BAIP
Beratungsstelle für
bauwerkintegrierte Photovoltaik

HZB Helmholtz Zentrum Berlin
PVcomB

One year of independent BIPV consultancy

Experiences, examples and lessons learned

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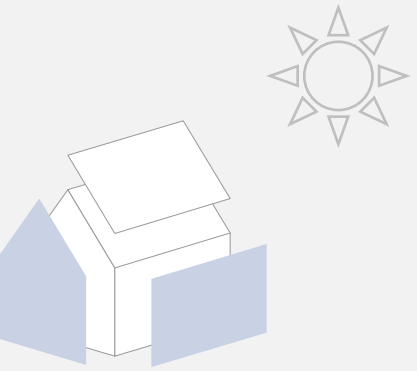
Helmholtz-Zentrum Berlin für Materialien und Energie (HZB)

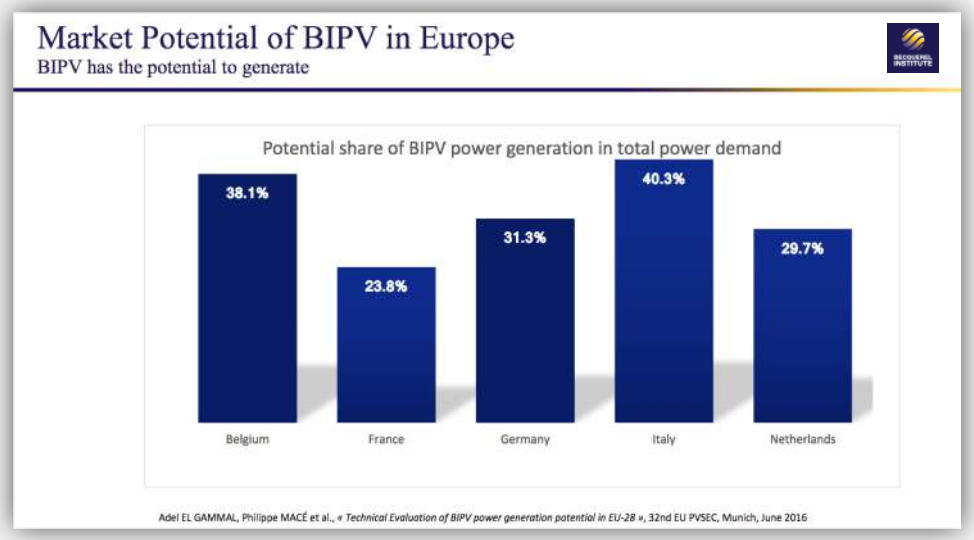


Outline

- Introduction
- The consulting agency for BIPV – BAIP
- Case studies
- Lessons learned

