Renovation "Schnitterhaus"


Schnitterhaus

Aesthetic integration

The big challenge was to find an architectural expression which would suit the historic building and village on the one hand, but on the other hand would be modern and simple. Window shutters were historically not represented on this building but several examples were found in neighbouring villages. Other former farm houses or village buildings also had comparable architectural elements like wooden framing for the window's reveal and 'stucco elements' made of wood above them. Furthermore the famous Berlin architect Schinkel use wooden reveals and window shutters for the castles in Berlin and Potsdam he was designing, even when these buildings had very stable brick walls. However, the integration of colour and exact shape also seemed to be easier for him with the interesting detail of a wooden frame around the windows opening. His work was a great inspiration for the classic design of the shutters and the framing. Thus, the solar window shutter elements were in this sense integrated into the local architectural heritage of Berlin and Brandenburg. The little wooden 'stucco'-elements above the window somehow give the window opening an 'eye'. The same effect occurs with the PV shading elements above the other windows: they give the windows more 'esprit'. The levering elements at the same time make the windows and the façade more durable by protecting them from rain. Furthermore the shading effects are enhancing not only the indoor comfort but also the structure of the façade. (Astrid Schneider)

Energy integration

The electricity yield of the façade BIPV system and the roof PV system has been monitored since November 2016. The façade modules are connected in strings of a minimum of 2 to a maximum of 5 modules, because of the shadows caused by the complex geometry of the building. From the available data, so far, it has been determined that all the BIPV façades contribute in a significantly to the total electricity yield. Furthermore, the distribution of BIPV modules over the different orientations distributes the power generation throughout the entire day.

Technology integration

The solar window shutters are made of glass-glass modules with crystalline silicon solar cells, which are 'conventionally' integrated into wooden frames. These shutter elements are attached and made movable with a very sophisticated mechanism, which allows the shutter to remain parallel to the wall while it was moved by supporting arms. This means that the solar active surface is always directed towards the sun, independently of whether the shutter is opened or closed. To enable installation, wooden frames were attached to the pre-installed stainless steel fixtures on the massive wall. The 3 cm thick planks form a reveal around the windows opening. This was very important to provide a stable and exactly defined substructure for the window shutters, as the 25 cm thick insulation turned out to be a constructive obstacle – and the façade of the historic building was certainly not planar. As a result, the original wall and the final surface of the insulation were not parallel. Furthermore, moving shutters would in time destroy the weak surface of a compound insulation panel. As a solution, the wooden framing for the window's reveal was designed and attached to the original metal elements anchored in the massive wall to be an accurate and stable backbone and counterpart for the solar window shutters. This wooden structure allowed optimal integration. The metal substructure moving the solar window shutters in a semicircle were detailed and designed by the solar architect and then manufactured by a metal-working company from Saxony. (Astrid Schneider)

To allow shading and ventilation at the same time, a so-called 'ventilation position' was designed: the lever used to close the window shutter from the inside was specially designed to allow a semi-closed position. In this position the window shutter is nearly closed but due to the movement path' is about 15

cm in front of and parallel to the wall. This allows a chimney effect with a comfortable ventilation behind the solar shutters, while the window opening and thus also the room are still fully shaded. This provides a double cooling effect.

The electric cables are hidden inside the upper metal arm and connected to the cables, which were already put in place during the construction works. (Astrid Schneider)

Decision making

The client was very interested in integrating PV electricity generation into the buildings renovation and was a driving force. However there was a permanent conflict between realizing the most advanced and beautiful BIPV elements and the cost argument. Decisions about product and supplier choices were made by the architect together with the clients.

Lesson learnt

To find an optimal position for the inverters was difficult, as the building has no cellar and there was no special room available for technological equipment. To be allowed to install the inverters in the staircase, they would have had to fulfil the required fire rating for the staircase as an escape route. Otherwise, a 90-minutes fire-resistant box would have had to be built. However, as inverters produce heat, this task would have had very expensive, as a special construction would have been needed to ensure ventilation. Finally, it was the wish of the client that all inverters be installed in the neighbouring building to allow an even simpler electrical connection with the grid and to establish an island network if needed. After the inverters had been installed in an upper storey of the neighbouring granary, it turned out, that the smallest inverter constantly emits a rattling noise. At the position of installation, this is not a problem, but it really would have been, when it would have been if the inverter had been placed within or near a room that was in daily use. It is strongly recommended to test inverters not only for fire safety but also for noise emissions to make them ideally suitable for construction purposes. At least some information about these properties would be helpful for planning purposes.

The BIPV shutters play an important role both in summer, when it is very hot and shading is needed, and in winter, when every sun ray could be enjoyed by opening the shutters wide during the day.

The semi-closed position of the shutters allow a chimney effect with a comfortable ventilation behind the solar shutters, while the window opening and thus also the room are still fully shaded. This provides a double cooling effect and is often used in summer by the inhabitants. Especially for the rooms on the ground floor, the protective function providing more privacy is a welcome effect of the solar window shutters.

PROJECT DATA

Project type	Retrofit
Building function	Residential
Integration system	Opaque flat roof
Location	17337 Nechlin, Deutschland

BIPV SYSTEM DATA

Module type	Custom made modules
Solar technology	Monokristallines Silizium
Nominal power [kWp]	1,16 (Shutters), 1,96 (Louvers)
System size [m²]	-
Module size [mm]	2773 x 725 , 1035 / 2445 x 710
Orientation	Süden-Westen
Tilt [°]	90 (Shutters), 30 (Louvers)

BIPV SYSTEM COSTS

Total cost [€]	-
€/m²	-
€/kWp	-

PRODUCER DATA

Producer	Solar Nova GmbH
Address	Am Marienhof 6, Wedel, Deutschland
Contact	info@solarnova.de +49 4103 91208 0
Web	https://www.solarnova.de/de/

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2. Streeet view © Thomas Franz, Phönix Contact
3. BIPV shutters close © Thomas Franz, Phönix Contact
4. BIPV shutters in ventilation mode © Thomas Franz, Phönix Contact
5. Side view of BIPV shutters in ventilation mode © Thomas Franz, Phönix Contact