

BIPV, Architecture and Design

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From niche to mainstream: the keys to making BIPV happen today

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What is BIPV ?

Building-integrated photovoltaics means

- that **PV elements** become an **integral part of a building**
- beside the production of electricity, they **take over additional functions** within the building skin.
- the (local) removal of such an element leaves a **functional or also only an aesthetic gap**, which needs to be closed

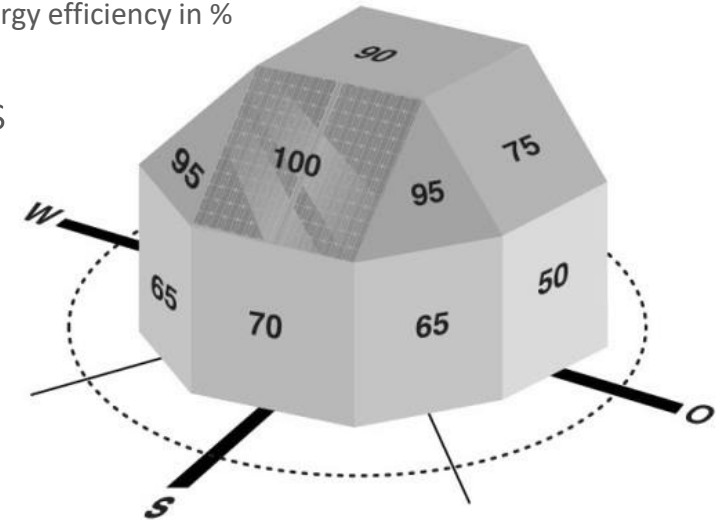


Pictures: HHS Architekten und Planer, Kämpfen für Architektur, GEWOBA

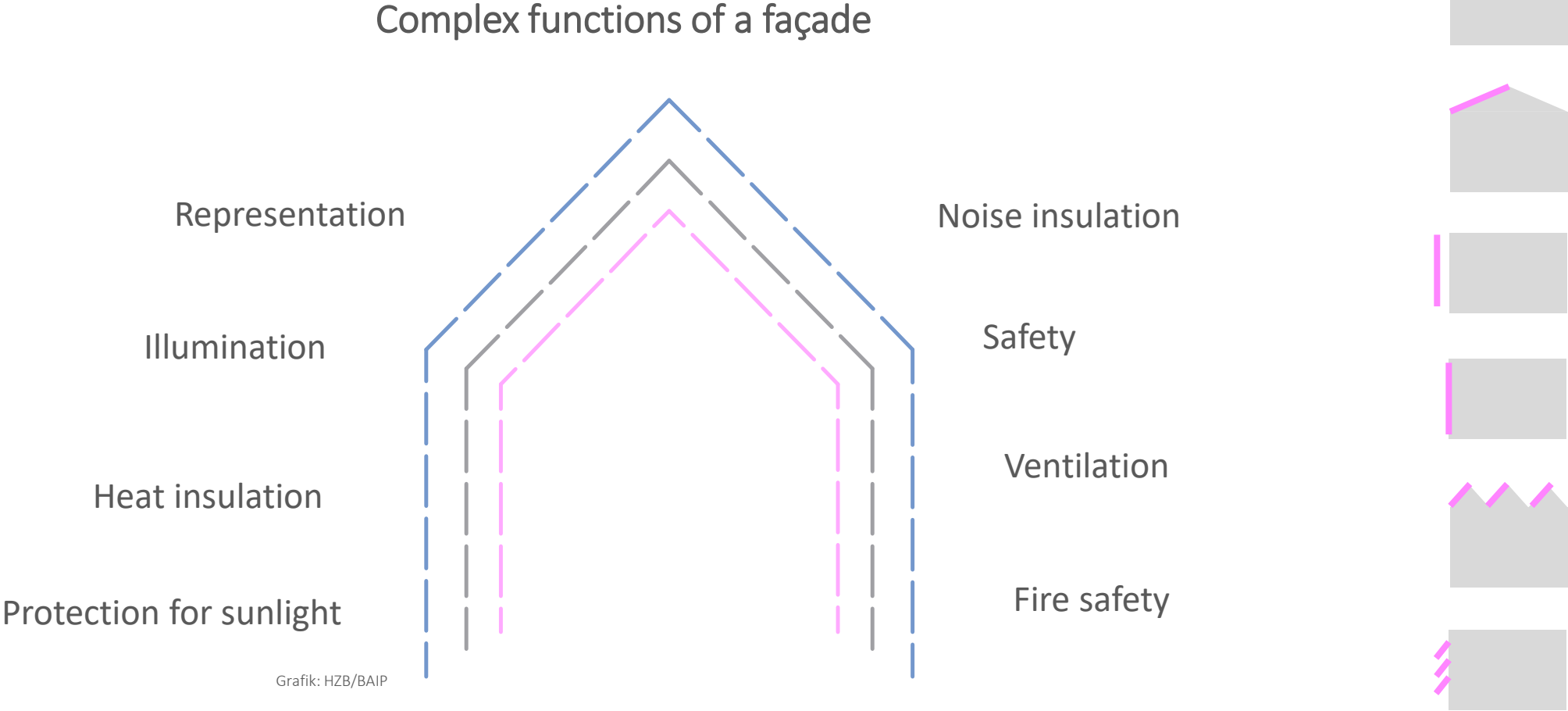
Why choose BIPV ?

