Social Housing Apartment

Introduction

“THUIS” social housing association developed an energy efficiency policy for their building stock. This policy guides decision-making regarding newly built dwellings and apartments and the renovation of existing housing. The energy efficiency policy includes the requirement that newly built housing units are to be “constructed as zero energy buildings”. THUIS owns several 5-storey apartment buildings which require deep-renovation. For the two worst apartment buildings, it was decided to demolish and replace the structures by zero-on-the meter, 5-storey apartment buildings (48 apartments). (Mr. Olaf van Dijk, THUIS)

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

Design approach

To sustain the adoption of a zero-energy building policy and of the BIPV integrated into the façade, several complementary innovations were required, involving both technological and administrative innovations. Firstly, THUIS invested in the development of the required organizational capabilities to create a knowledge base among the employees. Besides that, slack resources were made available and the procurement policy was reconsidered. In order to select supply chain partners with specific requirements to succeed within this innovative project, selection criteria are required that go beyond just the lowest price.

Based on a partnering concept the project was completed in close collaboration with the architect, the contractor and several key suppliers. Because of the immaturity of the market for zero-on-the-meter apartment buildings, this project is considered a demonstration project. Therefore, as mentioned by several stakeholders, integrated project organization was required to design, engineer and construct the project. Traditional procurement is not conductive to close collaboration between stakeholders and is therefore considered to be a key obstacle to the construction of zero energy buildings. In this respect, further innovation is required to optimize the construction process of zero energy projects. (Mr. Olaf van Dijk, THUIS)

Aesthetic integration

To reduce the construction costs, the façade was designed in such a way that standard CIGS modules could be used. As a result the façade is characterized by a zigzag form.

Energy integration

In the two buildings the BIPV system is combined with the heat pump installed in every single apartment, providing an “energy budget” which covers the energy consumption of each apartment.

Technology integration

About 750 m^2 CIGS modules are integrated into the façade and another 500 m^2 CIGS modules are integrated into the balcony balustrades. The modules are mounted with aluminium frames developed by Energywall. On the roof of the apartment buildings, additional PV modules are installed.

Decision making

The professional client of this BIPV case project, a social housing association, wanted a sustainable investment and was already convinced by, and had experience with, the application of PV. The investment was in particular motivated by the energy efficiency policy of the social housing association. BIPV integrated into the façade is part of the design of a zero energy apartment building. It was necessary to compensate for the insufficient electricity generation from the roof alone. Therefore standard thin-film solar modules are integrated into three façades of the apartment buildings.

Lessons learnt

The alternative to a zero energy apartment building including the photovoltaics installed in the façade in this project, would be an ordinary apartment building constructed according to the building code. Because of the infancy of zero energy buildings in general and the application of photovoltaics integrated into façades, demonstration projects are considered to be vital to their further uptake.

Guided by internal energy efficiency policies, the housing association decided to invest in two zero-on-the-meter apartment buildings, which include photovoltaics integrated into the façade of the buildings. The buildings are depreciated over a period of 50 years. However not all the investment costs are covered by the project. Financial resources were made available by the housing association to construct a demonstration project. At least 50% of the additional investment in sustainability needs to be covered by rent and the Energy Performance Fee. The Energy Performance Fee has been introduced by the government to overcome the split-incentive problem, i.e. the gains on the energy bill of tenants are paid by a fee to the social housing association to cover the investment in energy efficiency technologies.

The following key factors affected the case: 1. Energy efficiency policies stimulated the uptake of sustainable technologies by social housing associations. However, energy efficiency policies tend to differ among social housing associations as a result of local conditions. 2. Lowest price procurement policies are not conducive to partnering concepts and therefore hinder the uptake of sustainable technologies. 3. Financial resources to invest in sustainable technologies – often linked to learning costs – are stimulating the uptake of sustainable technologies 4. Despite the energy performance fee it remains challenging to communicate with tenants about the fee. Moreover, the legal implications of the energy performance fee are not fully understood by either social housing associations or the housing industry. 5. A lack of knowledge about the legal conditions and subsequent decision-making processes within the social housing sector complicates the collaboration between social housing associations and the housing industry. 6. The social housing association involved in the case project invested in building organizational capabilities, i.e. the knowledge and skills, necessary to adopt and implement sustainable technologies in the project.

PROJECT DATA

Project type	new construction
Building use	residential
Building address	Best, Netherlands

BIPV systems

BIPV SYSTEM DATA

Architectural system	rainscreen, balustrade
Integration year	2018
Active material	CIGS thin-film
Module transparency	opaque
Module technology	glass-glass, hidden PV, customized modules
System power [kWp]	250
System area [m²]	750 (rainscreen), 500 (balustrade)
Module dimensions [mm]	656 x 1,656
Modules orientation	Several
Modules tilt [°]	90

BIPV SYSTEM COSTS

Stakeholders

Main building designer

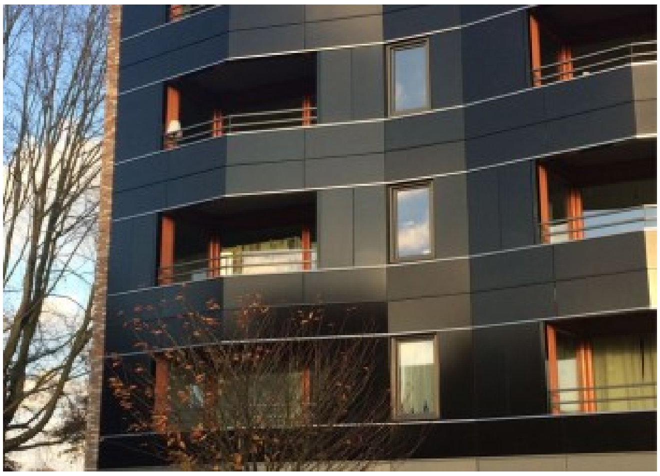
NB Architecten

BIPV components producer

EigenEnergie.net BV
Spaarpot 20, Geldrop, Netherlands
info@eigenenergie.net 040 8432067
https://www.eigenenergie.net/


BIPV modules installed in a zigzag shape © J. van Oorschot


North-East façade with partly BIPV (left side) © W. Folkerts


BIPV façade with standard modules © BEAR-iD


Aluminum structure supporting the modules © J. van Oorschot


Construction detail with cavity and thermal insulation © J. van Oorschot


BIPV façade in the late afternoon © BEAR-iD

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