Energy
National Research Programmes 70 and 71

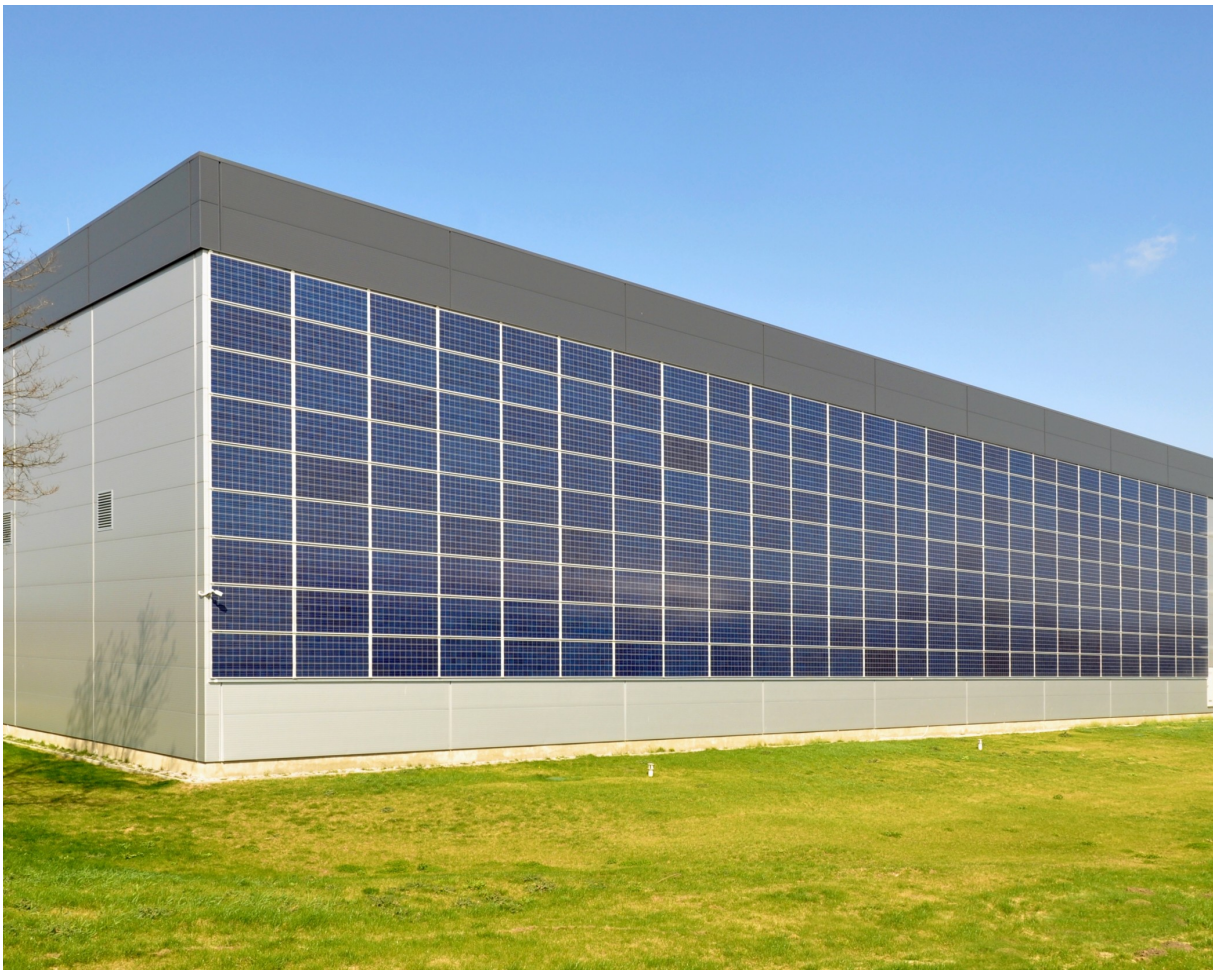
Project

PV and urban renewal

Intelligent building façade generates energy

Intelligent building façade generates energy

In Switzerland, there are many buildings with solar systems on their roofs. However, there is significant catching up to do when it comes to such systems positioned on building façades, especially in the area of renovation projects. A research team says that façades with integrated photovoltaics can also be aesthetic, efficient and generally accepted.



Solarzellen in Gebäudefassaden produzieren nicht nur Strom, sondern können auch zur Wärme- oder Schalldämmung eingesetzt werden. *Source:* Shutterstock

At a glance

- Renovation projects with integrated photovoltaics are implemented too rarely in Switzerland.
- On the basis of a large number of case studies in Neuchâtel, the Swiss Federal Institute of Technology Lausanne (EPFL) has demonstrated that such renovation projects can be both energy-efficient and affordable to maintain.
- For these renovation projects with integrated photovoltaics to break through, modern 3D city maps of Switzerland would be required.

