CABRISS

IMPLEMENTATION OF A CIRCULAR ECONOMY BASED ON RECYCLED, REUSED AND RECOVERED INDIUM, SILICON AND SILVER MATERIALS FOR PHOTOVOLTAIC AND OTHER APPLICATIONS

• H2020-WASTE-1-2014-two-stage: Moving towards a circular economy through industrial symbiosis
• Start/end date: 01/06/2015 - 31/05/2018 (36 months)
• Partners:
PV wastes recycling – Circular economy approach of CABRISS

Symbiosis with others industries (electronics, metallurgy)

- Soldering applications
- Powders metallurgy
- Ceramic
- In, Ag sputtering targets for thin films
- Silver paste

Photovoltaic Industry
- Transformation of recycled materials into usable products
- Fabrication of silicon solar cells using recycled materials
- Fabrication of silicon wafers using recycled material
- Purification of silicon and metallics

- Dismantling, extraction and recovery
- Collection of end-of-life modules & cells, PV waste

- 90% of glass + Al frame
- 10% silicon and metallics

Symbiosis with the glass industry

- Glass

Symbiosis with the aluminum industry

- Al

CABRISS Project Scope
CABRISS Project Case Study

1. The EU/ SPIRE needs
→ Measurable reduction of waste generation and resource use in the medium term.
→ Technological innovations for recovery of valuable materials in waste streams.

2. The Project Solution
→ New processes for opening thin-film and Si based PV modules without damage, recovering high quality glass.
→ Industrial scale demonstration of re-use of Si in conventional PV chain and of Ag with conductive pastes/inks from recycled silver.
→ New business model within and across sectors with the ambition to closing the loop.

3. Value to Customers
→ High-value added revenue due to valorization of current PV waste by recovery of secondary products.
→ Economically and environmentally efficient technologies for the recovery of glass and valuable materials (Si, Ag, In, Al).
→ Customers will be able to use secondary feedstocks in their conventional processes.

4. How will this happen?
→ Industrial scale demonstration.
→ WEEE legislation drives recycling market.
→ Contribution in developing standardization.
→ Financing of recycling: eco-participation fee is an enabler of recycling programs.
What are the **key expected sustainability impacts of CABRISS**?

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<th>Indicator</th>
<th>Baseline</th>
<th>Expected Impact</th>
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<tr>
<td>Total material consumption*</td>
<td>No recovery of valuable metal in Si based module recycling. Limitation to the recovery of Al frame and glass (crushing process). But total recovery rate must be &gt; 80% as fixed by legislation. Very limited recycling of PV production wastes (broken cells, Si-kerf).</td>
<td>Additional recovery of valuable metals (Si, Ag, In, Al) using the CABRISS value chain. Expected recovery rate of valuable metals of &gt; 90%. CABRISS value chain is also able to recover PV production wastes, especially Si-kerf. Data to be evaluated in 3rd year of the project.</td>
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| Global Warming Potential                       | Si production environmental impact:  
- ‘Electric energy CO₂’ (11-13 MWh/t Si).  
- fossil CO₂ (~6t/t Si). | Expected reduction mainly due to the recovery and reuse of Si as secondary feedstock. Data to be evaluated in 3rd year of the project with LCA. |
| Economic high-added value                      | Current panel recycling legislation only addresses 20% of the potential value of silicon solar panels. | For silicon panels, CABRISS materials (silicon/silver) provide, in principal, 80% of the total value, 4 times as much as the baseline. |

*Core SPIRE indicator
What **outputs or learning** from Project CABRISS could have value for other SPIRE projects here?

- PV modules’ recycling: new delamination processes for full opening of modules without crushing steps. Already available for thin film and under development for Si based modules.
- Reference on technical and organizational solutions in order to establish a sustainable circular economy based on the recycling of PV wastes, including industrial symbiosis with other industries.
- Market study and public business model on PV wastes may be of use to others to develop a circular economy and increase value of wastes (public access through SPIRE website).
- Awareness raising among users and producers PV products regarding the fact that PV is a renewable energy source which should become even more environmentally friendly (‘double green’ effect).
- Contribution to CENELEC standards validated by industrial players (2 drafts of standards already commented).
Even in Solar - Think Circular!
Contact

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Project website

https://www.spire2030.eu/cabriss/