- **decarbonizing** the energy system of the building stock, infrastructure and cities
- **key technology** for sustainable decentralized architectural building concepts
- different orientation of the building skins
→ **improved balance** of electricity generation and consumption in the course of the day
- **acceptance**
→ clean energy from the building skin without risks and constraints
- **high potential for development of local markets**
→ business cases for customized solutions

Energy efficiency in %

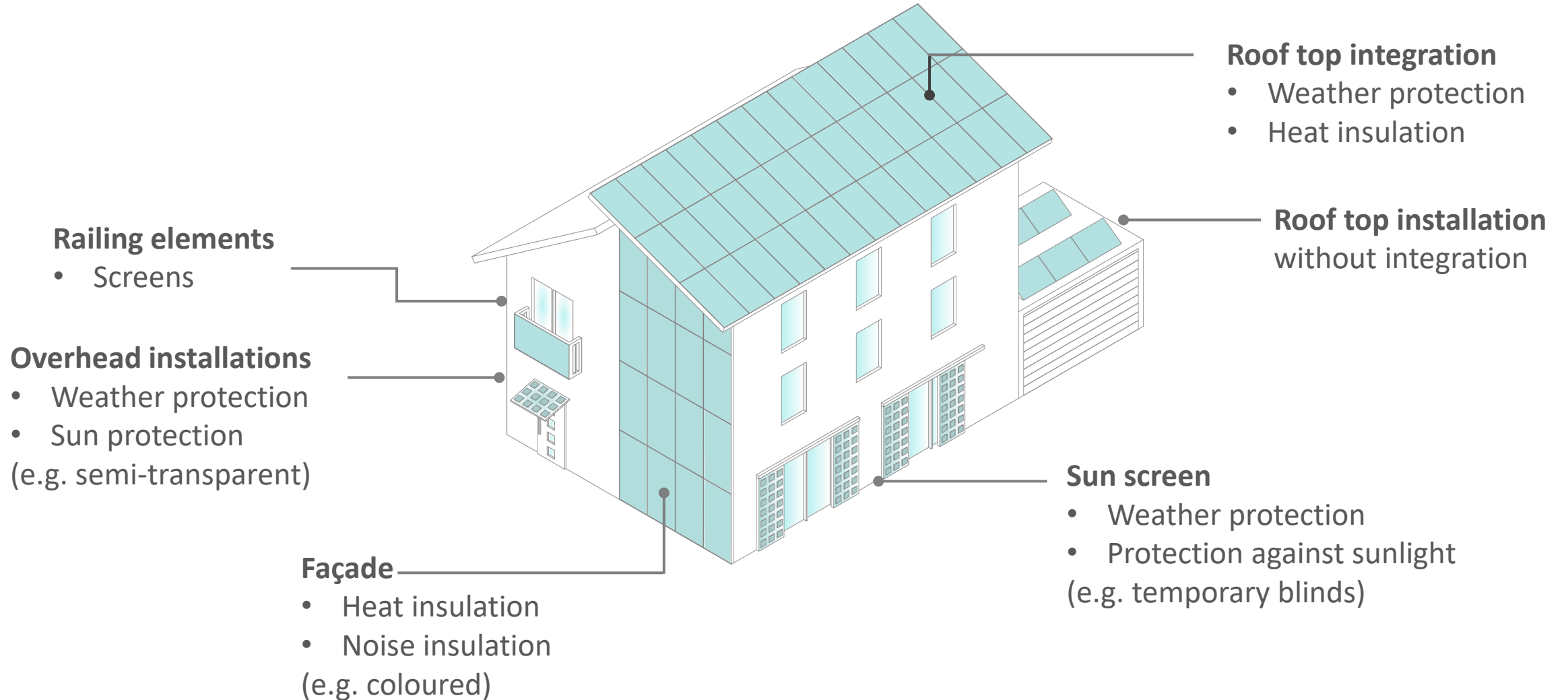


Challenges for solar active building skins



Added value means additional requirements

Opportunities for solar active building skins



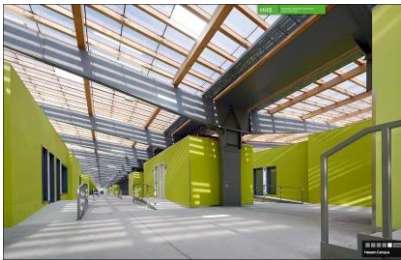
Opportunities for solar active building skins



