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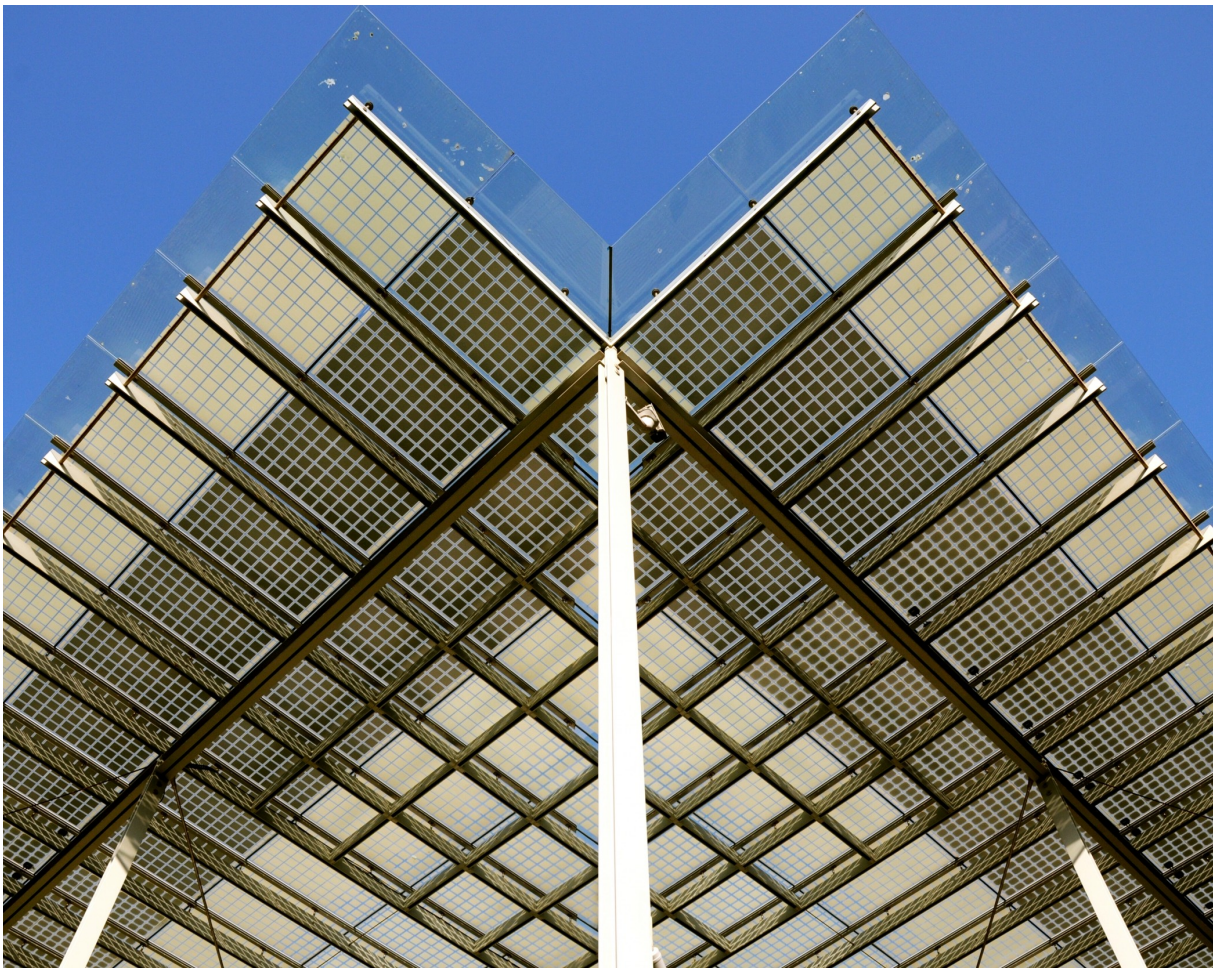
Project

Accelerating PV applications

Building-integrated solar cells

Building-integrated solar cells

In order to fully exploit the potential of solar cells, these should not only be mounted on roofs, but also be integrated into façades. However, this is as yet seldom the case. What do architects and house owners think of building-integrated photovoltaics?



