Solar Energy in retrofitting building: 10 case studies of integration in the residential heritage of the 20th century in Western Switzerland

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Abstract

The main purpose of the research is to suggest qualitative and efficient integrated solutions of solar energy into existing buildings in a delicate balance between energy production and respect of the building quality and its context. Solar capture is integrated into the building envelope according to harmonious composition respecting the global architectural logic. Calculations show that existing buildings have significant potential for solar integration on both roofs and facades. The research raises many questions about the way we apply solar panels on the different parts of a building and encourages developments of products as photovoltaic and thermal panels towards sustainable buildings.

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Keywords: Retrofit building; Energy building integration; Solar energy efficiency; Solar Photovoltaic; Solar Thermal; Case studies;

1. Findings and Goals for future

The research starts from three fundamentals findings. First, the interest developed for the solar power and his necessity toward a sustainable energy production. Secondly, the growing of the number of aging buildings. Thirdly, existing buildings retrofit is a non-usual practice.

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1.1 Solar energy needs

The energy retrofit of the existing buildings and the construction of new energy-efficient buildings are challenges to reach the goals of energy strategy 2050 in Switzerland. Solar energy is essential to tackle sustainable changes. Increase of decentralized electricity production sites and thus the development of a renewable energy systems as well as the development of global energy management are large projects to develop [1]. Nowadays, solar energy production is not yet widespread despite its huge potential. It represents only 2% of the total electricity supply in Switzerland [2].

1.2. Modern heritage and new constructions

An important part (24-34 %) of buildings with more than 3 levels were built before 1920 in cantons of Fribourg, Vaud and Geneva. Then, a second period of quantitative construction which corresponds to urban sprawl mechanism started in the 1960s. Nowadays, a lot of residential buildings are getting old. This set of buildings is less energy efficient than new constructions and consumes up to seven times more energy [2].

1.3. Retrofitting existing buildings

Introduction of renewable energies in new buildings or extended spaces such as attics is mandatory in the requests for building permits. The requirement of renewable energy production varies depending on the canton. Nowadays, only 0.9% of real estate is retrofitted. A proposition is to consider the building envelop, the building technologies and at the same time, the introduction of renewable energies like solar energy in energy retrofit. The research lies in a global process which takes into account various stages of renovation. The goal is to encourage the owners and the planners to consider this process as long-term costs savings and ensure a full and synergic use of necessary facilities during the retrofit period (installation of scaffolds for attaching the peripheral insulation also used for installing solar panels).

2. Ten case studies

Fig.1. The 10 studied buildings (a) Avenue de carouge,48 Genève ; (b) Avenue d’Edouard dapples19, Lausanne ; (c) Rue de Bordel, Lausanne ; (d) Chemin du Levant 137, Lausanne ; (e) Avenue du Bois de la chapelle 69, Genève ; (f) Route de Morges 24, Cossonay ; (g) Impasse de la forêt 20, Fribourg ; (h) Avenue du bois de la chapelle 89, Genève ; (i) Rue de Zurich 17, Genève (j) Avenue de Roseraie 34, Genève.
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