Solsmaragden Office

IEA PVPS

Introduzione

Solsmaragden Office is a seven-floor office building located in the pier area of Drammen city, in the surroundings of a river and commercial building blocks of similar height. The BIPV system was integrated into the building façade as result of a collaboration between the enterprise and contractors. The module design and the mounting method was developed as a collaboration between the building owner (Union Eiendomsutvikling), the project architect (LOF Arkitekter), the entrepreneur (Strøm Gundersen), the electrical installer (Powertech) and the PV supplier companies (FUSen and Issol). The final PV system quality control was performed by FUSen, also with the public financing by Enova, the Norwegian government enterprise responsible for promotion of environmentally friendly production and consumption of energy.

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

Approccio progettuale

The BIPV design and construction process was organised as a collaboration between the enterprise and contractors. As the original offer from Issol for mounting the PV façade was too expensive, the owner coordinated the development of a new method using standard glass façade mounting adapted by the entrepreneur and using a local electrical installer company. The module design and the mounting method was developed to meet the specific requirements.

The size of the PV installation was not influenced by the financial analysis, as aesthetics was the main criterion. It was decided that the green-coloured BIPV modules should cover the full façade, despite not all areas being of ideal orientation for power production, to create the right appearance.

Integrazione estetica

The building replicates a green wall according to requirements of the architects. All formats were adapted to the façade to give a holistic architectural impression. The formal integration influences the output of the PV system to some degree. The choice of coloured modules reduces efficiency by around 17% compared to traditional modules, and the different façade orientations are not all ideal for maximum electricity generation.

Integrazione energetica

The building satisfies the Norwegian passive-house standard NS3701 and is classified as a low-energy building with energy label A. Normally, all of the generated PV power is self-consumed. The BIPV façade system has a generation profile that fits well with the consumption profile of the building. As the building also contains a traditional rooftop BAPV system, the total generation at certain times in summer may require export to the grid. The total electricity generation is estimated to contribute 23% of the total building electrical consumption, with the BIPV façade contributing around 56 MWh of the total estimated 106 MWh annual production. Some shading from the surroundings may affect the façade system output.

Integrazione tecnologica

The modules are of the type Issol CENIT, customized in terms of size and colour. The frameless glass-glass modules use standard mono-crystalline silicon solar cells, with 4 mm building-approved safety glass at the front and back side. The green pattern is printed on the inside of the front glass. The modules are mounted as the outer cladding material of the building, ventilated by natural outdoor air. The mounting structure was especially developed for the project by the system installer and produced in Norway. Standard brackets for façade glass mounting are used to fasten the modules to the wood battens of the climate wall. Wall reinforcement of the building structure was required due to the extra weight of the façade. Cabling is pulled through the façade and hidden in the ceiling, with inverters of the type SMA Sunny Tripower (3-20 kW according to the different string sizes) located on different floors.

Processo decisionale

The local energy company Glitre Energi needed new premises and announced a competition. The initiative to apply a PV system to the building was taken by Mr Trond Aasheim, CEO of the owner company Union Eiendomsutvikling. It was in the company's interest to contribute to the green transformation, and to create an attractive building for environmentally conscious tenants (Mr Trond Aasheim, Union Eiendomsutvikling). The energy company liked the idea of covering the whole façade with solar modules. The final decision was made during the construction phase. The architect wanted an aesthetic façade and, in discussions with the PV supplier company FUSen, the decision was made to install a BIPV system on the façade.

Enova chose to finance this project because the solar cells are used as an integrated part of the façade. It is a very exciting and innovative solution, which contributes to the increased use of PV technology in Norway. The costs are still difficult to defend on a short-term basis, but the technology has a market potential on the longer term (Mr Ole Aksel Sivertsen, Enova).

Lessons learnt

Overall, nothing went wrong in the project and the building owner is pleased with the construction and implementation of the PV system. The employees are very satisfied, the premises are modern, light and efficient. The green profile of this building is ideal for an energy company (Mr Paal Skjaeggestad, Glitre Energi).