Introduction

Need & Potential



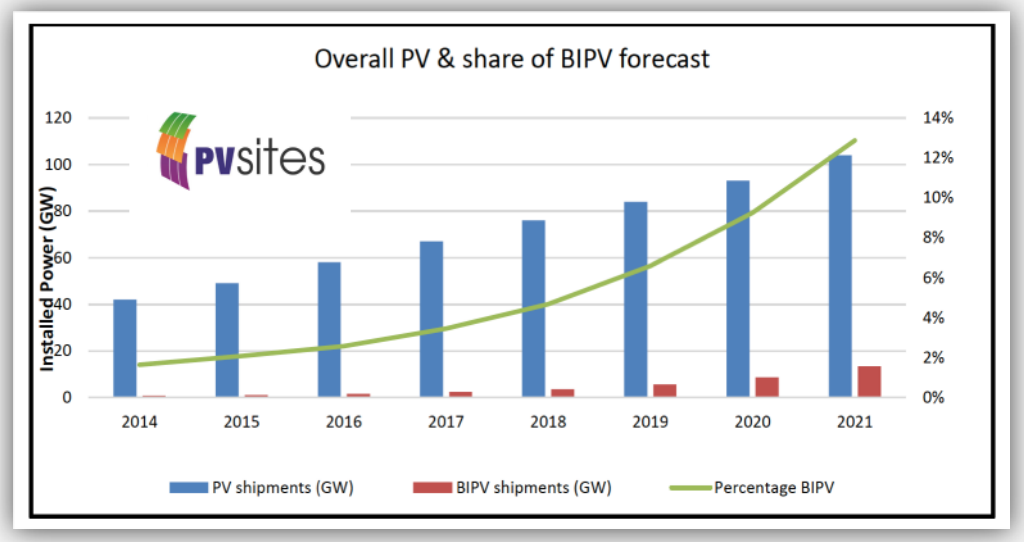
! **Green Deal / 2010/31/EU**

\+ Efficient PV technologies
\+ Market potential

\- Well established (lazy) construction market
\- Market share

Reality

PVSites project report, Oct. 2016



Source: Pixabay

“Photovoltaics only has a future, if it can be integrated harmoniously into architecture”

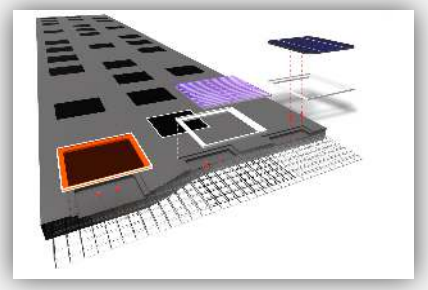
Charles Fritts, 1880

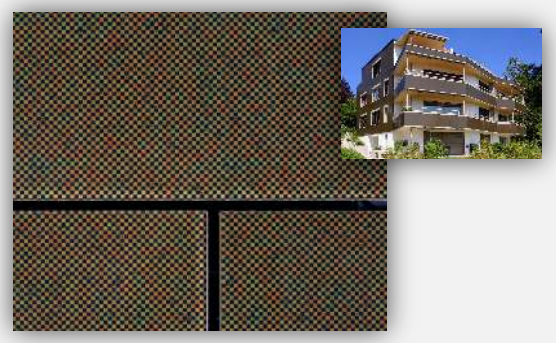
(Inventor of the first solar module)

Challenges for PV industry

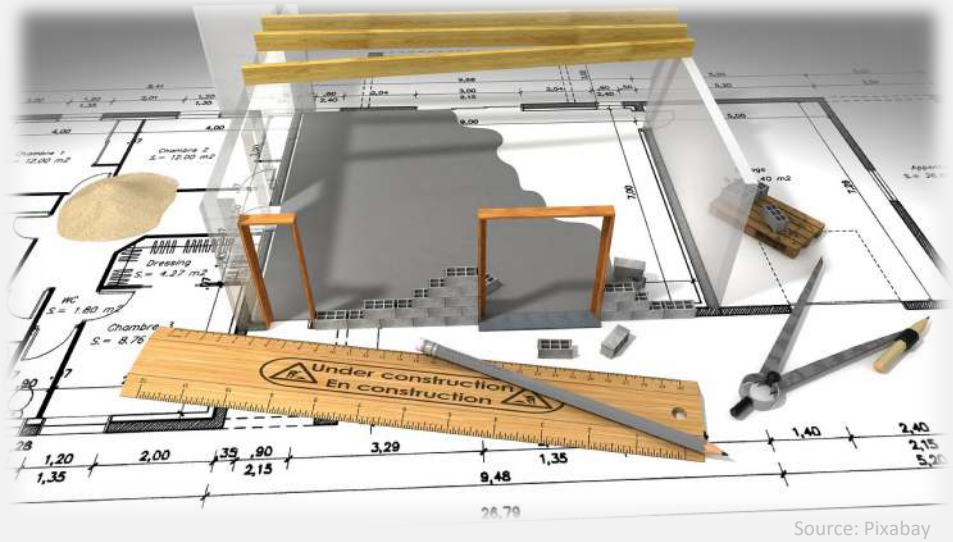
- Customized solutions (size, shape, transparency, colours…)
- Easy to plan and cost-effective standard elements
- Integration into new façade elements
  → Combination of construction materials &
  electricity generating elements
- Application-related properties (Resilience against temporary (local)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

