such buildings due to initial costs and the need for hard competition in sales.
- The solar energy absorbed through the shell only in the southern part has the highest efficiency, and in other ways, due to the shadow of its efficiency, it will decrease further [19].

Conclusion:

Through a study of papers relating to " Zero Energy Building " , the results indicate that :

- Humans are now in a position to save energy in a situation that has never been so critical, and it's vital to determine and accurately control energy consumption in buildings to meet the standards and standards for energy savings. Architecture has a significant contribution to the creation of environmental crises due to the problems caused by improper construction methods, because by the construction of any soil pollution, water enters nature.
- This crisis will continue as long as the buildings do not tend to stay stable and reduce energy consumption.

- In the zero-energy buildings, the idea is to build the entire energy supply with low-cost local and renewable resources. Even if it is possible to produce more energy every year, to export it to the municipal electricity grid or to use it for emergency purposes .
- Indeed, Zero Energy offers life and work facilities in a fossil-free space. Proper physics and structure and the use of renewable resources in these buildings greatly facilitate the achievement of the above goal .
- In order to reach zero energy building parameters, the design stage must go beyond the design stage and approach the building elements in the construction phase to the existing standards, which should be economically investigated considering energy costs and construction in the country and achieved an optimal design.

In future research it is necessary to study:

- How to promote zero energy buildings.
- How to upgrade technology to design zero energy buildings.
- Methods of reducing the initial set-up costs of these buildings.

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