This has become the most magnificent office building in Drammen. It was definitely a smooth building process, thanks to a great collaboration between the building owner, the contractor and excellent advisors. They went through a three-step process. First they introduced efficiency measures beyond the current building standard requirements. Next, they addressed additional measures to achieve the passive-house standard. Finally, they added solar modules to the building. (Mr Trond Aasheim, Union Eiendomsutvikling)

A BIPV façade is still costly, especially for customized products. At the time of planning and design, not many suppliers were available. The coloured PV technology was not well developed and the project team travelled around Europe to find a suitable solution. The mounting solutions offered were expensive and not suited for Norwegian building methods, which required the use of safety glass in façades. Hence, proper methods were developed. The smooth collaboration between the project actors was

imperative to develop new technology that satisfied the requirements for cost, appearance and installation method. Using the competence of local companies was a key factor. Despite some challenges with shading, a low energy price for selling surplus power to the grid and a lack of knowledge about new products, the building owners state that they would do it again, even without public financial support.

In this BIPV installation FUSen started a separate R&D project for green solar cells. This is very unusual. In an ordinary building project everything is streamlined to ensure that the process is as fast and cost-efficient as possible. The efforts made by Union Eiendomsutvikling should inspire other building developers to do the same. A traditional procurement model would not have worked in this project. The product was not available on the market, it was commercialized underway. By breaking out of the traditional way of doing things, it is possible to create new solutions. This is a great example of how to achieve locally generated electricity and an environmentally correct building. (Mr Thor Christian Tuv, FUSen)

The BIPV system costs were increased due to the customized modules of different sizes and the complex string design. The added cost of the BIPV façade was 382 k€ (308 €/m2), where costs associated with a typical façade material have been subtracted. The added cost represents 1.4% of the total building cost. With the public funding received for the BIPV façade, the total added cost was 213 k€ (172 €/m^2). The owner calculates 3-4% return on the additional investment compared to a traditional façade. A lifetime of 25-30 years and low maintenance costs are foreseen.

DATI EDIFICIO

Tipologia progetto	nuova costruzione
Destinazione d'uso	uffici
Indirizzo edificio	Grønland 67, Drammen, Norwegen

Sistemi BIPV

DATI SISTEMA BIPV

Sistema architettonico	Kaltfassade
Anno integrazione BIPV	2015
Active material	monokristallines Silizium
Trasparenza modulo	opaco
Tecnologia modulo	vetro-vetro, FV non riconoscibile, modulo customizzato
Potenza sistema [kWp]	115,2
Area sistema [m²]	1242
Dimensioni modulo [mm]	verschiedene
Orientamento moduli	Osten, Süden, Westen
Inclinazione moduli [°]	90
Produzione FV annuale [kWh]	56000

COSTI SISTEMA BIPV

Stakeholders

Progettista principale

LOF Arkitekter

Progettista sistema BIPV

Union Eiendomsutvikling, LOF Arkitekter, Strøm Gundersen, Powertech, FUSen, Issol

Produttore componenti BIPV

ISSOL
Rue du Progrès 18, Dison (Liège), Belgium
infopv@issol.eu +32 (0)87 71 90 81
http://www.issol.eu/

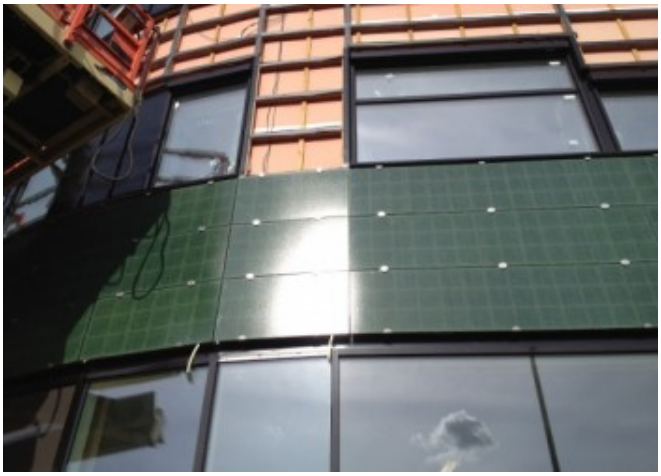
Adapted BIPV module sizes © Union Eiendomsutvikling

BIPV and glass façade © FUSen

Detail of the green screen-printed module © Åse Lekang Sørensen (Norsk Solenergiforening)

Alternative patterns for printed BIPV modules © FUSen

Mounting of the BIPV façade modules © FUSen



Mounting BIPV modules on a curved section © FUSen

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