Innovative Technologies 1.4

How can we integrate BIPV on vertical facades?

A full integration of PV is possible both in ventilated and more standard facades [1]. Whichever the case, solution providers should be contacted in the early phases of the project [cf. sheet 2.4]. Some technical approaches are illustrated here.

There are several barriers and constraints hindering the full implementation of BIPV into the building envelope, ranging from economic or financial barriers to legislative and institutional obstacles, or purely technical issues at both urban and building levels. A detailed study of building skin construction technology is therefore essential to analyze the relationship between the PV module and the different sub-systems and materials.

Keywords: BIPV building skin; Active facade; Skin technology; Urban and building barriers; Cost-acceptance.
Target audience: Owners & other decision makers; Architects & engineers; Suppliers & companies.

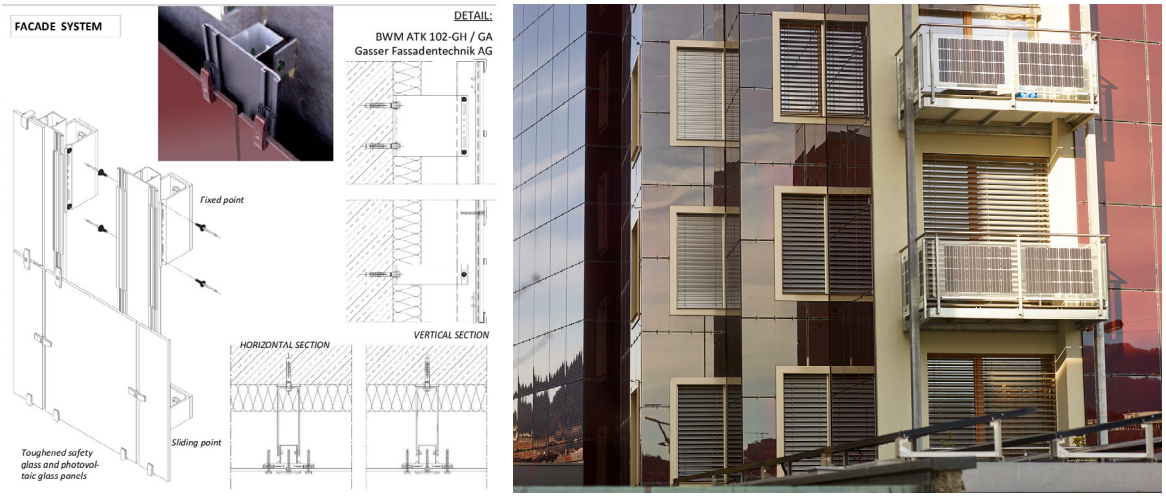

Fig. 1 Palazzo Positivo in Chiasso, Ticino. Facade details (©SUPSI www.bipv.ch; Gasser Gebäude AG).

Today's BIPV market can provide a clear catalogue of BIPV technical solutions, namely a structured scheme of elements to activate the building skin [2].

A detailed study of **building skin construction technology** is essential:

- to analyze the relationship of the PV part with the layerings, the different sub-systems and envelope materials;
- to define the construction interferences to be solved by the technical solution in order to properly satisfy the building's technological requirements (e.g. watertightness, mechanical stability, etc.) and PV functionality.

The **building skin engineering** should be a crucial step to consider both in R&D and in real Architecture, Engineering and Construction (AEC) processes, in order to evaluate all of the interacting construction aspects between PV and building envelope (such as physical integration, functionality, building/electro-technical requirements, cabling integration, etc.). Functionality, performance, aesthetics and energy use have to be assessed and addressed by a unitary solution.

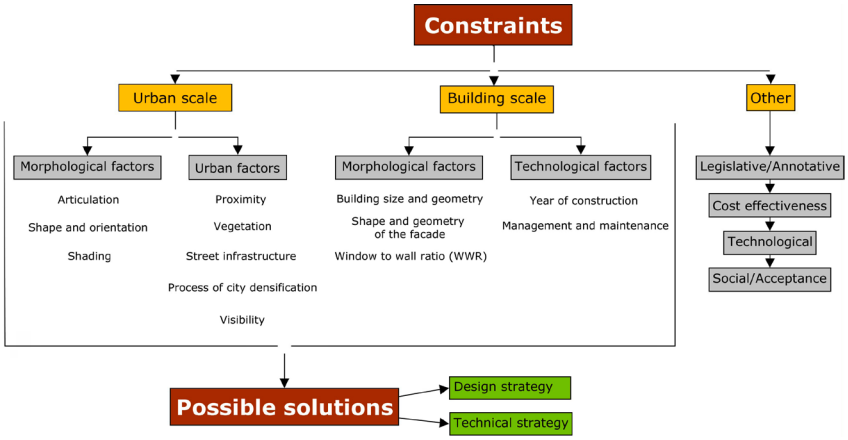

Fig. 2 Flowchart of main barriers for BIPV implementation (©SUPSI).

The topic of BIPV facades today demonstrates tangible **feasibility and design flexibility** [3,4]. However, some specific **technical requirements** (Fig. 1) and the related issues are often perceived as obstacles for the full implementation of BIPV in the existing built environment, namely in two specific contexts: the **urban** and **building** levels [5]. The former includes issues related to characteristics of the urban area where the building is located which can affect the BIPV concept and installation. The latter is related to the issues that arise when considering the specific building typology and building envelope for the BIPV installation (Fig. 2).

From project investigation it emerges that several **strategies to reduce or eliminate** constraints and limitations are possible, by implementing both a design and a technical approach.

- On the one hand, **technical solutions** such as accurate electrical wiring, the use of appropriate PV technology or technical devices (power optimizers, micro inverters, by-pass diodes, dummies) can moderate or eliminate some energy problems that building and urban situations create on a PV plant (shading, non-optimal exposure, etc.).
- On the other hand, implementing an accurate **BIPV design** approach during the early stages of architectural concept and building skin construction can help avoid some of the critical aspects affecting PV energy behavior, as can carefully taking into account some basic design rules and optimizing design factors such as PV plant configuration, geometry, exposure, string layout, etc. according to the urban or building context.

Our results highlight definitively that for technical, construction, energy and economic reasons [6] an integrated evaluation of BIPV in a broader building perspective is crucial. This integrated design must be the driving factor for supporting the growth of BIPV in the built environment.

References

[1] Several companies and offices can provide expertise in Switzerland, such as CR Energie, Solarwall, 3S solar plus, Viriden+partner (architecture), ISSOL CH, Ernst Schweizer AG, Basler & Hofmann, Solvatec, Solstis, etc.
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