



**Energy**  
National Research Programmes 70 and 71

# Project

Overcoming opposition to PV





## Facing the sun with red modules

In fact, all the groundwork has been done: Technical solutions for the installation of solar modules on façades and the willingness of potential users to pay more for them. But before building-integrated photovoltaic systems can make a contribution to the Energy Strategy 2050, acceptance amongst building owners still needs to be raised. As well as architectural know how.



Solar modules don't just have to be attached to roofs. They also look attractive on façades. *Source: P. Heinstein*





## At a glance

- Building-integrated photovoltaic systems are still not very widespread in Switzerland.
- Many homeowners would welcome these innovative solar façades.
- The breakthrough could come from lighthouse projects in cities that are open to building-integrated photovoltaics.

There are over 84,000 photovoltaic plants in Switzerland. The photovoltaic modules are frequently mounted on roofs and at a defined angle, ensuring optimum energy yields. These mounted modules are known as BAPVs (building-attached photovoltaics) and are used solely to convert sunlight into electricity.

By contrast, photovoltaic (PV) elements can also be integrated in sections of buildings – e.g. on roofs or in façades. In addition to producing electricity, such so-called building-integrated photovoltaics offer additional benefits. The modules are design elements of the buildings and can be used, for example, for thermal and sound insulation or to deflect light.

## Only every seventh solar module is building-integrated

Experts agree: If more building façades and roofs were upgraded with building-integrated photovoltaics as part of renovation projects, this would make an important contribution to implementing the Energy Strategy 2050.

However, this type of solar module is currently only a marginal player. Building-integrated photovoltaics account for just 15 % of all PV modules in Switzerland. Rolf Wüstenhagen's research group has investigated why the situation for building-integrated photovoltaics is so difficult in Switzerland, and how this could be changed. He is Professor for Renewable Energy Management at the University of St. Gallen.



## Interest certainly exists

The scientists interviewed a representative sample of homeowners who were planning to renovate their roofs. One of the results shows that building-integrated photovoltaics could actually be popular: Over half of the respondents could imagine deploying building-integrated photovoltaics when renovating their roofs. They would even be willing to pay on average 22 % more for an integrated solution than for conventional solar modules on the roof.

Within the context of experimental options, homeowners were asked to choose between different variants for roof renovations. In this regard, the characteristics of the options were systematically varied. On the one hand, conventional on-roof systems were available for selection in comparison to integrated modules, and on the other hand, the influence of price, colour and countries of origin of the modules was also examined.

## Red is the new blue

Traditionally, solar modules were dark blue or black. EPFL researchers have, however, also developed coloured modules, opening up new architectural opportunities. The surveyed homeowners showed interest in coloured modules, whereby red modules in particular performed better than the classic blue. Wüstenhagen explains this in terms of their more effective integration in the cityscape, which in Switzerland is often characterised by red roofs. He is hoping that, thanks to the new technical developments, discussions about municipal planning approval or heritage protection will also move forward. This is sometimes an obstacle for homeowners who are keen to renovate.



## Neighbouring role models

In the case of listed buildings or where municipalities have no objections, building-integrated photovoltaics are becoming increasingly common. It would seem that the higher installation costs are not deterring owners too much. According to Wüstenhagen, homeowners respond positively to tax breaks. His team was also able to identify other factors, however, that help homeowners choose building-integrated photovoltaics. For example, the imitation effect. If solar modules have been fitted to one house, this influences the decision of neighbours, friends and family members. Important public buildings also trigger an imitation effect. For this reason, they should increasingly be fitted with building-integrated photovoltaics because homeowners tend to emulate such lighthouse projects.

Wüstenhagen suggests a variety of solutions to boost the popularity of building-integrated photovoltaics. This begins with the planning approval: Amongst other things, Wüstenhagen emphasises the need to slash red tape. In addition, building-integrated photovoltaics should be made part of the architectural curriculum – currently this is rarely the case.

Wüstenhagen's report also proposes that this new construction method should be the subject of information campaigns for the real estate industry.

## Financial constraints as an opportunity

It remains the case, however, that many homeowners shy away from the cost of building-integrated photovoltaics. These are – as mentioned above – significantly higher than for conventional building façades. Here it would be necessary to emphasise the financial savings offered by energy renovation projects. The report concludes: if homeowners were able to benefit from low-cost mortgages for building-integrated photovoltaic façades, this would help them become established throughout Switzerland more quickly.



## Produkte aus diesem Projekt

- Shotgun or snowball approach?  
Accelerating the diffusion of rooftop solar photovoltaics through peer effects and social norms  
Date of publication: 19.06.19
- The adoption of building-integrated photovoltaics: barriers and facilitators  
Date of publication: 19.06.19
- Red is the new blue – The role of color, building integration and country-of-origin in homeowners' preferences for residential photovoltaics  
Date of publication: 19.06.19
- Beatrice Petrovich on Solar Peer Effects  
Date of publication: 19.06.19
- Alexander Stauch on Community Solar  
Date of publication: 19.06.19



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