Väla Gård

IEA PVPS

Introduction

Väla Gård is situated at the northern entrance to Helsingborg, in south Sweden. Alongside a listed granite barn is the new office building, with characteristic gables and pitched BIPV roofs. Skanska had the whole management of the project. Its in-house energy expert Björn Berggren played a key role in the PV design process. Solar panels and the mounting system were delivered by NAPS Solar Systems.

Source: Successful Building Integration of Photovoltaics – A Collection of International Projects

Design approach

Corresponding to the neighbouring old stone barn, the Väla Gård office building presents two imposing gables to its visitors and pitched roofs which were specified by the detailed development plan. The large roofs provide space not only for a third floor but also for solar energy harvesting. (Arch. Patrik Ekenhill, Tengbom arkitekter)

Aesthetic integration

Whereas part of the roof is covered with traditional wooden boards, the South facing slopes are fully covered by dark monocrystalline standard-size frameless panels parallel to the pitch. The solar panel glass is slightly textured, giving a varied surface and a vivid expression, harmonizing with the surrounding dark wooden surfaces. (Arch. Patrik Ekenhill, Tengbom arkitekter)

Energy integration

In order to make it possible for the solar power yield to exceed total electricity use, every kWh in the calculation had to be scrutinized. Apart from designing an effective heating and ventilation system, within the airtight and well insulated building envelope, a lot of effort was made to include users' behaviour in the energy calculations. One of the major electricity loads to be discovered was the refrigerated foodvending machine, that used as much as 10% of the total solar roof yield (6,700 kWh/year). The BIPV roof produces about 68,000 kWh annually. The summer surplus is exported to the grid, to be bought back during winter. Solar power covers the buildings energy use of 65,000 kWh/year for heating by a ground heat pump, hot water, and ventilation (to achieve this 26,000 kWh electricity/year is required). The tenants' use of electricity exceeds 44,000 kWh/year.

Technology integration

Tilted to the north wooden board roofs follow the lines of the wooden panel façade cladding, while solar panels cover the sunny sides with neither visible frames nor profiles. Wooden boards as well as solar panels are mounted on top of a rainwater proof bitumen membrane.

Decision making

The aim from start was to achieve a net zero energy building, fulfilling the standards of Skanska's own ambitious goals of a 'Deep green' office building. Thus the use of solar energy was prescribed already in the architectural competition, with the level of integration taken into account but not as a prerequisite. Use of solar panels was not regulated in the detailed development plan. A decision to extend the solar roof was made by Skanska during the design process.

Lessons learnt

Initially the dark solar panels were considered to be a constraint, which would be better off on a bright building. Only a very few custom-sized panels were needed to make them fit. Rainwater gutters were suggested to be fully integrated into the eaves. The reason they did not in the end was related more about to general concerns regarding moisture management than due to the solar panels. When the building was put into use, one out of five inverters failed, leading to an installation of a lightning alarm to avoid future production losses. (Mr Daniel Ryman, Skanska)

The project management notes that the question of payback time is never raised for any other part of the building envelope or structure, only for the integrated solar cells. A battery as a night storage unit could have increased the direct consumption of solar generated electricity corresponding to half of the electricity for building use. Since erecting Väla Gård, investments in integrated solar power have not accelerated substantially. More common environmental certifications such as the national 'Miljöbyggnad' are dominating. Also other issues such as rain water treatment subjects solar power generation to competition against green roofs.

The overall goal for the project was to achieve a building that annually generated more electricity than it consumed (tenants' electricity consumption excluded). The initial plan was later changed and the solar installation was extended by more than 50%, almost covering both building related electricity consumption as well as tenants' electricity consumption. Since the total project budget would permit the extra solar panels, the option of covering the rest of the roof with wooden boards instead was not really an alternative. The price for producing 1 kWh was not the main driving force but instead the goal to minimize the need for externally bought electricity. The governmental financial grant for solar power was not taken into account in the project budget, so this was perceived as a welcome bonus of 45% of the total cost of €300,000. The local energy company and grid owner Öresundskraft is buying exported solar electricity for the average instantaneous price on the Swedish market. Additional income from electricity certificates has not been taken into account in the calculation, since they are considered to be small and unpredictable. The solar installation is calculated to be paid back in 12 years. The major value is said to be that the office building achieves a 'Plus energy' brand, a LEED-Platinum certification, and Skanska's own 'Deep green' label. The visibility of the solar installation is also regarded to be a major value. All services are included in tenants' rental agreement, so no cost or risk due to the solar installation is added.

PROJECT DATA

Project type	new construction
Building use	office
Building address	Kanongatan 100, Helsingborg, Sweden

BIPV systems

BIPV SYSTEM DATA

Architectural system	opaque roof
Integration year	2012
Active material	monocrystalline silicon
Module transparency	opaque
Module technology	glass-backsheet, hidden PV, customized modules
System power [kWp]	70
System area [m²]	450
Modules orientation	South-West
Modules tilt [°]	45
Annual FV production [kWh]	68000

BIPV SYSTEM COSTS

Stakeholders

Main building designer

Tengbom arkitekter

BIPV system designer

?Björn Berggren

BIPV components producer

NAPS Solar Systems Oy
Ruosilankuja 4, 00390 Helsinki, Finland
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https://www.napssolar.fi/

Tengbom arkitekter © Skanska Klas Andersson

Modern roof material next to traditional © Skanska Klas Andersson

South façade and BIPV roof © Skanska Klas Andersson

View from the public street © Skanska Klas Andersson

BIPV roofs for a zero-energy office © Skanska Torben Ådahl

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