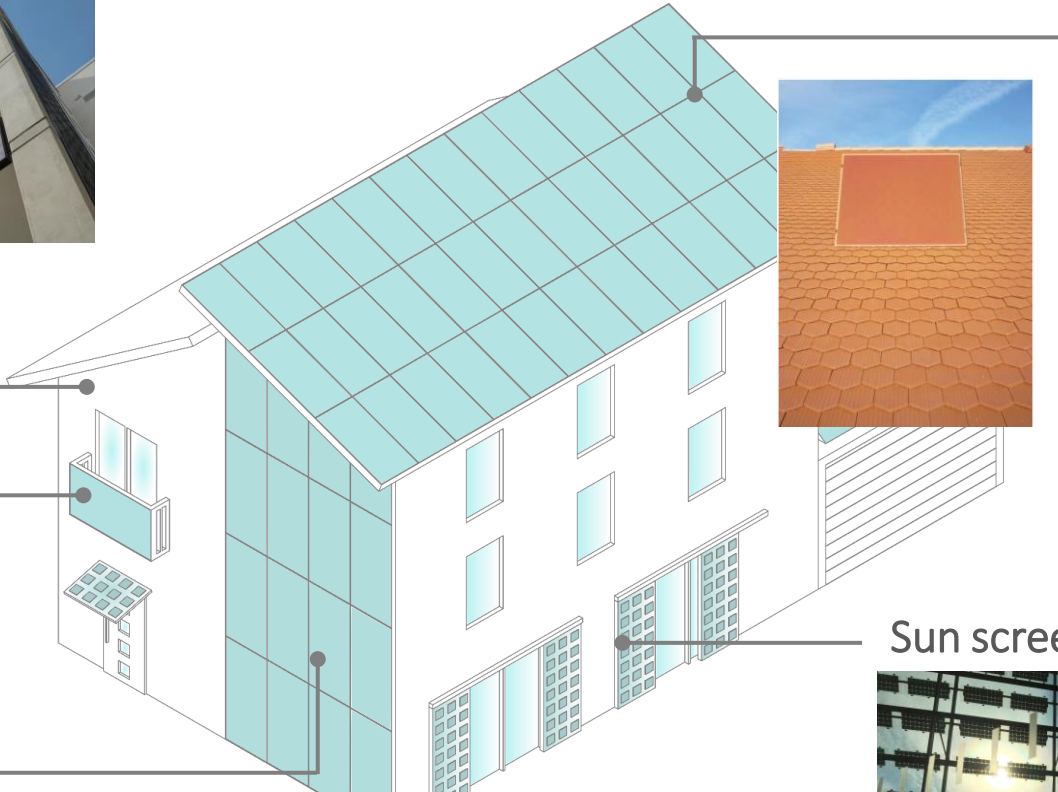
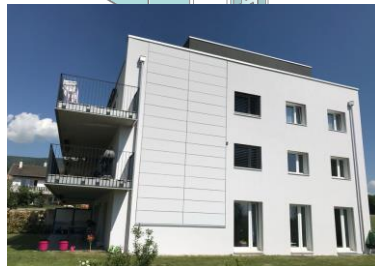
Railing elements



Overhead installations



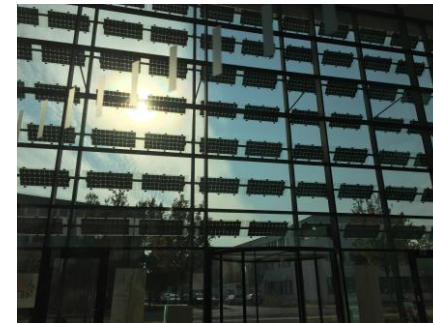
Façade



Roof top integration



Sun screen



Pictures: BIPV: Review, Potentials, Barriers and Myths; Heinstein, Ballif, Perret-Aebi, Balkony: ebay (Carportwerk.com) , GEWOBA, White modules: Solaxess

