



**Deliverable Report**

Deliverable No: 5.42  
Dissemination level: Confidential  
Title: 2-3 field demonstrations large 120 cells module

Date: 11-04-2018  
Version: FINAL  
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Grant Agreement Number: 322425  
Project Type: FP7 – ENERGY.2012.2.1.2: Demonstrations of smart multifunctional PV modules  
Project acronym: SuMMiT  
Project title: Smart large lightweight long life Multifunctional PV Module Technology for large Power Installations and Distributed Energy Generation  
Project start date: 01/12/2013  
Project website: [www.summit-project.eu]  
Technical coordination: TULiPPS (www.tulipps.com) (NL)  
Project management: TULiPPS / Uniresearch (www.uniresearch.com) (NL)



## Executive Summary

This report provides an overview of the demonstration activities for the frameless long-life and lightweight Cosmos 120 cells module to be mounted on the existing IBC Solar AeroFix10-S flat roof mounting system. In total, more than 200 units of 120 cells – 600 Wp modules have been produced, both in glass-foil as well as glass-glass configuration. (A complete overview of production by TULiPPS is provided in Deliverable D3.4).

The 120 cells frameless 120 cells module has been installed on several flat roofs to test the usability of the module and the modified Topfix or AeroFix mounting system and to gain experience with the modules. 72 x 120 cells units were demonstrated at the town hall of Waalwijk, 8 x 120 cells units were demonstrated at family Van Horen, and 115 x 120 cells units are being installed on the roof of Apparatenfabrikage Waalwijk. 5 units have been mounted on the roof of the demo-truck and several units have been sent to Kiwa for pre-liminary testing and certification.

The deliverable of 2 – 3 field demonstrations has been achieved successfully. The overall results are very positive although some possibilities for further improvement were found as well. The easy and ultra fast installation in combination with IBC-Solar AeroFix10-S for flat roof are superior to any other system in the market today and the quick “tool-less” release mounting system is excellent innovative features and greatly facilitate maintenance.

Another great advantage is the possibility to utilize an ultra low installation angle for the modules without having the risk of module pollution as is often seen with traditional framed modules. An installation angle of only 6° has been utilized in practice allowing for 10 – 15 % more installed PV capacity in a flat roof without the risk of dirt buildup on the glass edges. In comparison, traditional modules are typically installed at a minimum angle of 10° and often more.

The lightweight module utilizing 2mm glass has been successfully developed and demonstrated in the field. The long-life feature has been achieved by the development of the 100% polyolefin based Yparex encapsulant. The less lightweight but ULTRA long life feature (30 – year service life) has been achieved by utilizing a 2 + 2 mm glass-glass laminated utilizing the new Yparex encapsulant.

The elegant frameless 120 cells module performs very well on flat roofs although the really large size can cause difficulties during transport in general and installation in windy conditions. Some modules were broken during installation because packaging was not sufficiently robust enough. A real difficulty (handicap) was to source the large size (1980 x 1680 mm) glass for the 120 cells module and for this reason we had to implement our fall-back option by utilizing 2 x 60 cells laminates and glue these on ONE 120 cells rear-side construction. The weight and other properties of the 2 x 60 cells – 120 cells modules are identical to the 120 cells module consisting of 1 glass sheet.

The most important outcome of the flat roof demonstrations is that the frameless Click-&-Go module design consisting of 2 mm glass works well and provides the targeted features such as long-life and lightweight properties. In addition, it allows 10 – 15 % more PV capacity on flat roofs due to the low installation angle for the modules. The innovative mounting system will deliver the targeted installation time reductions when smaller size modules are used in the future (e.g. 60 cells compared to 120 cells). Based on the experience gained, some details of the AeroFix 10S system for the frameless module, such as fixation of the axis, can be further improved. In addition, the 60 cells

frameless version of the lightweight longlife module appears to be somewhat more practical in view of: availability of thin glass and lower costs, ease of packaging and storage, easy of transport and installation without sacrificing lightweight and longlife properties. The good results achieved by the successful module design development and demonstrations, shows the market readiness for the frameless lightweight (2 mm glass) longlife modules for application on weight critical flat roofs.

The demonstrations of the power optimizers showed several serious technical issues that require further attention. The demo projects clear showed that FemtoGrid should further improve the practical features of the PO310 power optimizers, such as: general electrical installation, zigbee software, DC-bus cabling, and monitoring. This power optimizer system is not ready to be sold commercially. The commitment of FemtoGrid to get the PO310 power optimizers up-and-running in the demonstrations was quite insufficient. The response times by FemtoGrid were very long and the overall organization commitment was poor. Technical problems can happen but the repeated inadequate response and lack of action by FemtoGrid caused other partners, in particular TULiPPS and IBC-Solar, a lot of problems and consumed an incredible amount of time.

Future projects and impact:

Following the flat roof demonstration projects at townhall Waalwijk and Apparatenfabrikage Waalwijk a further 9 (nine) commercial industrial flat roof projects are in the pipeline for a total of about 2,5 MegaWatt as SDE+ subsidies PV power feed-in production subsidies have been obtained already by TULiPPS subsidiary "Solar Valley". Another 6 MegaWatt is still in the applications stage awaiting the SDE+ subsidy approval: 12 projects in Waalwijk, Tilburg and Enschede. For the full list please see Appendix 1.

# Acknowledgment



This project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement no 322425 (Project acronym: SUMMIT)

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## Project participants:

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FTG | Femtogrid Energy Solutions B.V. (NL)  
Fh-ICT | Fraunhofer-gesellschaft zur foerderung der angewandten forschung E.V. (DLD)  
IBC NL | IBC Solar B.V. (NL)  
KIWA | KIWA Italia SPA (IT)  
UNR | Uniresearch B.V. (NL)  
YPR | Yparex B.V. (NL)  
RTG | Rimas B.V. (NL)  
SOL | SolNed B.V. (NL)

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This project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement no 322425.

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