U-light
Entwicklung von neuartigen Solarmodulen mit geringem Gewicht, integrierten Bypassdioden, hoher Effizienz und niedrigen Kosten für die Systemintegration

Project duration: from 11.2015 to 10.2018
Final report submitted: 21.05.2019

Summary

In the “U-light” project new light weight, high efficiency and long life-time modules have been developed with regard to lowest cost for integration into PV systems achieving lowest values of levelized cost of energy (LCOE). The new light weight modules were generated by the use of thin, strong, low cost glass and by the use of compositions (mineral or organic) like glass-fibre reinforced plastic (GRP). Strong focus was set on the long-term durability, failure probability, and energy harvest. The cell to module (CTM) losses were reduced by putting a strong accentuation on the development of novel thin glass and encapsulants with highest light transmissivity and low UV cut off as well on backsheet materials with 20% (abs.) larger reflectivity compared to state-of-the-art products. In addition, solar cells were developed which make the use of bypass diodes in modules unessential.

For the development of ultra-light weight modules, the reduction of thickness for all layers was a clear objective, while keeping the required functional properties. For this the glass thickness was reduced from today's 2.0 mm to lower thicknesses, which would obviously lead to a reduction of raw-materials and energy consumption during manufacturing which is a key target of the European manufacturing industry. It further increases the light transmittance thus reducing cell to module losses.

The scope of the material development for the module backsheet was set on products with reflectivity >90% with 20% (abs.) larger reflectivity compared to state-of-the-art products, while being at the same time a lightweight material. The new encapsulant materials combine advantageous properties, e.g. a UV-cut-off below 320 nm and an outstanding transparency in the wavelength-range from 400 to 1000 nm. Additional cost saving can be achieved by the reduction of the lamination time for the respective encapsulant materials to a value below 10 minutes. For most solar module factories, the lamination step is the bottle-neck preventing lower cycle times therefore the project aimed to set new standards with the material development.

The project was to deliver certified lightweight glass/glass and glass/backsheet modules passing relevant IEC 61215 and IEC 61646 standards with a cost reduction of 30% as compared to standard modules (without cell cost) in €/Wp.

In addition, the project was also to evaluate alternative concepts for light weight modules like the use of GRP as an alternative to glass. Beside the cost reduction the light weight and bifaciality of the new modules was to open up new applications for these modules, for example for greenhouses and parking roofs. In the frame of the project new applications have been be evaluated.

The module development was based on the latest generation of highest efficiency solar cells from ISC Konstanz, for example the bifacial BISON or the back-contact IBC cells, so-called ZEBRA cells.

The cell research in this project was focused on the development of IBC ZEBRA solar cells with intrinsic bypass diodes without additional costs. This was supposed to allow producing solar modules without bypass diodes and leading to a price reduction on module level but most of all increase the product lifetime since failing diodes is one of the main defects of solar modules in the field.

Project consortium

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Participating countries and financing:

Country	**Number of organisations involved**	**Project costs in EUR**	**Public funding in EUR**
Germany	1	341'343	273'074
Austria	2	300'541	195'351
Switzerland	1	146'868	136'722
Total	*4*	*788'752*	*605'147*

Funding angencies involved and contracts

Funding Agency	**Contract N° and Title**
PTJ	FKZ: 0325886A Entwicklung von neuartigen Solarmodulen mit geringem Gewicht, integrierten Bypassdioden, hoher Effizienz und niedrigen Kosten für die Systemintegration
Bundesamt für Energie BFE	TP Nr.: 8100073 Bestell Nr.: 810003117 Vertrag Nr.: SI/501280-01 U-LIGHT: Ultra lightweight PV modules (Solar ERA.NET 2-090)
FFG	848635 Ultra lightweight PV modules and their applications in innovative PV systems achieving lowest LCOE
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