Picture: HZB


Picture: Samira Aden


Pictures: Planeco

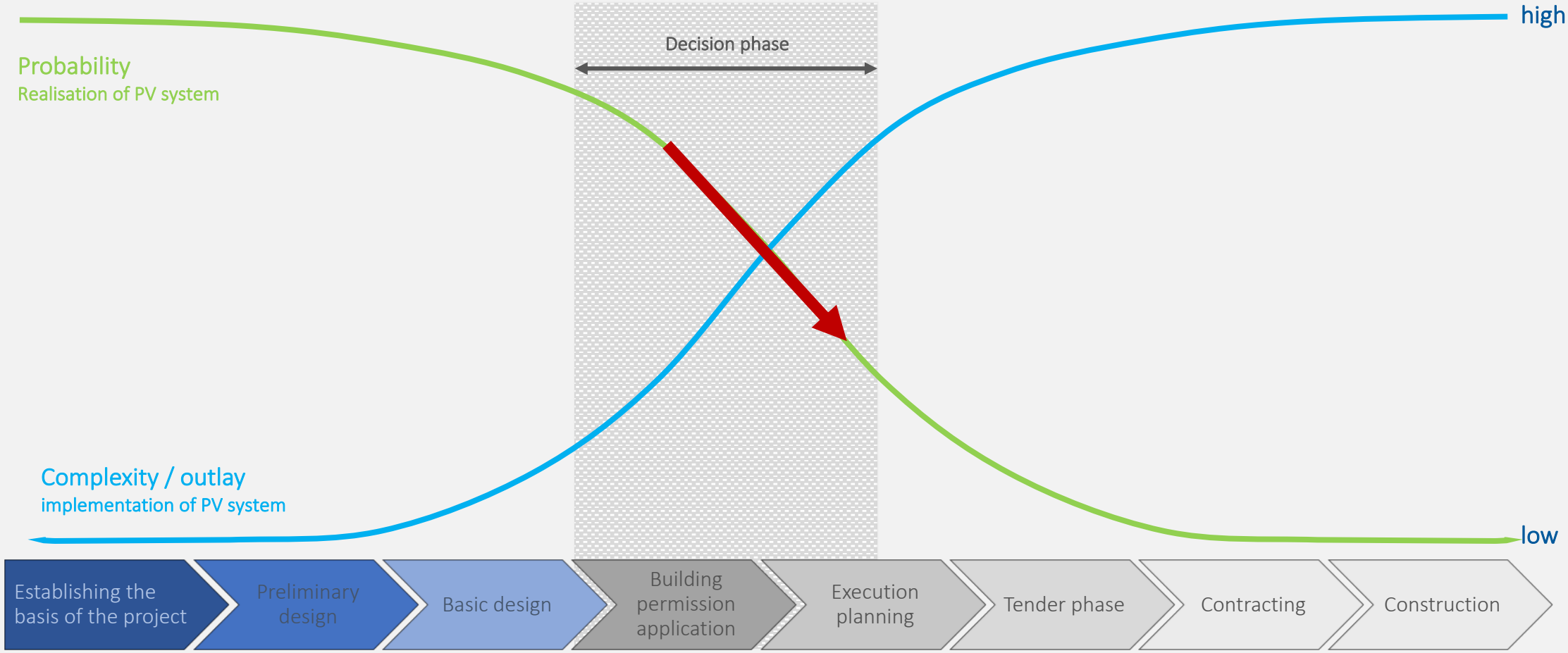
Challenges for architects



Source: Pixabay

- Gathering information about possibilities in design, technical solutions and boundary conditions
- Use of further education and qualifications
- Reduction of reservations
- Going into intercommunication with module manufactures
- Accepting changes in common planning process (work flow, content, cost structure…)
- Recognizing chances and responsibilities and acting

