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Sustainable Photovoltaics Integration in buildings and Infrastructure for multiple applications

SPHINX - Deliverable report

D6.6 - Readiness of the value chain for SPHINX technologies and products

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Public Summary

In the context of the SPHINX project, integrated photovoltaic (IPV) products were developed using matrix shingling cell interconnection technology. With this technology, cells are cut into narrow strips, overlapping slightly with one another and glued together using an electrically conductive adhesive in a brick-like pattern. This replaces most of the soldered copper ribbons that connect the cells in a conventional linear string-based module. Since cell interconnection is the part of module production that matrix shingling changes, this deliverable focuses on the four metals used in it, namely copper for the ribbons and wires, tin and lead for the solder that coats and joins them, and silver for the cell contacts and the conductive adhesive.

Deliverable D6.6 assesses the readiness of the value chain under a Moderate deployment and a High deployment scenario up to 2050 in Europe. It compares the consumption of these metals for matrix-shingled modules and their conventional equivalents. The resulting demand is then compared to world supply, and the study also reviews manufacturing, components, repair and market acceptance.

The results show that matrix shingling needs much less metal for cell interconnection, with 45-75% less copper and large reductions in lead and tin, although some lead remains in the ribbons at the ends of the module. Silver use can be reduced by up to 14% with optimised adhesive use, while with the amounts used in the SPHINX pilot production it is higher than in conventional modules. Metal supply is not expected to limit deployment, since in both scenarios the four applications studied would need less than 0.5% of the world's mine production of each metal in 2050.

The main constraint lies in manufacturing scale, as the High deployment scenario would require almost 3 GW of matrix-shingling production capacity by 2050, which is about a fifth of the current European manufacturing capacity for PV modules. Furthermore, material and manufacturing improvements are still needed, such as ribbons without lead, adhesives with less silver, and production at industrial scale. Matrix shingling may also make products last longer and be easier to repair, although this remains to be demonstrated.

The results will support the SPHINX partners' plans for bringing the products to market and for further technology development.

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Project partners:

#	Partner short name	Partner Full Name
1	VOL	VOLTEC SOLAR
2	ETW	ETWAY S.R.L.
3	HLP	HELIUP
4	M10	M10 INDUSTRIES AG
5	UNR	UNIRESEARCH BV
6	Fraunhofer	FRAUNHOFER GESELLSCHAFT ZUR FORDERUNG DER ANGEWANDTEN FORSCHUNG EV
7	ICARES	ICARES CONSULTING
7.1	BI	BECQUEREL INSTITUTE FRANCE
7.2	BIE	BECQUEREL INSTITUTE SPAIN
8	CEA	COMMISSARIAT A L ENERGIE ATOMIQUE ET AUX ENERGIES ALTERNATIVES
9	FSUNS	Freesuns SA
10	CSEM	CSEM CENTRE SUISSE D'ELECTRONIQUE ET DE MICROTECHNIQUE SA - RECHERCHE ET DEVELOPPEMENT
11	EPFL	ECOLE POLYTECHNIQUE FEDERALE DE LAUSANNE
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