Circular Business Models for the Solar Power Industry

Norwegian Solar Energy Cluster
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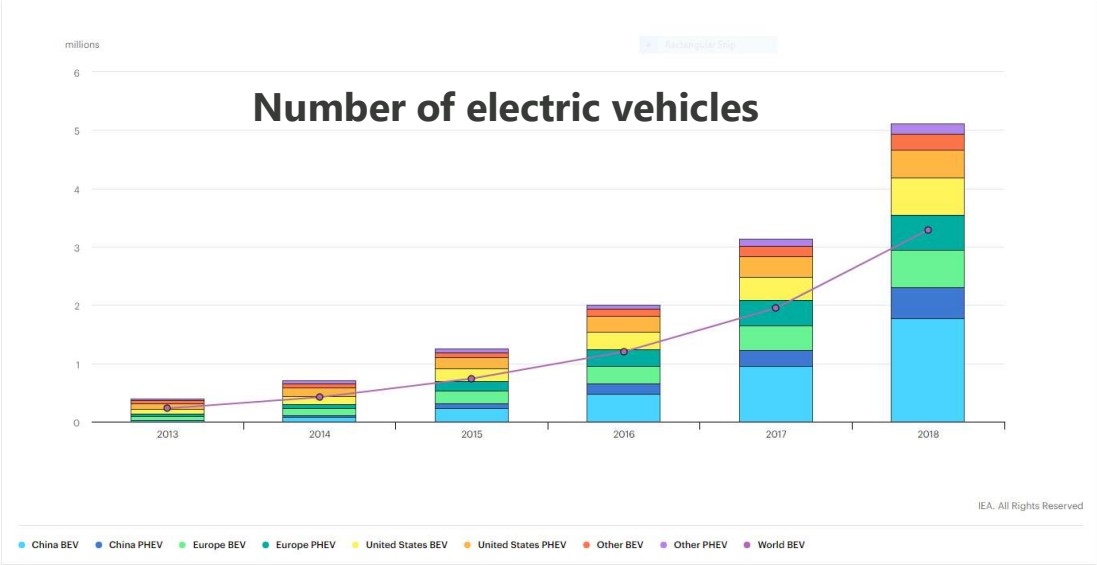
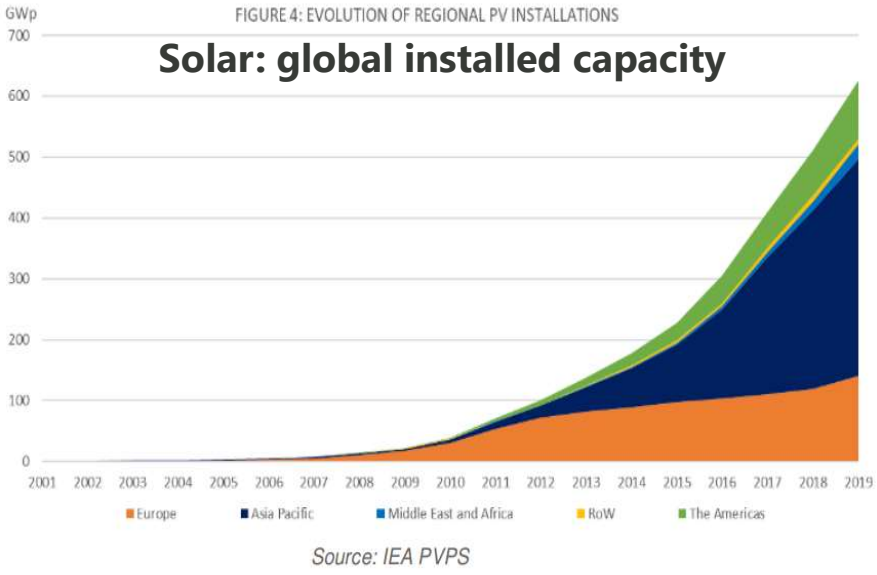
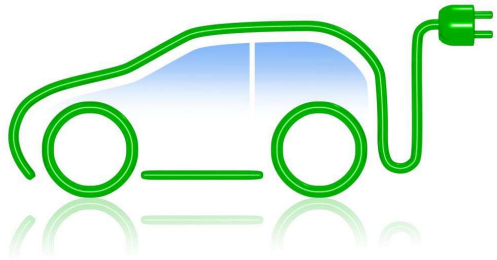
Why Circusol?