Common process flow of planning and execution



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

Bridging the gap

BAIP

Consultancy office for
building integrated photovoltaics

Picture: Katja Bilo

Dr. Björn Rau
PV / Technology Transfer

Samira Aden
Architect Design Research

Thorsten Kühn
Architect / Energy Expert in Construction

Dr. Markus Sauerborn
Knowledge Transfer

Builder-owners
Architects
Investors
Planners

- Experienced team of PV scientists, architects and experts in knowledge transfer and communication
- Imbedded in the HZB science infrastructure, funded by HELMHOLTZ RESEARCH FOR GRAND CHALLENGES
- Strong partners like chambers of architects, BIPV alliance, university, sustainability council and research

HZB Helmholtz Zentrum Berlin

BUNDES ARCHITEKTEN KAMMER

ARCHITEKTEN KAMMER BERLIN

htw. Hochschule für Technik und Wirtschaft Berlin University of Applied Sciences

ALLIANZ BAUWERKINTEGRIERTE PHOTOVOLTAIK BIPV

DGNB Deutsche Gesellschaft für Nachhaltiges Bauen German Sustainable Building Council

RLI REINER LEMOINE INSTITUT

Bridging the gap

BAIP

Consultancy office for
building integrated photovoltaics

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**

We aim…

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

Individual consultancy

Picture: Katja Bilo

Picture: Rau/HZB

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Consultancy office for
building integrated photovoltaics

- Builder owner (private/public/industry/…)
- Representatives of owner communities
- Architects in specific projects (e.g. requested by builder owner)
- Architects in preparation of competitions
- Berlin Senate Chancellery – construction departments of public properties

More than
40 clients since
Sept. 2019

- **Renovation / construction / development of sub-districts**
- **Technology / design / legal aspects / fire protection/ yield estimations / …**

Training courses and workshops

Picture: Aden/HZB

Picture: Kühn/HZB

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Consultancy office for
building integrated photovoltaics

- Individual events for architect's and planner's offices
- Workshops and trainings jointly organized with chambers of architects* and the German Sustainability Council
- Collaborations with "Solarzentrum Berlin" experts in general aspects of PV, energy law, models of operation, …
- **Strong interest (architects, planners, administration…)**

- (Covid19 restrictions: some events postponed and/or changed into online courses)

* Credit points for members

Case study 1

Pictures in courtesy by Anca Timofticiuc.

Heightening of residential building

Owner: private
Architects: Mensing Timofticiuc Architekten
status: planning phase (SP3)

Story-addition on existing multifamily house.
“Conflict” between Owner (yield!) and architect (design!) about integration

Project: Solutions for well-integrated, high-yield PV

Motivation:
Story-addition (increased living space)
Building owner demands holistic energy concept incl. PV, storage and green roof

Findings:
- Fundamental aspects of PV unknown (although experienced architect)
- Owner had contacted module manufactures → advice towards non-integrated standard modules
- Architect had already pre-selected black c-Si modules
- Architect very open for advices, suggestions

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Pictures in courtesy by Anca Timofticiuc.