The name given to such systems is a little cumbersome: building-integrated photovoltaics (BIPV). It refers to building façades that can do more than simply house windows. Solar panels convert incoming sunlight into electrical energy. And BIPV façades offer a great deal more additional application options: they can be used, for example, for heat or sound insulation or as a means of light control.

Nevertheless, the technology is not yet very widespread. Objections with respect to aesthetics, in particular, often prevent use in upcoming façade renovations.

A variety of opportunities for building owners and architects

Emmanuel Rey, a professor at the ETH in Lausanne, opines that this technology is only implemented at an insufficient level in Switzerland. If the façades worked upon as part of renovation projects were upgraded with BIPV, this could represent an important step in the implementation of the Energy Strategy 2050. With this new technology for the integration of photovoltaic systems in buildings, building owners and architects now have a broad range of options for combining architectural quality with the necessity for sustainable energy generation.

In contrast to solar systems on roofs, calculations with respect to the use of BIPV are more complicated. The researchers therefore propose already initiating the integration of BIPV in an early project phase. In parallel to this, they also recommend making 3D city maps available to the architects and planners. Within this model, both solar radiation and the vegetation in the surrounding area, among other things, would be taken into account. Such parameters would make it possible to better identify the strategically optimal locations for photovoltaic systems.

The expenditure pays off

A study in Neuchâtel has shown how various renovation projects with BIPV perform in practice. On the basis of this medium-sized Swiss city, Rey and his researchers examined five buildings to ascertain the impact of BIPV in reality. To do so, he looked at buildings of various ages to which three different renovation models had been applied: ranging from a soft BIPV renovation strategy with the objective of maintaining the building's expression and at the same time improving its energy to a BIPV renovation project implemented in accordance with the principles of the 2000-watt society and the requirements stipulated under the Energy Strategy 2050. The third renovation strategy lay between these two extreme variants.

If you are going to renovate, do it properly

Although the initial investments for renovation projects with BIPV are higher than the costs for a renovation without a PV system, the effort is worthwhile when viewed over the long term. The amortisation period for both non-renewable primary energy emissions and greenhouse gas emissions is significantly shorter than the expected useful life of a building-integrated photovoltaic system. The reasons for this include lower energy costs and tax incentives for BIPV renovations.

The researchers also anticipate that the costs for BIPV renovation projects will fall over the coming years. Viewed from this perspective, these renovations not only make an efficient contribution to the achievement of environmental objectives, but rather will also in future pay dividends from a financial viewpoint.

Sophisticated city model

For the study in Neuchâtel, the team headed by Emmanuel Rey applied a sophisticated 3D city model. It contains all of the data relevant for renovation projects with BIPV. A tool such as this for the whole of Switzerland would represent an important step towards achieving the goals of the Energy Strategy 2050.

Produkte aus diesem Projekt

- Review and critical analysis of early-design phase evaluation metrics for the solar potential of neighborhood designs
  Date of publication: 19.06.19
- Integrated thinking for photovoltaics in buildings
  Date of publication: 19.06.19
- 3D model discretization in assessing urban solar potential: the effect of grid spacing on predicted solar irradiation
  Date of publication: 19.06.19
- A toolkit for multi-scale mapping of the solar energy-generation potential of buildings in urban environments under uncertainty
  Date of publication: 19.06.19
- Thermo-mechanical stability of lightweight glass-free photovoltaic modules based on a composite substrate
  Date of publication: 19.06.19
- Light and durable: Composite structures for building-integrated photovoltaic modules
  Date of publication: 19.06.19
- 3D model discretization in assessing urban solar potential: the effect of grid spacing on predicted solar irradiation
  Date of publication: 19.06.19

Contact & Team

Prof. Emmanuel Rey
Versuchsanstalt für Architektur und nachhaltige Bautechnologien
EPF Lausanne
Route Cantonale
Station 16 1015 Lausanne

+41 21 69 30881
emmanuel.rey@epfl.ch

Emmanuel Rey
Project direction

Sergi Aguacil

Marilyne Andersen

Jean-Philippe Bacher

Christophe Ballif

Martin Boesiger

Sophie Lufkin

Giuseppe Peronato

Laure-Emmanuelle
Perret-Aebi

All information provided on these pages corresponds to the status of knowledge as of 13.06.2019.