

Data-driven reuse business models for the Swiss solar industry

This poster is based on the project SwissPVcircle which aims at the development of reuse business models for the Swiss solar industry.

Authors

Ässia Boukhatmi, Roger Nyffenegger (A)
Fabio Giddey (B)
Pasqual Zopp (C)



Affiliation

(A) Bern University of Applied Sciences - School of Engineering and Computer Science
(B) Swissolar - Swiss Solar Energy Association
(C) Sens eRecycling - Foundation for the Recycling of Electrical and Electronic Equipment

Introduction

The expansion of new photovoltaic (PV) systems is a central component of the energy transition in Switzerland and is growing strongly by 43 % in 2022 compared to the previous year [2]. However, the increasing number of new PV installations is leading to major challenges in terms of managing the growing volumes of discarded modules entering the waste stream at the end-of-life stage. Thus, the amount of generated PV waste in Switzerland is likely to grow to up to 533'000 tons in 2050 [3]. Up to 50 % of the discarded modules are still suitable for a second usage [1] but are often damaged by improper handling after disassembly or not sufficiently tested to be qualified for another life cycle. One underlying problem for those market imperfections is an insufficient data exchange between different actors and stages along the PV value chain.

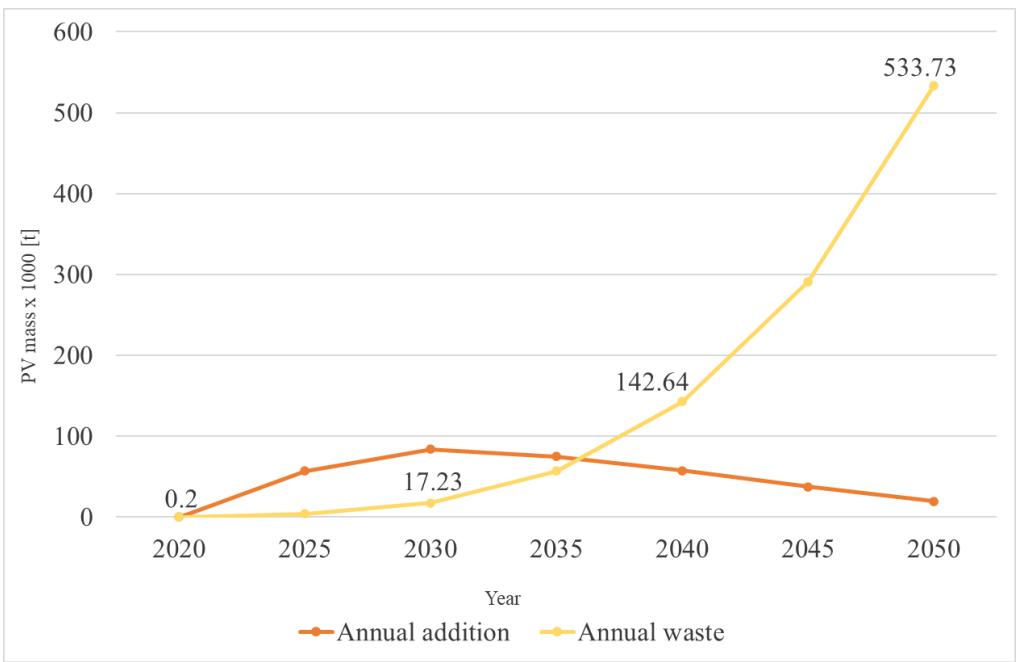


Figure 1: PV installations and waste forecast for Switzerland according to IRENA, Swissolar and Wambach Consulting.

Project objectives

The project intends to establish a standardized testing infrastructure for the reuse of PV modules in Switzerland based on information from a central database. In the best possible case, the potential of reuse PV modules should be determined on the basis of data before first disassembly, so that PV modules can be triaged for reuse or recycling at an early stage.