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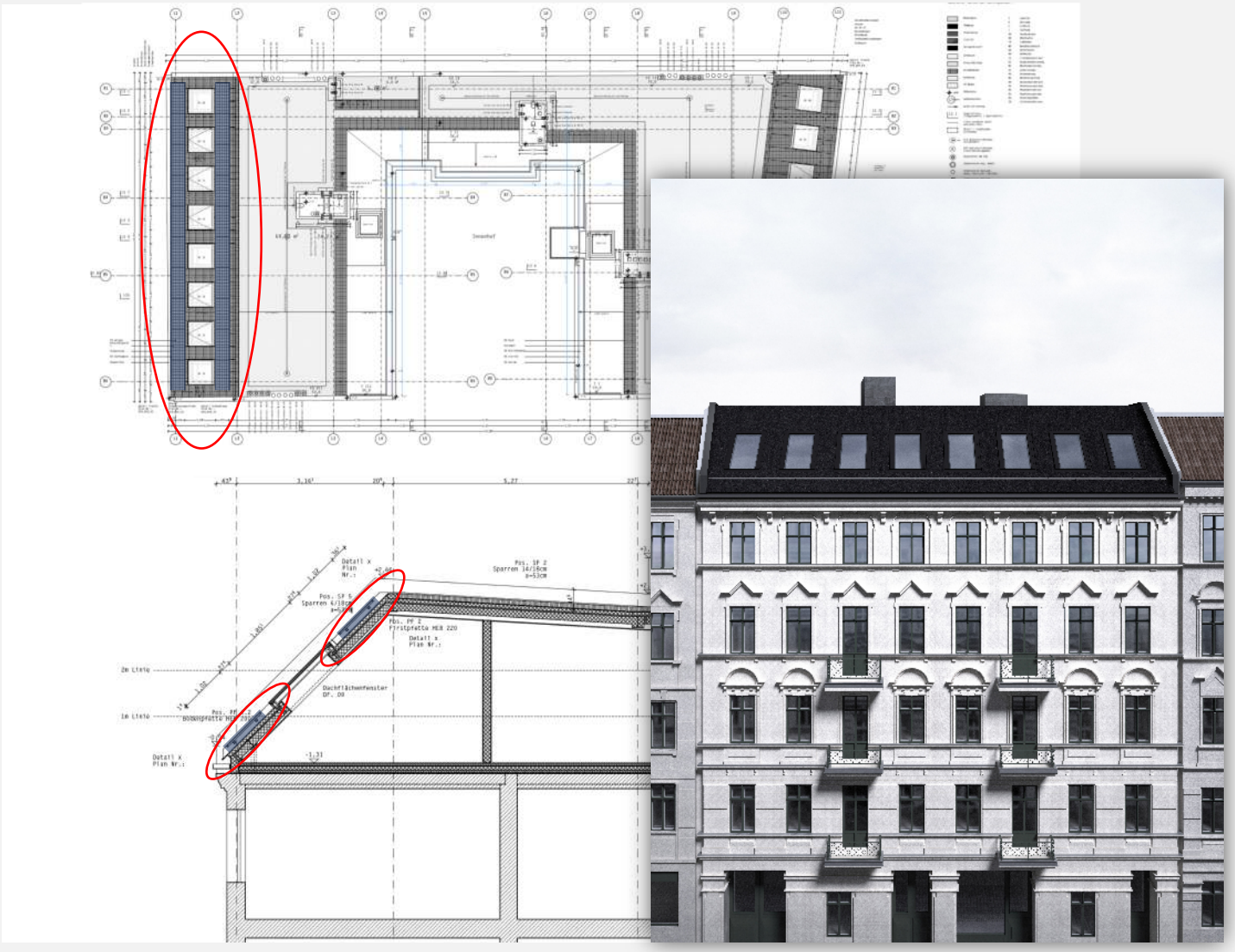
Project: Solutions for well-integrated, high-yield PV

Our service:
- Design opportunities
- PV system simulation (range/size, yield, location)
- Conveying to “Solarzentrum Berlin” for legal aspects of being an energy producer

First conclusions:
- Design (invisibility) important -->
- Support from PV industry “misleading” (no customer-orientation)
- Finally, system size determined (< 10 kWp) by to regulatory aspects (EEG levy)

Case study 1



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BIPV solution will be realized!

Pictures in courtesy by Anca Timofticiuc.