Installation with well known construction techniques

- Solar modules can be implemented just like ordinary building materials



Pictures: BIPV: Testinghalle, Adlershof, Helmholtz- Zentrum Berlin



Pictures: BIPV: Helliathek

Façade costs in comparison

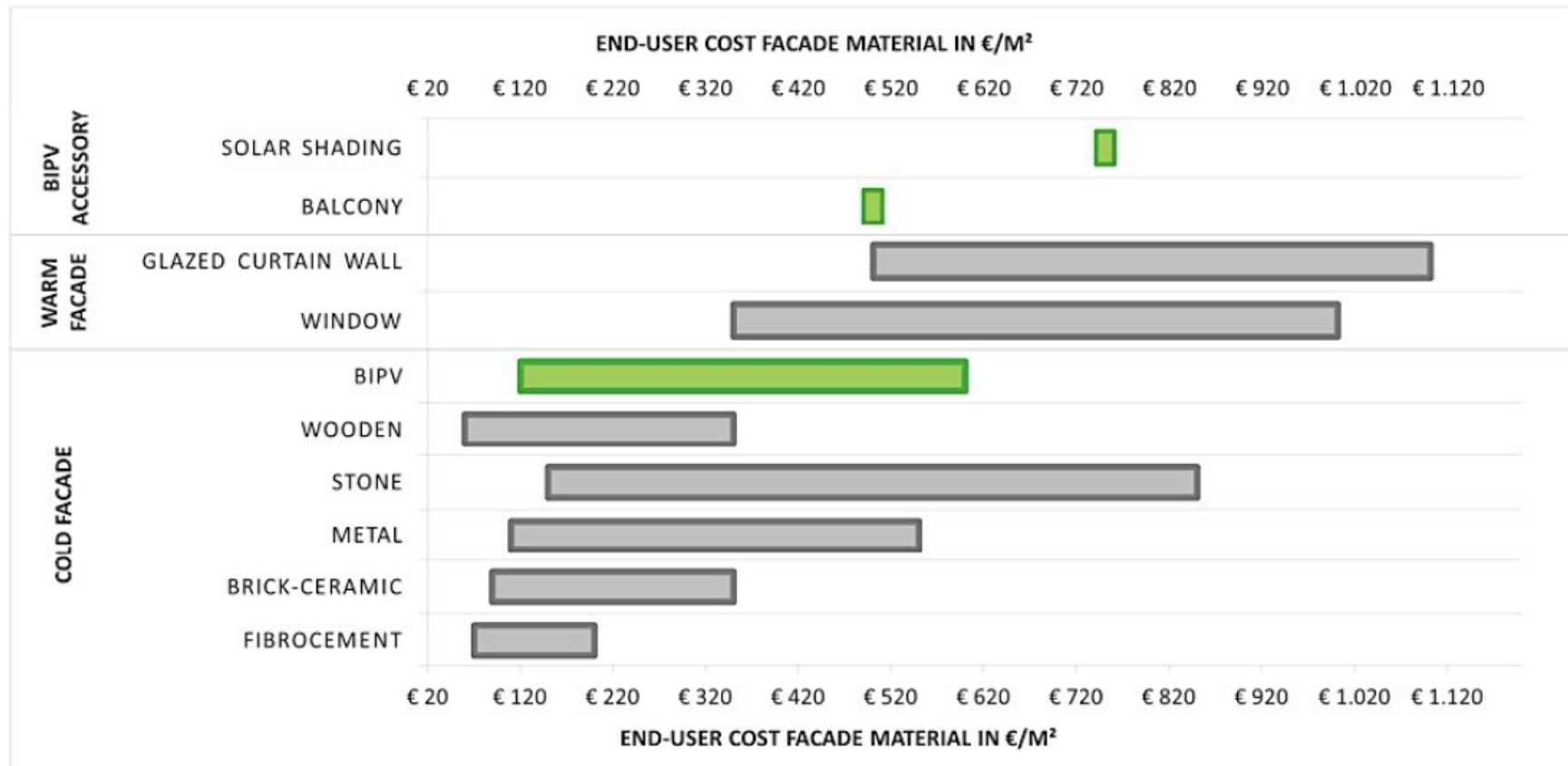
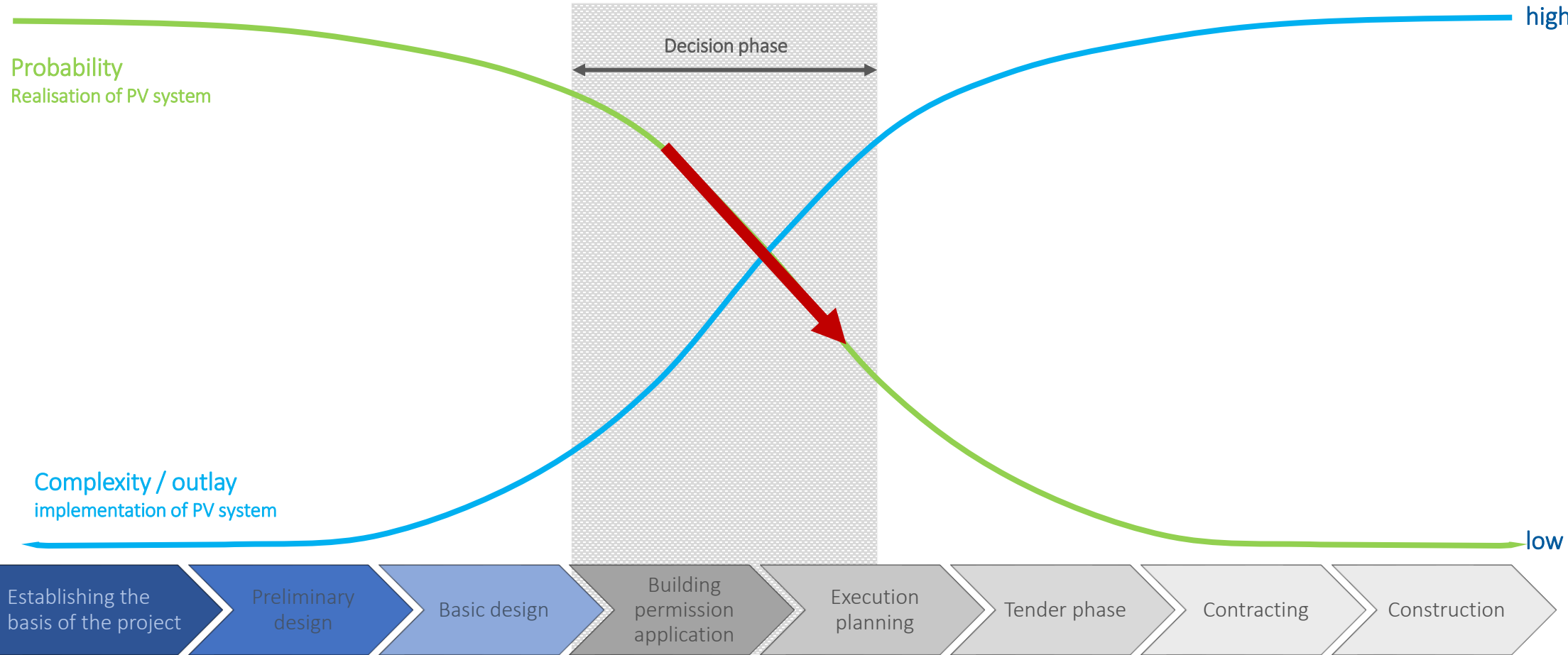


