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Building-Integrated Wind Turbines in the Aspect of Architectural Shaping

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Abstract

Today, the use of wind energy is becoming one of the most developed areas of alternative energy. Introduction of means of alternative power engineering in structure of the building demands special events on safety measures that is strongly reflected in space-planning decisions. Increase of energy efficiency of system of the power active building, as a rule, depends on a form of its material and constructive structure. Thus, speaking about integration of means of alternative power engineering into structure of the building, we mean special approach to an architectural shaping. Efforts of architects and engineers are directed on that having united ideas of use of energy of renewable sources, function of the building and art of creation of an architectural form, to receive harmonious result. Search is directed on a choice of forms and designs, not only elements, but also actually buildings which promote increase in amount of the transformed energy.

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Keywords: architecture, renewable energy, shaping, wind energy, energy-efficient buildings, energy-efficient technologies, Building-integrated wind turbines.

1. Introduction

The issue of energy saving in construction has become the object of attention with the 70-ies of XX century [1-8]. The main reason was the recognition of the necessity to save energy after the world energy crisis of 1974, and the creation of innovative concepts of sustainable development and its adoption by most developed countries of the

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world.

Development of the first principles in the field of energy efficiency of buildings was the result of criticism from the International energy conference of the United Nations. Opponents of WEC were made by the experts, who spoke about the huge reserves of increase of energy efficiency of buildings. In response to this, in 1976, the WEC was formulated the basic principle of energy conservation. He stated that energy can be used more effectively if the measures that are technically feasible, economically justified, and acceptable from an environmental and social point of view.

Today, the use of wind energy is becoming one of the most developed areas of alternative energy. Throughout Europe there are wind power plants, but they are not able to fully provide the population and the city all the necessary energy. This raises the question about the possibility of implementing wind turbines on buildings, as engineering support each home, thus providing the necessary energy to the population of cities, using only renewable energy source

Interdependence of the architectural form with function is one of constant topic of discussion in the architectural theory [9-18].

Increase of energy efficiency of system of the power active building, as a rule, depends on a form of its material and constructive structure. Thus, speaking about integration of means of alternative power engineering into structure of the building, we mean special approach to an architectural shaping. Efforts of architects and engineers are directed on that having united ideas of use of energy of renewable sources, function of the building and art of creation of an architectural form, to receive harmonious result. Speaking of the architecture of buildings, we can safely call the use renewable energy as form design factor in architecture [19-29].

Building-integrated turbines, where buildings are designed with wind energy in mind, are an option for consideration by developers tuned into the change surrounding sustainable living [30-35].

2. Wind-driven generator in in architecture buildings

Building-integrated turbines are of course limited to new developments in relatively windy areas and will have natural constraints in the size of turbines they can accommodate. The vision behind integrating a turbine into a building, in some cases, is perhaps less a practical solution to be widely adopted than an architectural and cultural statement. The value of the possible cultural benefits should not be underestimated as architecture simultaneously reflects and influences culture and cultural changes. Having these powerful dynamic symbols integrated directly into the heart of urban communities could help change mindsets and have positive knock-on effects in terms of environmental action (e.g. homeowners improving energy efficiency or engaging directly in renewable energy).

Despite their more limited applicability (relative to large-scale stand-alone turbines), it is thought that they can be viable and efforts have been made in this area. There is a project in which (in the presence of a moderate wind) the high-rise building would "eat" air streams almost for 100%.

Fig. 1. Twin skyscrapers from Project Web. Source [36]