Solar cells integrated directly into the building envelope open up new architectural possibilities. *Source:* Shutterstock

At a glance

- Solar cells can not only be mounted on roofs and open spaces, but also integrated directly into façades and/or roofs.
- During renovations, it may be wise to consider the use of so-called building-integrated photovoltaics.
- However, this technology is still rarely used. Interviews with architects and house owners show, firstly, that there is a lack of knowledge in this area and, secondly, that high costs stand in the way.

According to the Confederation's Energy Strategy 2050, the switch to renewable energies will entail a significant increase in the share of solar energy: from 1.9 gigawatts of installed capacity in 2016 to 10 gigawatts by 2050. Solar energy produced on buildings is of particular importance in this regard. However, rooftops are not the only surfaces that can carry solar systems. Panels mounted on façades can also help achieve the intended objective. Numerous options for so-called building-integrated photovoltaics are now available, e.g. solar cells in the shape of façade components, windows or roof tiles. But what do architects and owners think of these new components? What stands in the way of a resounding success? Researchers at the School of Engineering and Architecture of Fribourg have looked into this matter.

Potential during renovations

In a first step, the scientists determined the potential of building-integrated photovoltaics (BIPV) in the context of renovations in the city of Neuchâtel. For this purpose, they used a register of building permits for renovations performed between 2011 and 2015. 45 % of the 212 listed permits have good potential for building-integrated photovoltaics: 23 % of the permits are for conversions and 22 % for changes to the exterior of buildings, mostly modernisations of the building envelope or roof renovations.

Not yet widespread: Building-integrated photovoltaics

An increasing number of solar systems have been installed in the city of Neuchâtel over the past years: four only in 2012, 68 by 2015. But building-integrated photovoltaics still lead a niche existence: of the 202 systems installed by the end of 2015, only three were integrated into buildings. To elucidate the reasons for this situation, the researchers selected twelve representative buildings which differ in various respects: for example, buildings in different construction phases, free-standing buildings as opposed to buildings embedded in a line of houses, or presenting different types of roofs (flat or inclined). The scientists then interviewed the architects and owners (pension funds, real estate funds, foundations and state authorities) of these buildings. Their conclusions: there are many reasons why building-integrated photovoltaics are rarely installed. For architects, the following factors are decisive:

- Limited knowledge among both clients and architects regarding building-integrated solar energy.
- Lack of social pressure, also from politicians.
- High costs for building integration which deter investors.

The architects also mentioned a current lack of experience with building-integrated photovoltaics that complicates planning. The owners agree with the above points, but also state that the administrative procedures for the planning and approval of projects are very cumbersome. However, the discussions also pointed to the potential of the technology: both architects and owners are convinced of its efficiency. Despite the fact that the choice of shapes, colours, sizes and textures seems satisfactory, architects hope for further diversification.

The interviews showed that successfully completed projects are essential, since they clearly demonstrate the feasibility of the technology. According to the researchers, this in turn means that a growing number of individuals will in future consider integrating these systems into their plans. It is also helpful to call in solar energy specialists who can advise and convince architects and provide the relevant information regarding current developments on the market. The majority of the interviewees, i.e. 81 %, think that the government should subsidise building-integrated photovoltaics to make these systems affordable for owners.

The scientists point out that building-integrated solar cells are a good option not only for new buildings, but also in the context of pending renovations. On the other hand, the premature replacement of an intact and contemporary building envelope is not a sustainable option.

Information, incentives and training

In a second study designed to identify procedures that have proven their worth, the scientists investigated only remodelling projects in which building-integrated photovoltaic systems were used. A solar specialist was involved in seven of the eight projects examined. Only one owner consulted the specialist from the start of the project, even though most respondents thought this was the best approach. The owners were the main driving force behind building integration. The researchers find it encouraging that out of a total of 28 survey participants, 27 would consider installing a building-integrated photovoltaic system in a future project.

The owners expect that the investments will pay for themselves within approximately ten years. At present, however, the high costs still prevent many owners from choosing building-integrated solar energy systems. This is why owners hope for government incentives, especially financial support. In order to inform more architects and engineers about the opportunities related to building-integrated photovoltaics, study curriculums need to be revised to offer the required content.

Produkte aus diesem Projekt

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Associated projects

Cooling of SiC solid-state transformer

Clever Cooling System for Power Electronics

All information provided on these pages corresponds to the status of knowledge as of 18.06.2019.