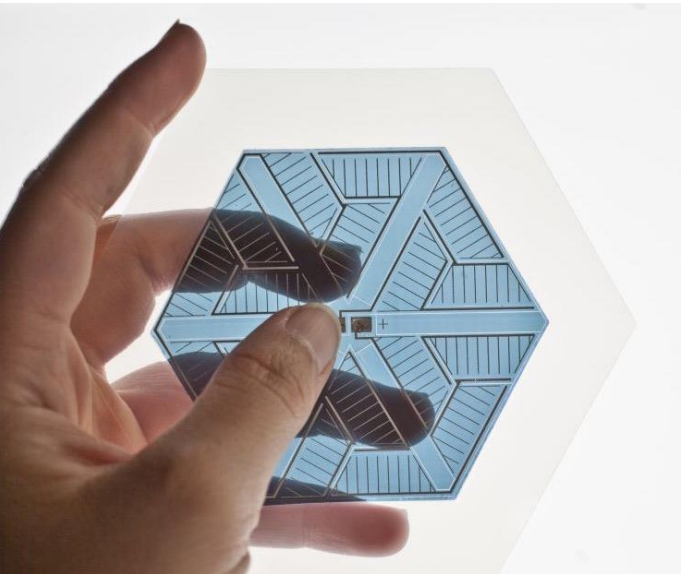
Figure 2.11 A benchmark of the conducted price survey, comparing conventional façade materials with BIPV façade solutions. the price is defined as the end-user price and measured in €/m² [11]