Appears in
Global EV Outlook 2019

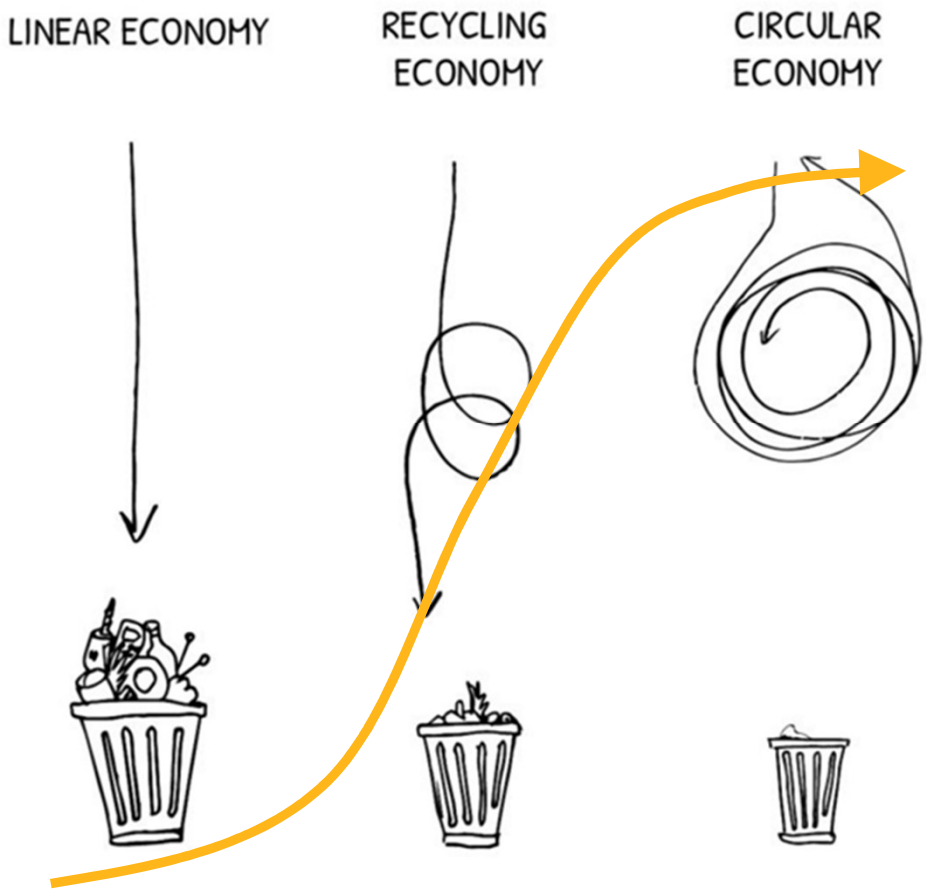
Notes





The question

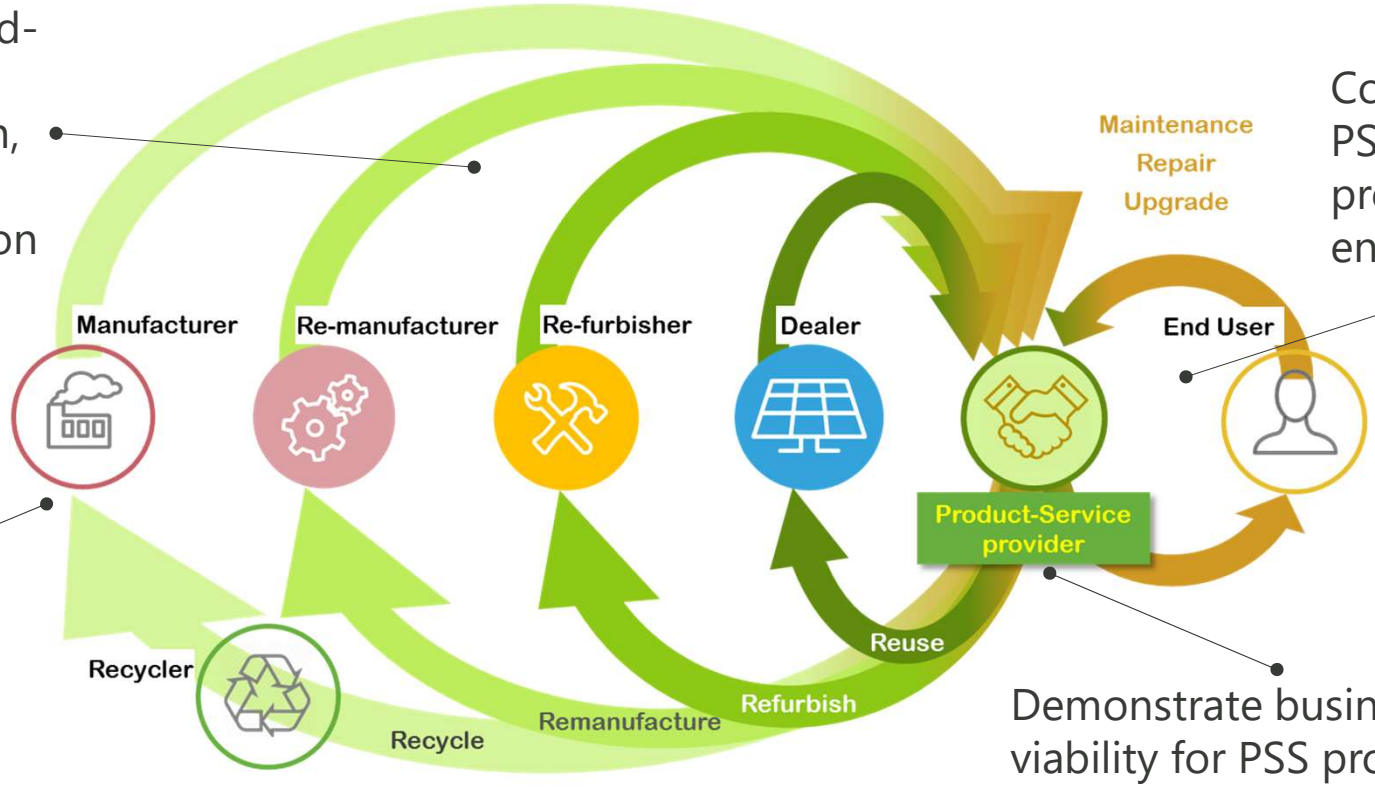
Are business models for PV and EV-batteries future-proof?



The solution

Develop "second-life" paths — re-use, refurbish, remanufacture + Standardisation

Co-create solar PSS value propositions with end-users



Incentivize "design for circularity"

Demonstrate business viability for PSS providers (and other actors)

Circular PSS Model = Circular Product Management + Value-added Product-Service