The project therefore aims at contributing to the fulfillment of the following goals:

- Conservation of PV capacity through reuse instead of recycling
- Avoidance of waste that would be recycled with diminishing value (downcycling)

Work packages

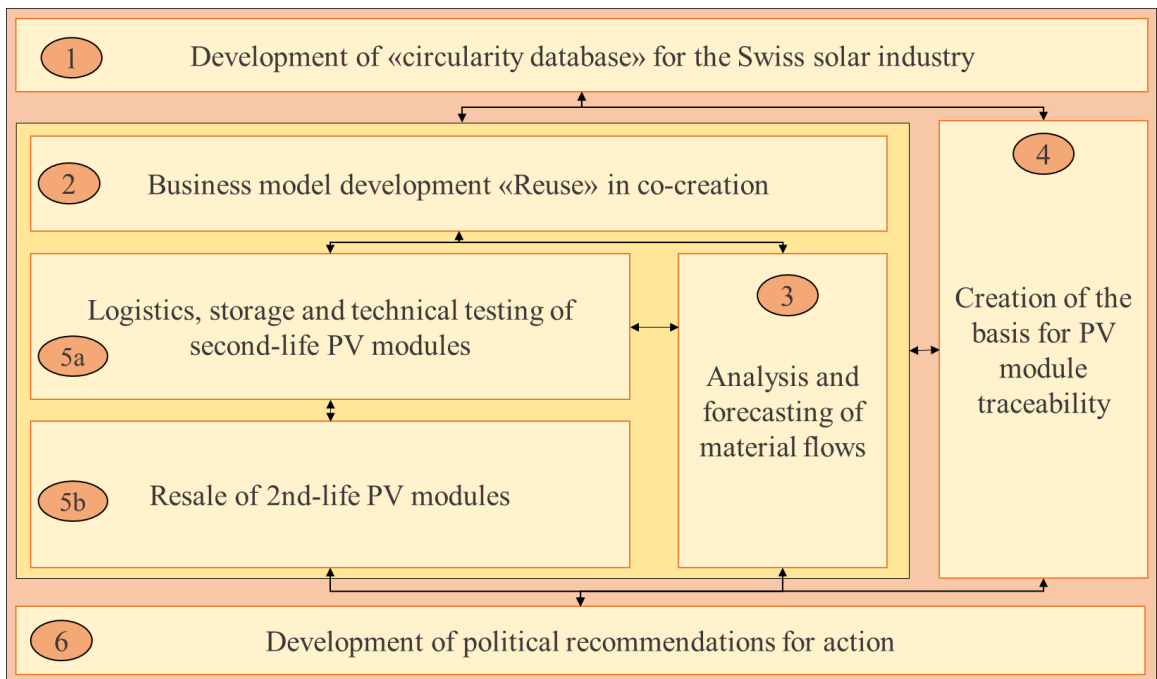


Figure 2: Work packages divided into business-model-related, technological and political topics.

Reuse business model development

The first key deliverable of the project is the experimentation with different reuse business models together with partner from the Swiss PV industry. The currently established process of picking-up, collecting and processing of PV modules is complemented by a testing step for reuse. Whether such an intermediate step to test for reuse is (1) technically, legally, and logistically feasible, (2) desirable for certain customer group, (3) financially viable for the involved partner, and (4) socially and environmentally sustainable, is explored with the partners in different business model variants. This process is backed up by the results of the Horizon 2020 project CIRCUSOL, where Bern University of Applied Sciences participated. During the business model experiment process, we deliberately work from an ecosystem perspective, which is intended to open up new opportunities for all partners along the PV value chain. Finally, based on these considerations, the preferred reuse business model is demonstrated in real terms in pilot projects in Switzerland, where we intend to install second-hand PV modules.

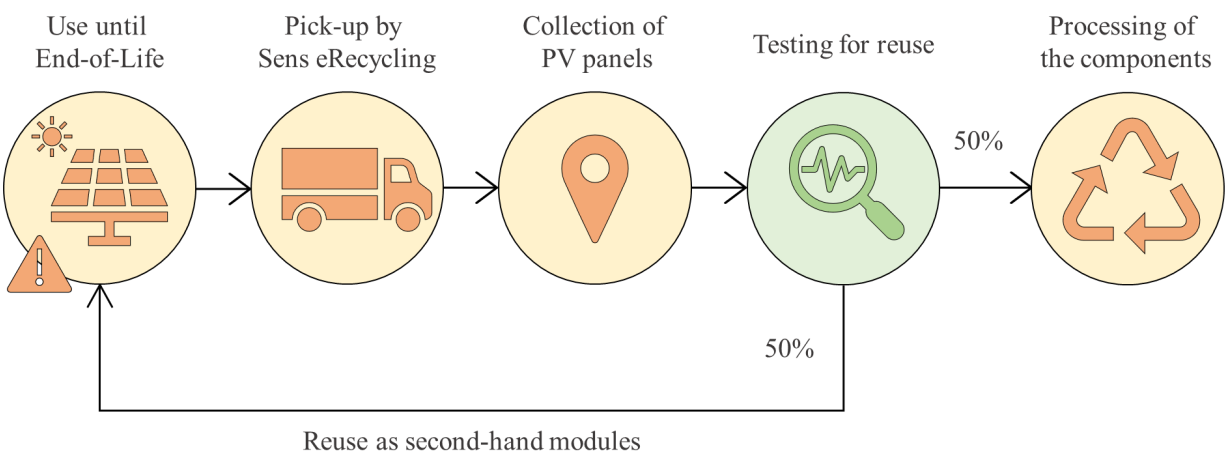


Figure 3: Process steps involved for decision-making about reuse or recycling.