Common process flow of planning and execution

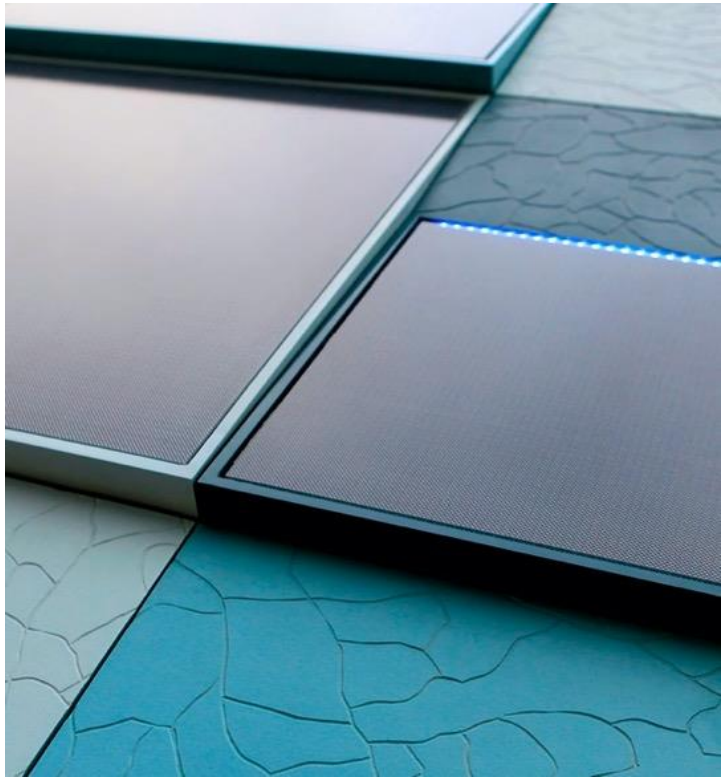


Service phases according to HOAI (Fee structure for architects and engineers)

High aesthetic value and designs available



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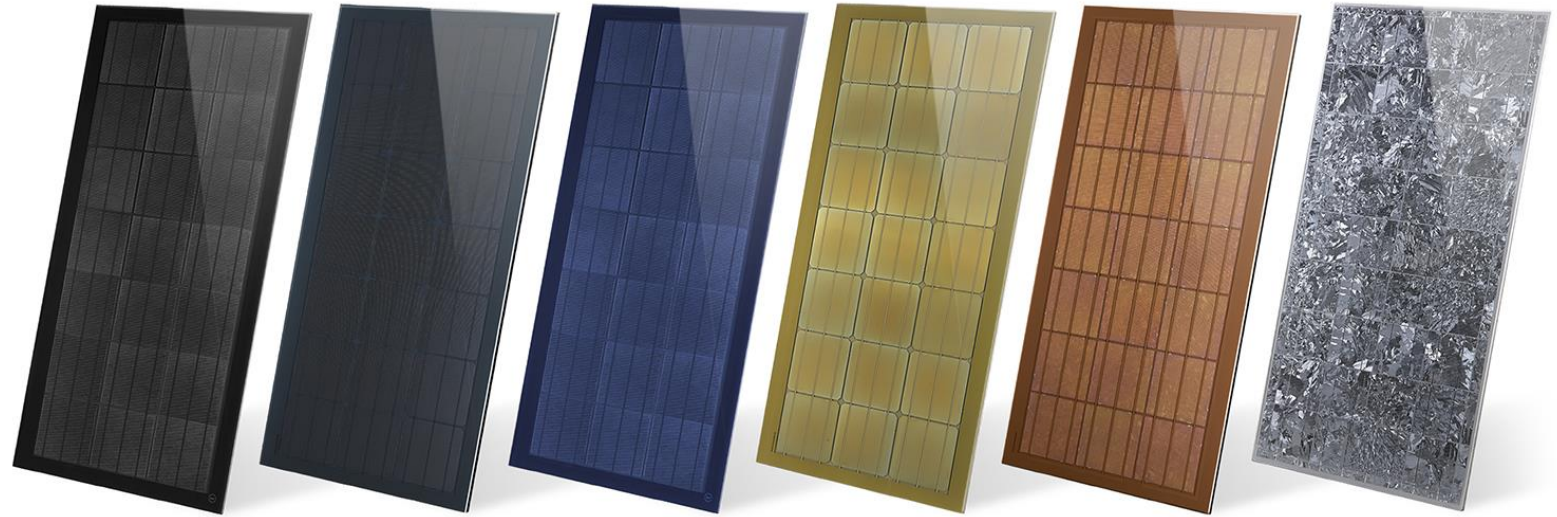
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Variety in form and technologies