The plan

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Analyze

Design & Develop

Validate

Environment Science	Social Science	Business	Technology

1 Eco-system analysis & simulation

2 Circular business model co-creation

5 Supply chain development

3 Large-scale demonstrators

4 Circular business experimentation

1. Eco-system analysis and simulation

Input parameters

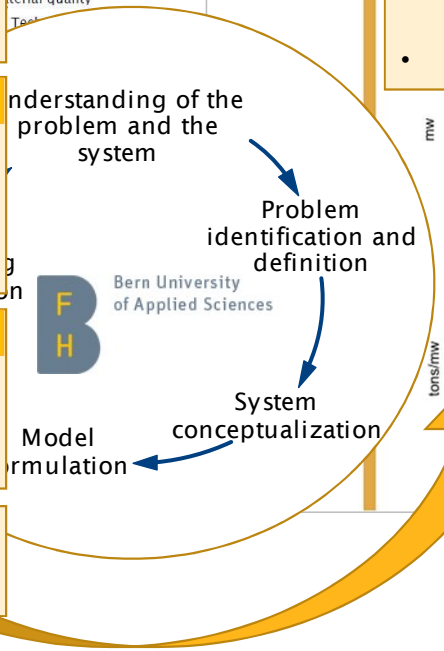
Macro
- Population birth and death rates
- Household size
- …

