

Towards a circular solar power sector: practices for ideating, designing, experimenting and scaling

Lars Strupeit¹, Nancy Bocken², Wim Van Opstal³

¹*The International Institute for Industrial Environmental Economics, Lund University,
Tegnérsgården 4, 22350 Lund, Sweden.
lars.strupeit@iiee.lu.se*

²*Maastricht Sustainability Institute, School of Business and Economics, Maastricht University,
Tapijn 11 Building D, P.O. Box 616, 6200 MD Maastricht, The Netherlands.
* Nancy.Bocken@maastrichtuniversity.nl*

³*VITO, Flemish Institute for Technological Research, Unit Sustainable Materials Management,
Boeretang 200, 2400 Mol, Belgium.
wim.vanopstal@vito.be*

Abstract

Wide-scale use of solar energy is an essential part of a future circular economy powered by renewable energy. However, as the market for solar photovoltaics (PV) is expected to grow significantly in the coming years, so will the demand for raw materials, and the potential waste volumes from PV panels at the end of their lifetime. In response to these emerging challenges, CIRCUSOL (www.circusol.eu), an Innovation Action project funded by the Horizon 2020 programme of the European Commission (2018-2022) seeks to unleash the potential of circular business models, in particular Product Service Systems. The aim is to ensure that material aspects of the energy transition will also be sustainable.

This study draws on five demonstrator case studies that were part of project CIRCUSOL. The cases included: Waasland Co-housing (Belgium), REScoop PV (Belgium), Cloverleaf (Belgium), Scaling-PSS (Switzerland), and SunCrafter (Germany). Within each of these five cases, aspects of circularity, such as product life-time extension through reuse of PV panels, as enabled through service-based business models were trialed.

This study uses an action-based case study approach. This means that the researchers had an active role in the case studies. The aim was to spur the development of PSS-oriented circular propositions for each of these cases during the project. To achieve this, a range of tools and methods were applied through workshops and other interactions with the case companies and end-users. Tools included scenario techniques, jobs-to-be-done approach, customer journeys, focus groups and choice-based conjoint analysis, amongst others. We mapped and applied these tools and methods according to the phases of ideating, designing, experimenting and scaling circular business models.

The contributions of this work are as follows. First, this study reveals the need for a portfolio of instruments for different situations and phases of the circular business model innovation process. In applying these tools, a lifecycle perspective and co-creation process have been found critical to integrate knowledge and resources of various actors from the complex solar PV value chain. Second, given that pilot projects for solar PV have long lead times and are capital-intensive, it was found that these tools could speed up the innovation process and lower cost by providing an indication of the viability, desirability, and feasibility of circularity strategies early on. Furthermore, while certain tools and methods are typically applied by business already (e.g. customer journeys), there is great value for academia to conduct studies e.g. in the form of conjoint analysis, simulation tools and surveys to help companies

better understand the desirability, feasibility, and viability of circular business models. To conclude, there is still ample work to transform the largely linear solar power sector into a 'circular industry' but this is urgently needed, given the accelerated growth in solar energy needed for a sustainable energy transition. The insight we provide through suitable tools and methods may contribute to the transformation via circular business model innovation can help speed up this process.

Keywords: product service systems (PSS), circular business models, solar energy, solar PV, experimentation