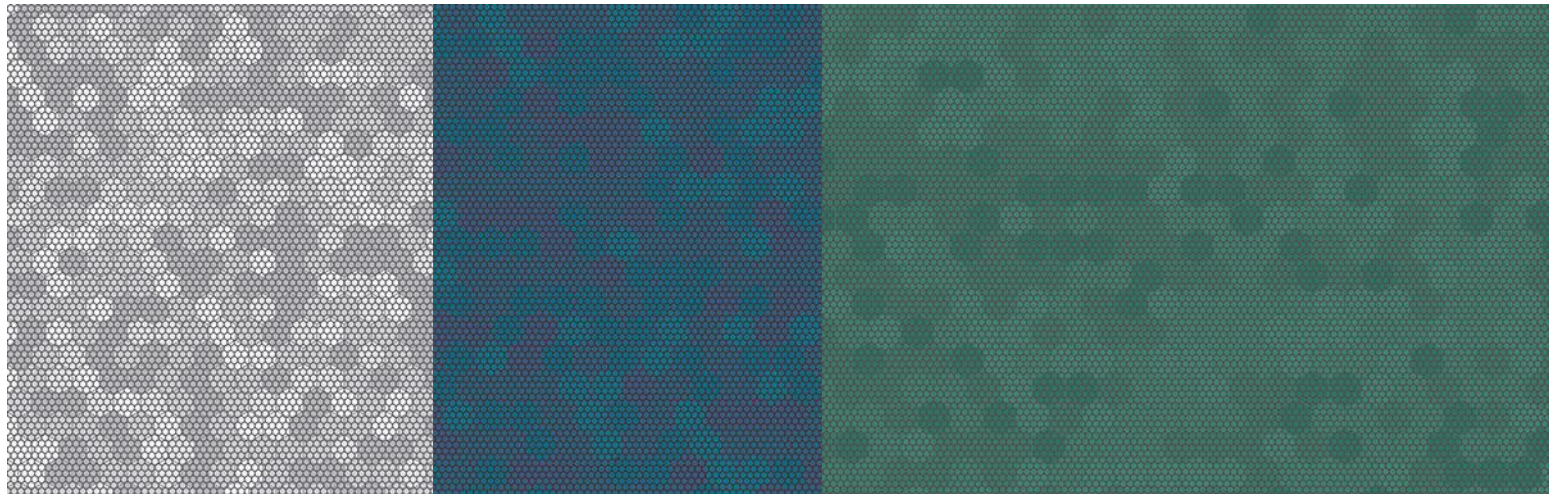
High aesthetic value and designs available



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Variety in colours and technologies

High aesthetic value and designs available



SMA Solar Academy Niesetal, Germany, ©HHS Planer + Architekten AG, Kassel

Pictures: Thorsten Kühn

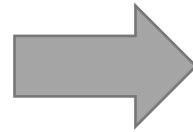
Solar window blind (LEC Leutnegger Energie Control)

Reduces cost by being multifunctional

- Solar modules also replace conventional building materials



Pictures: BIPV: Review, Potentials, Barriers and Myths; Heinstein, Ballif, Perret-Aebi



Energy producing building material

- Energy Payback Time of PV-Modules: 1- 2 years



Graphic: Helmholtz Klima Initiative



©Andreas Heupel Architekten, Münster



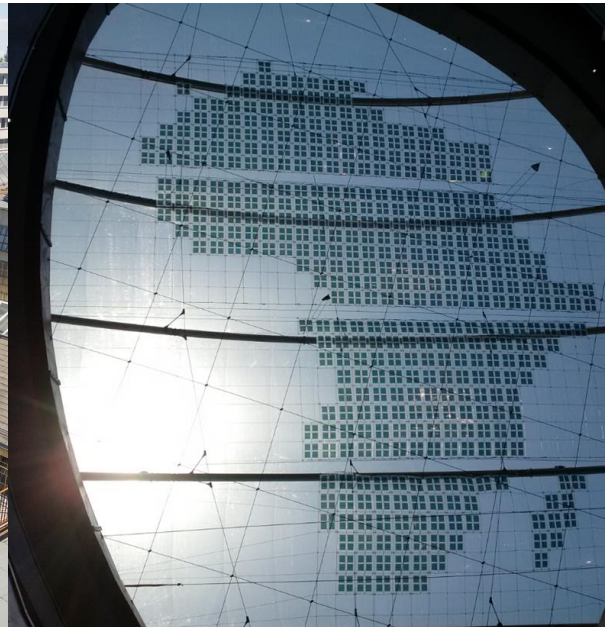
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- solar active building materials