Consumer
- Load profile
- Electricity price
- …

PV system — 1st and 2nd life
- PV lifetime
- PV power output (kWh/kWp)
- α factor for power degradation in modules
- PV module costs
- …

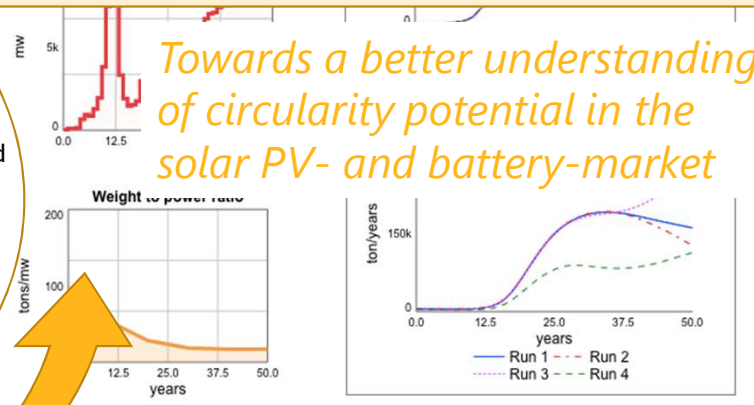
Battery systems — 1st and 2nd life
- Storage capacity
- Energy losses
- …

Economic
- Nominal interest rates
- …



Output parameters

Macro
- NPV for investments in PV systems
- Perceived utility of the different concepts
- Adoption shares for 1st and 2nd life prosumers and prosumers with storage
- Number of 1st and 2nd life prosumers, installations and installed capacity
- …



Towards a better understanding of circularity potential in the solar PV- and battery-market

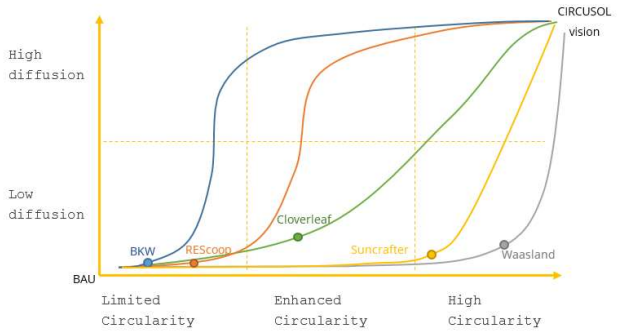
2. Circular Business Model co-creation

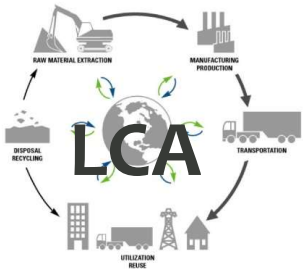
T2.1 CBMD Framework:

Toolset to quantify economic/environmental parameters of system configurations

T2.2 Co-creation facilitation:

Process approach to help people iteratively design and adjust CBM configurations



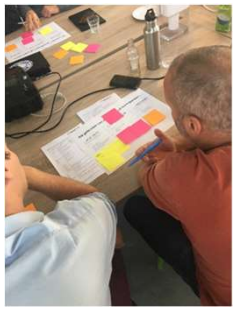


T2.3 CBM co-creation:

Workshops in/around demo's using (results of) toolset to co-design and adjust CBM

T2.4 CBM business experiments:

Additional space to test/validate CBM design assumptions



WP4 demo's

vito vision on technology

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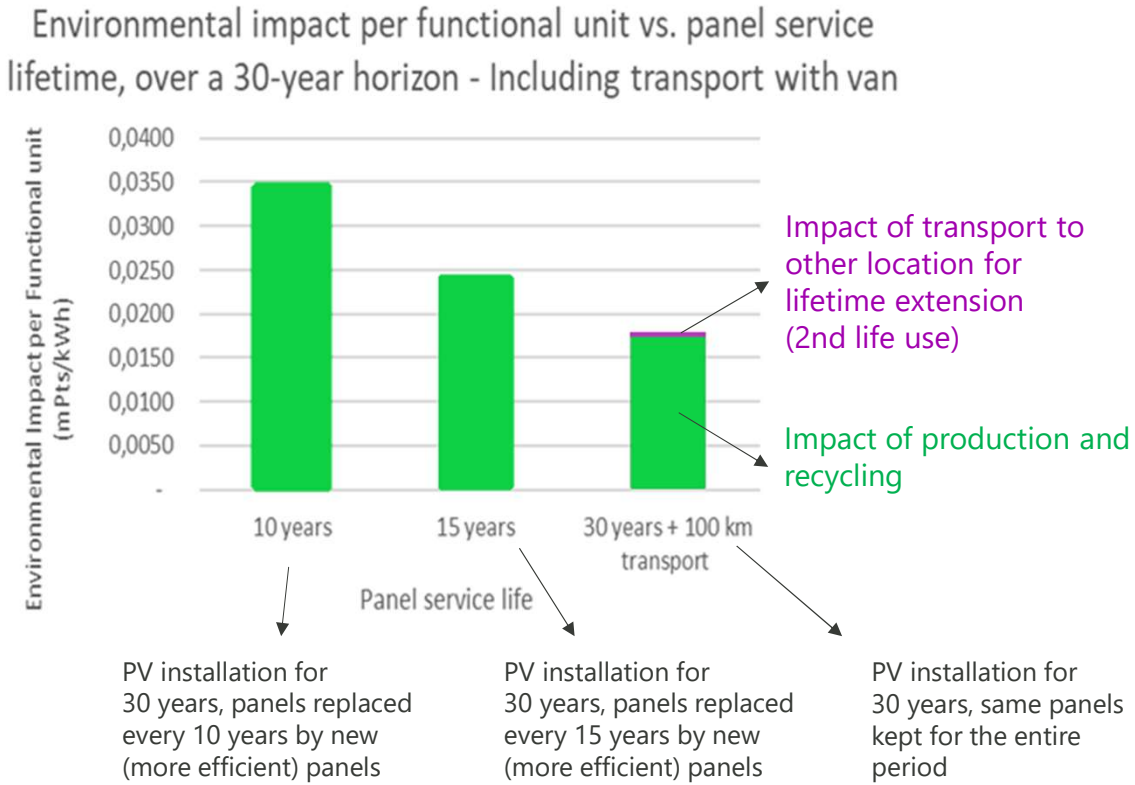
2. Circular Business Model co-creation

LCA for lifetime extension/re-use case*



*Report under revision, soon available @ iea

Sensitivity analysis:

Even drastic technology evolution/revolution is unlikely to make replacing older working panels with new (more efficient, more environmental friendly) ones an environmentally favourable choice.

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3-4. Large-scale demonstrators Circular Business Experimentation

3-4. Large-scale demonstrators Circular: First learnings

Main challenges identified:

- Asymmetric **information** in the value chain for **2nd life** (transaction costs, volumes, warranties, …). Sourcing of substantial volumes remains a challenge. Need for standards, labels, certification…
- 2nd life becomes less competitive due to **increasing efficiencies** and **decreasing prices** of new solar PV
- In some cases PSS fails to be competitive with sales model

Recommendations: Identify **sweet spots** where **PSS PV** meets customer need.