Circular PV database

The second key deliverable of the project is the development of a central database that collects and analyzes information from different stages of the PV value chain to enable an improved reuse or recycling decision in Switzerland. The data enables improved forecasts about returning volumes of currently installed PV plants in the upcoming years to facilitate decision-making processes for the adequate strategy. The data is made accessible to and further enriched by various actors via a user interface. Additionally, second-hand PV modules including their test protocols can be made available through the database to interested parties.

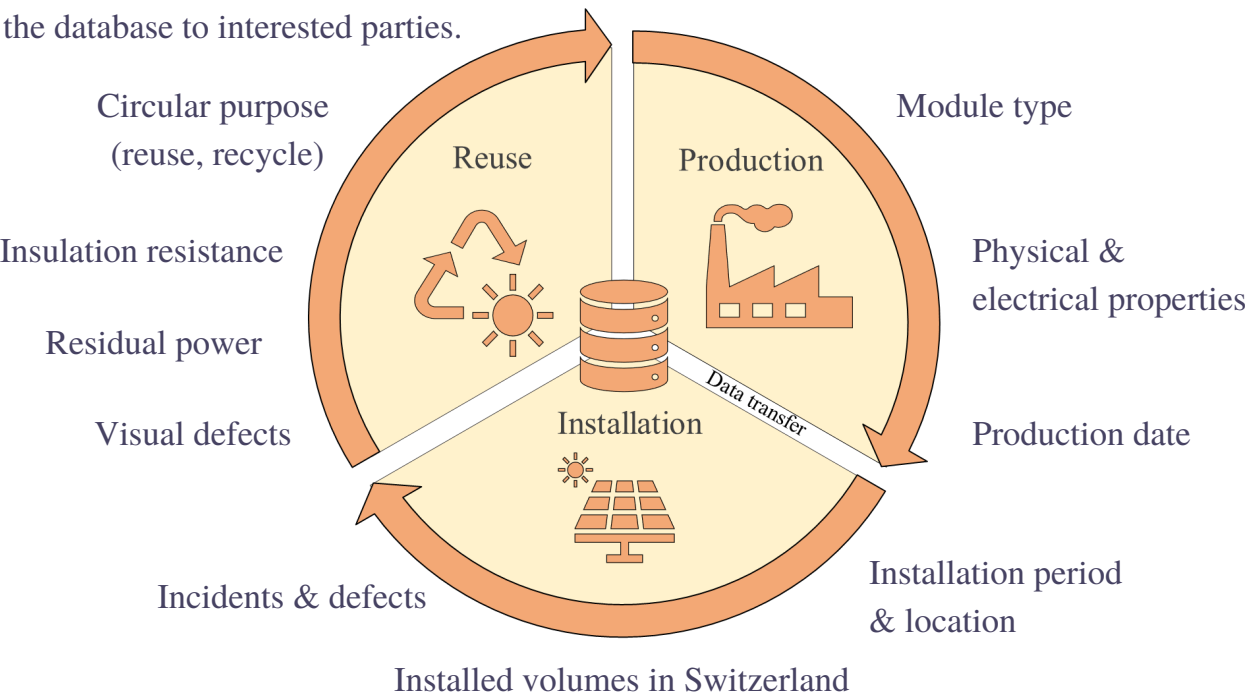


Figure 4: Schematic representation of the information required from different stages of the PV value chain.

Acknowledgments

The SwissPVcircle project is being implemented in collaboration with Meyer Burger AG, KWB Planreal AG, Helion Energy AG and Reiling-PV Recycling GmbH & Co. KG.



Scan for demo video.