- passive building materials e.g. brickwork, concrete: infinite payback time

High level of acceptance for PV

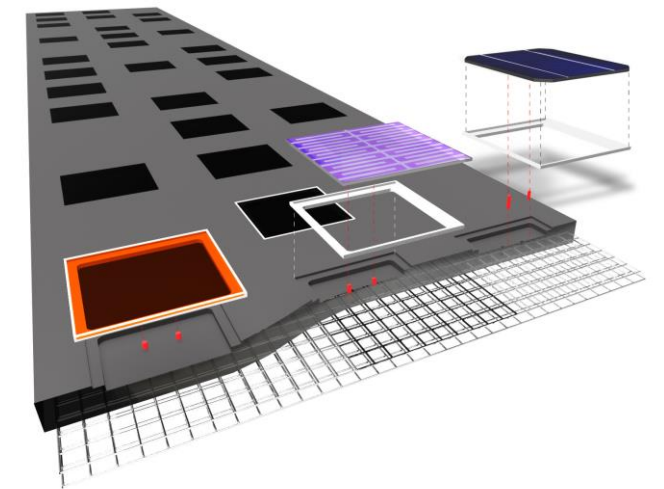
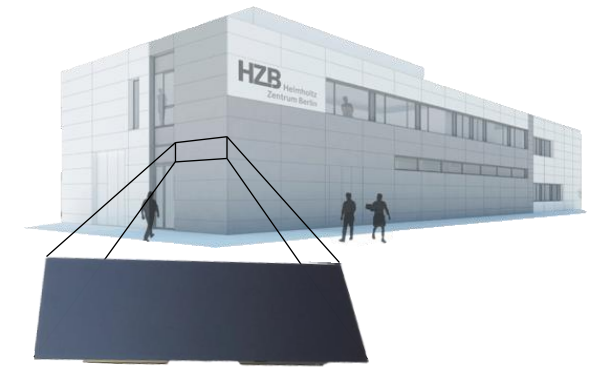
- clean energy from the building skin without emissions, risks and constraints
- significant contribution to the energy transition
- use of existing surfaces without conflicts with land for agriculture, recreation, ...
- variety of aesthetic solutions



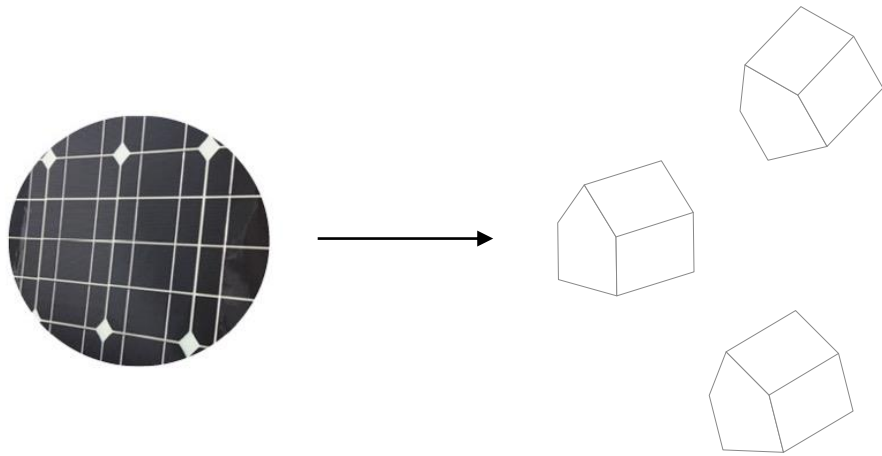
©C.F.Møller Architects, Opvius, baubüro in situ

Challenges for PV industry

- Customized solutions (size, shape, transparency, colours...)
- Easy-to-plan and cost-effective standard elements
- Integration into new façade elements
→ Combination of construction materials & electricity generating elements
- Application-related properties (Resilience against temporary (local) shading)
- Legal aspects (materials, glare, safety, ...)
- Certification and testing
- Partnerships required with construction companies
(module manufacturer is usually not a direct contractor on-site)



Challenges for architects



- Gathering information about possibilities in design, technical solutions and boundary conditions
- Use of further education and qualifications
- Reduction of reservations
- Communication with module manufactures
- Acceptance of changes in common planning process (work flow, content, cost structure...)
- Recognition of chances and responsibilities

Who we are



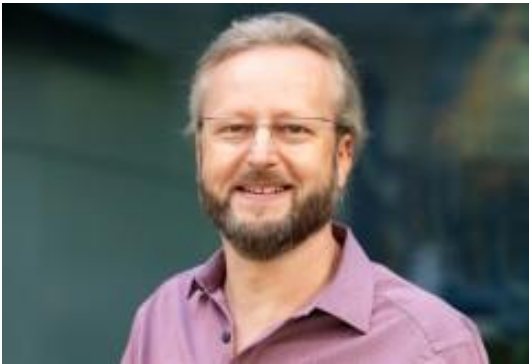
Consultancy office for
building integrated photovoltaics

We aim...

- inspiring and supporting the stakeholders of construction and renovation, to consider BIPV (or at least PV) in der projects.

We provide...

- **free consultancy** for the initial stakeholders of construction and renovation projects
- Individual consulting → **independent, product-neutral, free-of-cost**
- Development and organisation of **workshops and lectures** for the target group (e.g. together with chambers of architects)
- Dialogue between research and manufacturing AND architects and end users (round tables)
- Collaboration with universities → **educating and teaching**



Dr. Björn Rau
PV | Technologie – Expert



Dr. Markus Sauerborn
Knowledge transfer



Samira Aden
Architect Design Research



Thorsten Kühn
Architect | Building-Energy Expert



HELMHOLTZ RESEARCH FOR
GRAND CHALLENGES

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