Case study 2

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Public buildings in Berlin

Owner: City of Berlin
Architects: various / sometimes departments of construction
status: SP0 .. SP3

Politics and high-level administration put pressure on their own construction departments → evaluation of PV implementation

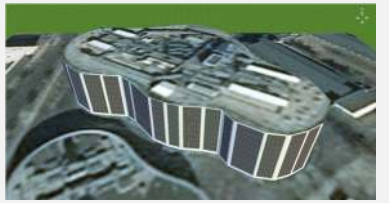
Projects: Renovations and new constructions
Schools, university buildings, hospitals, …

Motivation:
nZEB directive (2010/31 EU)
Climate change / social pressure / Fridays for future / conviction

Findings:
- Individual decision makers are key persons
- Different stakeholders need to be convinced
- Reservations have to be reduced
- Local benefit often not existing
- Operator's models are needed
- Green roof conflicts

First conclusions:
Communication with people in charge important
Also politicians need to be enlightened

Case study 3



©sauerbruch hutton

Zentrum für Photonik und Optische Technologien

Owner: Wista Management GmbH
Architects: Sauerbruch Hutton
Constructed: 1998

Very high demand for design (colours)
Complete glass façade
Coloured blinds indoor, coloured design inside

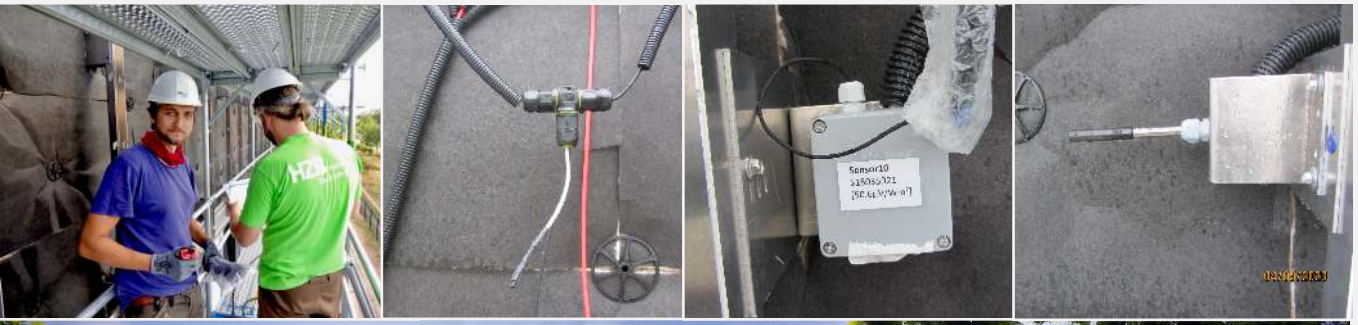
Project: Replacement of blinds / Evaluation of PV active, coloured blinds

Motivation:
Use of PV / demonstration / positive impact
Replacement of broken blinds
Individual energy supply for each blind (avoidance of wiring)

Findings:
- Design opportunities (colours, PV-blinds, transparency…) unknown

First conclusions:
Existing concepts do not fulfil (complex) colour requirements

BIPV real lab



BIPV real lab @HZB

Owner: HZB
Architects: DGI Bauwerk
status: in construction

360 fully-integrated thin-film modules / 47 kWp

Project: BIPV real lab – coloured CIGS façade as ventilated curtain wall

Motivation:
Advanced analysis of façade-integrated CIGS solar modules as complete PV system under real conditions

Measurement of yield, temperatures, ventilation with respect to specific location inside façade (N, S, W) and ventilation/isolation conditions

Findings (so far):
- Steep learning curve on the entire chain of realizing a building with a PV façade

First conclusions:
- “If there is a will, there will be a way”
- General building approval for used modules/building elements is quite helpful.
- …

Summary / lessons learned

BAIP

Consultancy office for
building integrated photovoltaics

- There is a need for a serious, independent free BIPV consultancy.
- There are architects and planners, willing to learn and to work with (BI)PV.
- Design, technologies and legal aspects of BIPV are all quite relevant topics.
- Fire protection is a point of discussion in about 50% of concretely discussed BIPV projects.*
- Political and administrative decision makers are key persons.
- Roof top installations are still often preferred (costs/yield optimization).
- Good operator's models are strongly required.
- The earlier PV is considered in the planning phase, the lower additional cost, the saver the time plan and the higher the probability of success.

* The Alliance BIPV (in cooperation with BAIP) will publish a guideline for fire protection soon.

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HELMHOLTZ RESEARCH FOR GRAND CHALLENGES

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