



Integrated Design

2.3

Are BIPV compatible with different renovation strategies?

BIPV can be successfully integrated into renovation projects with various levels of intervention, from lightest to heaviest. Here, we illustrate three possible strategies.

After analysis of the current status of the building in order to detect the improvement potential [cf. sheet 2.2], we can propose three design scenarios for incorporating BIPV: S1-Conservation, S2-Renovation, and S3-Transformation. Each scenario implies a technological approach and defines specific energy performance targets.

Keywords: BIPV architectural integration; Renovation project; Level of intervention.

Target audience: Regulation makers; Owners & other decision makers; Architects & engineers; Suppliers & companies; Broader public.

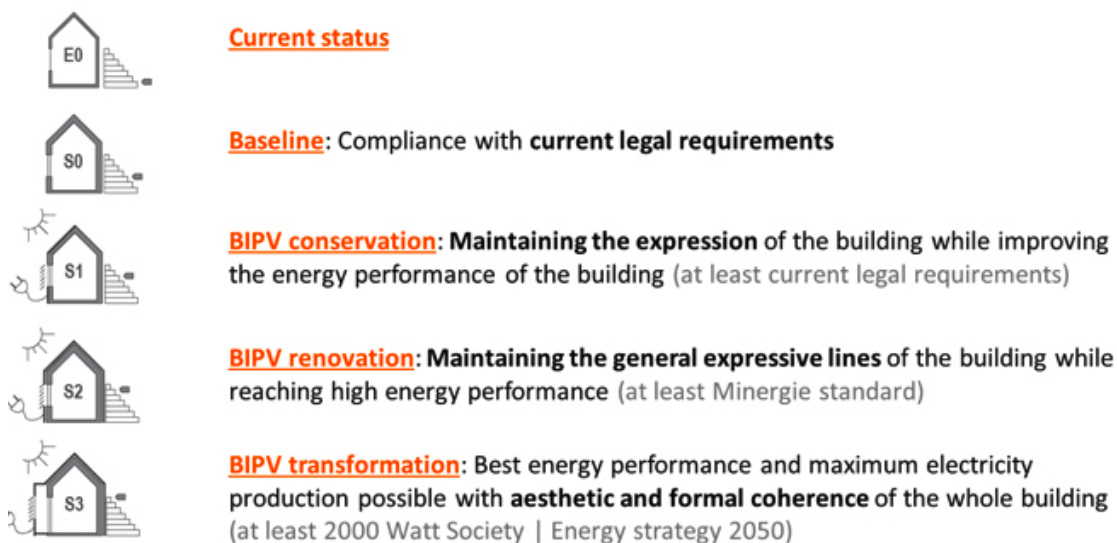


Fig. 1 Proposed renovation design scenarios for BIPV strategy : E0-Current status, S0-Baseline, S1-Conservation, S2-Renovation and S3-Transformation [1] (©EPFL-LAST).

One of the main issues faced when requesting a construction permit for a BIPV renovation project relates to the visual impact on the final aspect of the building. We propose three different approaches from an architectural design standpoint to try to address this matter.

Before choosing a scenario for BIPV strategy – S1-Conservation, S2-Renovation or S3-Transformation (Fig. 1) – it is necessary to study each building in detail to obtain a picture of the actual situation. Thus, the first reference scenario is the current status (E0), where all the necessary information to define renewal strategies, technical feasibility and economic feasibility is compiled. This study is also used to detect all BIPV integration opportunities in the building's thermal envelope. The subsequent scenarios, defined in terms of architectural objectives, will try to respond to the demands of the built environment in each archetypal situation.



Fig. 2 Example of BIPV renovation scenarios proposed according to design and energy performance objectives [1] (©EPFL-LAST).

S1-Conservation: This scenario aims to maintain the substance or expression of the building when possible (considering current practices) while improving its energy performance, by replacing defective elements with better performing ones: for instance, by changing windows, internal wall insulation and roof insulation. The highest performance is not necessarily achieved, because we want to respect the existing appearance of the building, but current legal requirements [2] should at least be achieved. In addition, unlike the baseline (S0, current practice), in this scenario (S1) we propose to respect the targets needed to obtain a subsidy of 60 CHF/m² from the "programme bâtiment" [3] which promotes energy renovation of existing building envelopes.

S2-Renovation: This scenario aims to maintain the general expressive lines of the building while reaching high energy performance and high electricity production (as reference, at least Swiss Minergie® standard label [4] for renovation projects), placing photovoltaic elements wherever possible.

S3-Transformation: This scenario involves a global strategy corresponding to the best energy performance and maximum electricity production possible (at least 2,000-Watt Society [5], according to Energy strategy 2050 [6]) with aesthetic and formal coherence of the whole building, but allowing the image of the building to be changed radically. The results of this scenario should show the energy performance improvement potential for each type of building and the feasibility of achieving the 2,000-Watt Society concept targets.

Fig. 2 shows an example of implementation of the different BIPV renovation scenarios for the Archetype 4, built in the 70s as detailed in [sheet 2.2]. For S1, the window railings are used and an internal insulation is proposed. For S2, a ventilated facade renders almost all opaque surfaces active. Finally, for S3 we propose a prefabricated facade using low-carbon materials modulated using standard-size PV elements.

The multi-criteria scenario assessment, which integrates both qualitative and quantitative aspects, is described in [1] and [sheets 3.2 and 3.3]. Through an iterative process between the assessment and design phases, the scenarios are refined in an integrated process to ensure the architectural quality of the propositions.

References

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