References

- [1] CIRCUSOL, S. (2018). Homepage | Circusol. <https://www.circusol.eu/en>
[2] Hostettler, T., & Hekler, A. (2022). Statistik Sonnenenergie Referenzjahr 2021. Bundesamt für Energie BFE. https://www.swissolar.ch/fileadmin/user_upload/Solarenergie/Fakten-und-Zahlen/220712_Statistik_Sonnenenergie_Bericht.pdf
[3] Karsten Wambach, bifa Umweltinstitut, *Technisches Recycling von PV Modulen Erfahrungen und neue Entwicklungen* Referenzjahr 2022

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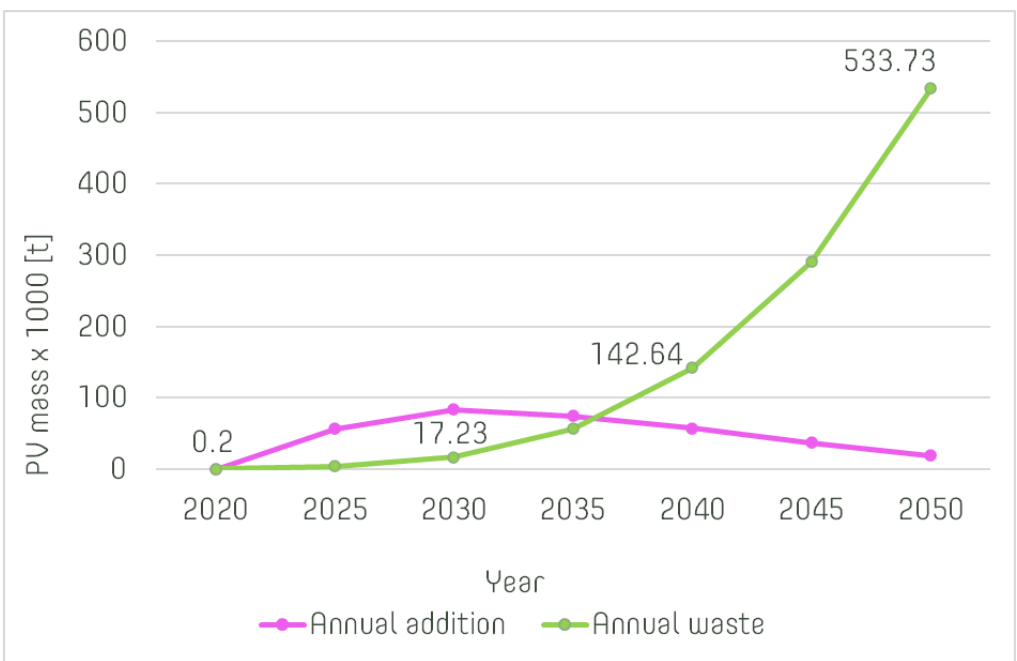


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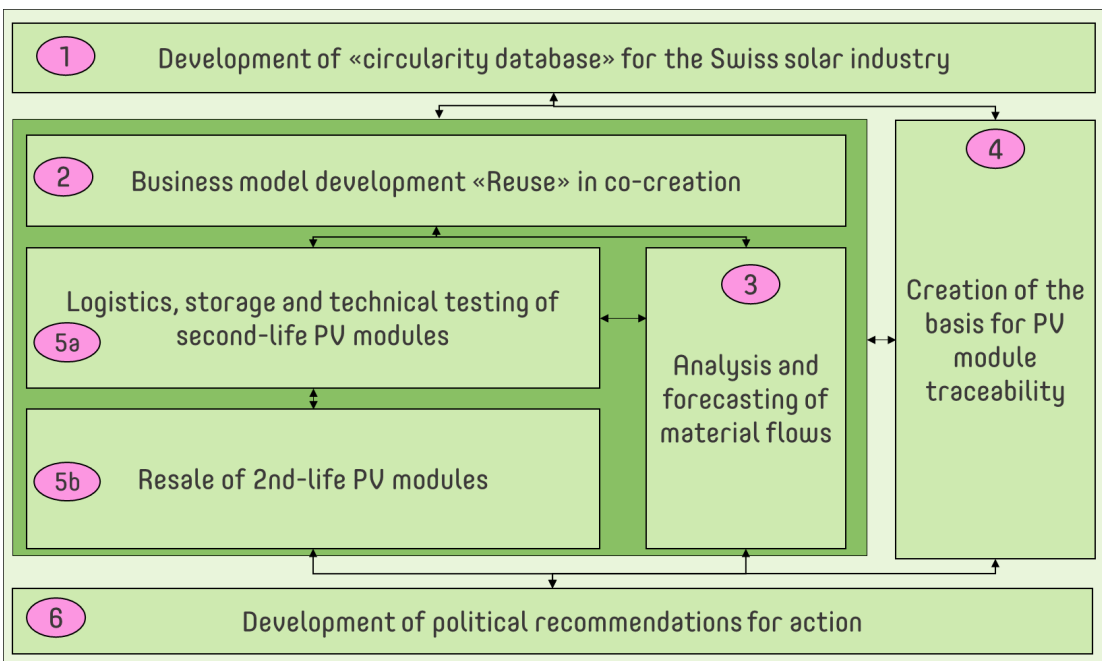


