PROOF
Competitive Industrialized Photovoltaic Roofing

Project duration: from 12.2015 to 12.2018
Final report submitted: 03.2019

Publishable Summary

Building integrated PV (BIPV) solutions have great potential to become both cost effective and aesthetically appealing but despite the fast growth of the PV market in general, BIPV has not yet been realized in any significant numbers. There is a lack of costeffective standardized solutions which can be easily integrated in the building process. The overall target for this project has been to develop an industrialized concept for BIPV/BAPV roofs that visualizes several added values, minimizes additional costs and thus paves the way for a wide use of PV in the built environment.

The project has been running for three years. Partners of the project were, beside Skanska, SP Technical Research Institute of Sweden (since 2018 named RISE Research Institutes of Sweden), Glafo (since 2018 part of RISE), Solkompaniet, SEML (later replaced by Elementum Eco AB), the Danish partner Gaia Solar and, as a sub-consultant to RISE, the internationally well renowned architect Ingo Hagemann from Germany.

The concept developed and tested in the project is a prefabricated roof element with PV modules aimed for a multifamily house. Calculations and analyses comparing the concept to state-of-the-art solutions shows comparable costs but - most important - several added values such as improved quality control leading to an even and high quality, reduced materials use, reduced risk for the investor etc. The concept will be used as the basis for the development of new PV solutions in new building construction as well as in refurbishment. Good aesthetics as well as high performance and competitive costs are believed to be attained in this way.

The project partners have gained experience from the European market, partly through collaboration with Mr Hagemann and through participation in an international collaboration on BIPV (IEA PVPS Task 15). A full-scale demonstration of the roof concept was planned to take place on Skanska's project Lindholmshamnen in Gothenburg. However, since the project suffered some hard setbacks resulting in long delays, it was not possible to carry out the demo project. In stead a mock up roof element was constructed and tested in a laboratory set-up. Several tests have been carried out to ensure critical safety and quality aspects of the mock-up roof section. Apart from a test intended to determine the effect on solar cells of transport vibrations, the tests for water tightness and fire safety have shown that applicable requirements have been met. The outcome of the vibration tests points to the need for in-depth investigations in order to ensure that product guarantees still apply to modules that are transported from the factory to a building site after they have been mounted on a roof element. A new quality-assured industrial building product concept and a collaboration between several of the project's partners that is now being continued in a follow-up project is seen as a strong result. In the follow-up project "Optimized renovation for efficient solar PV roofs" (acronym "EST"), which now takes on a similar but more market-related constellation, four property owners and their consultants have important roles. In the case studies to be carried out, we will have the opportunity to verify the cost estimates of the PROOF project

and to deepen the knowledge of processes and technical solutions for roof renovation with solar cells. The ambition is also to initiate some demo projects, which is seen as an important prerequisite to create trust among the customers.

Project consortium

Coordinator and all contact details:

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Participating countries and financing:

Country	**Number of organisations involved**	**Project costs in EUR (1€ = 9,5Sek)**	**Public funding in EUR**
Sweden	5	329’219	240’856
Denmark	1	88’500	50’700
Total	*6*	*417’719*	*291’556*

Funding agencies involved and contracts

Funding Agency	**Contract N° and Title**
Swedish Energy Agency	2014-006843 project No 40180-1 Competitive Industrialized Photovoltaic Roofing
Swedish Energy Agency	See above
Swedish Energy Agency	See above
Swedish Energy Agency	See above
Swedish Energy Agency	See above
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