Focus on segments where

- Technical and legal issues deter solar ownership models
- Unburdening is an important value
- Anticipation on sustainable development ambitions of (local) authorities via circular procurement

3-4. Large-scale demonstrators Circular: Opportunities

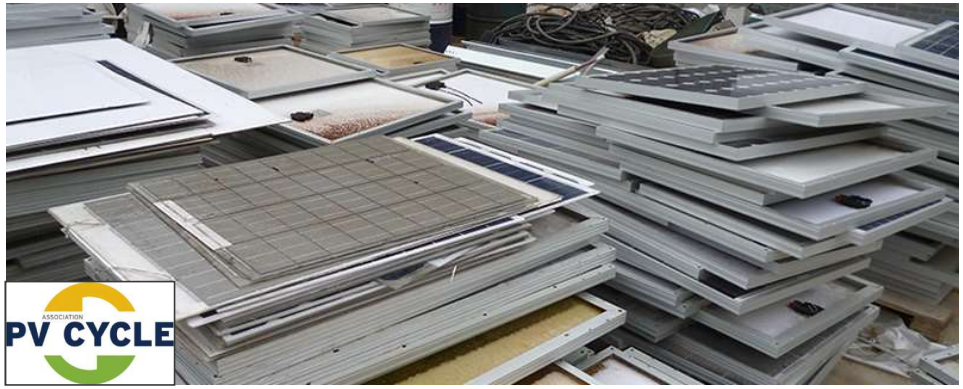
PSS models can enable **additional circular strategies** like ***reduce, rethink, repair*** **and** ***recycle*** deployed (next to *reuse/repurpose* of 2nd life) via

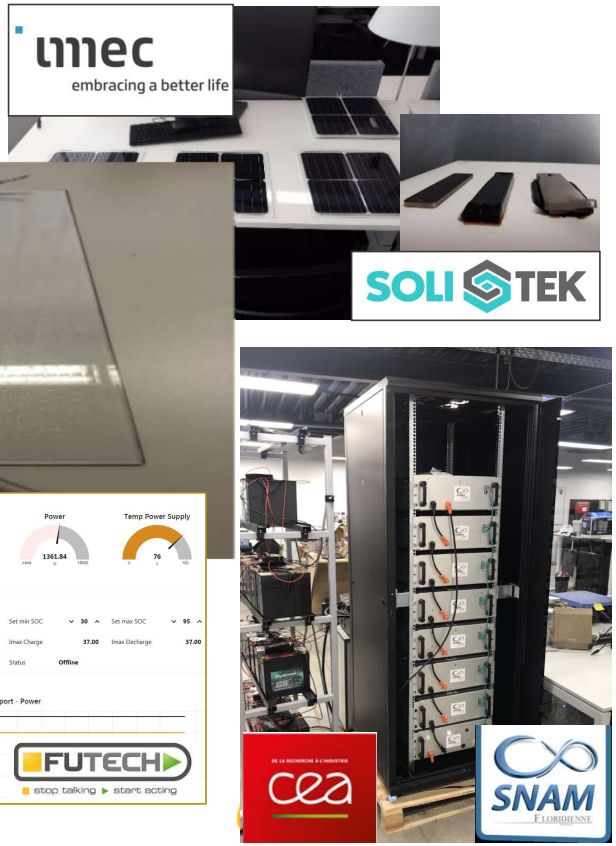
- PSS models incentivize service providers to optimize system parameters;
- Enhance efficiency and longevity of PV installations via monitoring and preventive maintenance;
- Allocate responsibility for proper decommissioning and recycling or disposal.

5. Circular Supply Chain Development

Working on:

- Circular Design, data management and recycling
- Standards for PV and battery reuse: support/develop 2nd life market





Conclusions – so far

- **Plan versus reality**: acceptation of 2nd life and PSS vs. ownership model remains a challenge -> end user preferences;
- Identify **sweet spots and target customer segments** accordingly:
  leave your "safe bubble" while innovating and invest in the **demonstration** of your value proposition;
- **Standards** are key to develop/structure the **2nd life market** and **supply chain**;
- **"Circular" is more than "recycling";**
- Still 1,5 years to go: **Follow us !**

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Thank you!

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