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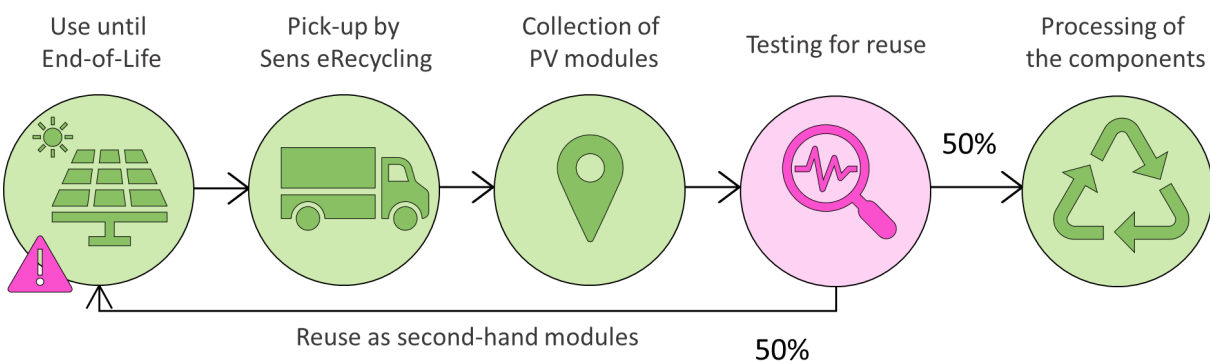


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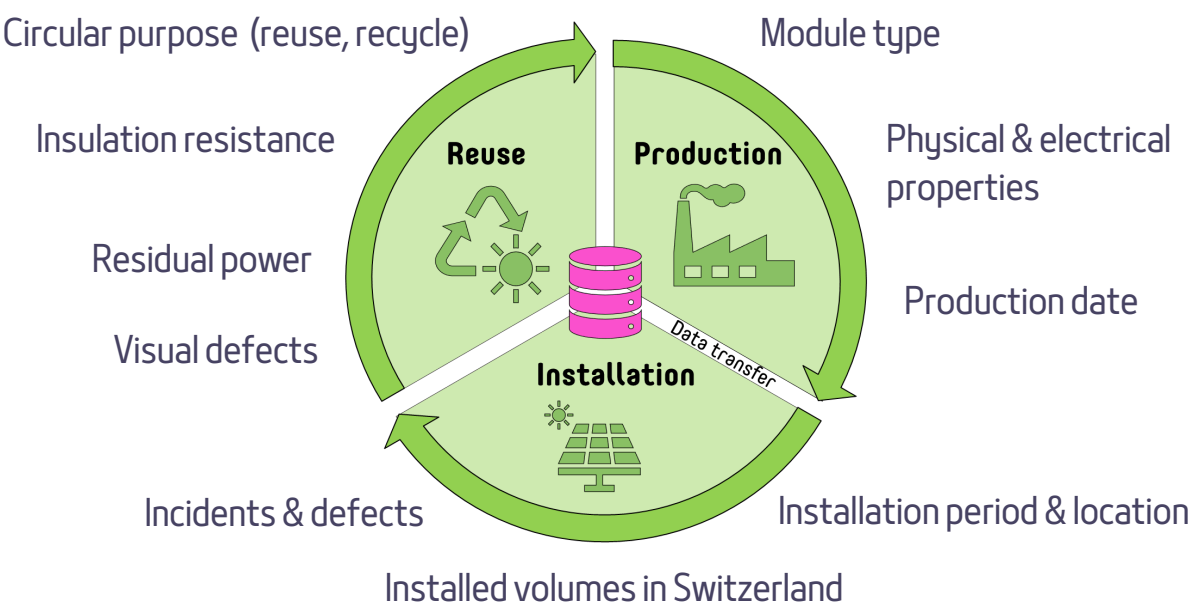


Figure 4: Schematic representation of the information required or given from different stages of the PV value chain.

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