CAMBRIDGE ZERO $_2$

Light Harvesting
Special Interest Group

Sustainability and life cycle analyses of light harvesting technologies
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Panel

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Challenges

- Recycling all components of complex solar cells, and enabling this with pragmatic design.
- Mapping of material and energy flows along the supply.
- Transparency of data, which is especially challenging when commercially sensitive data is involved.
- Analysis of technologies at different stages of development. Approaches could include benchmarking, using proxy indicators, and using machine learning to predict the LCA impact.

Discussion Points

- Attributional life cycle analysis (LCA) looks at a technology in a relatively isolated way. To get a broader view, a 'consequential' LCA can be used which accounts for the products and its. But this is more complicated and less precise.
- While LCA is the most recognised method for assessment of environmental sustainability, its quality ultimately depends on the data used. Transparency is needed regarding data, model and assumptions.
- There are many LCA studies, but they are seldom generalizable and analysis methods often do not follow standardized criteria. The objective of the LCA maters: the difference between two established technologies can be assessed precisely, but it is harder to compare technologies at different readiness
- Comparisons become harder as LCAs go out of date, e.g. as electricity becomes decarbonised. Local factors influence this strongly, and it becomes harder to understand if the LCA actually captures the biggest problem of a technology.
- It is important to look at the beginning and end of a product lifetime, as well as raw materials sourcing, and design production systems with minimal material loss.
- LCAs are powerful tools, but maybe they are not always necessary where answers are obvious.
- Important to adopt a whole system view and look at interactions along the supply chain and with neighbouring technologies. The systems are often very large and the data not available.
- LCAs methods need to adapt to emerging sectors and new business models.
- Some 'waste' at the end of product life is becoming increasing valuable but can be difficult to retrieve. Making things more standard and modular could help bridge the gap in recycling and production. It would need regulatory change and could grow an 'end of life' industry. Thinking about recycling at the design stage is important, and LCAs could help here.

Opportunities

- Digital tools for mapping flows in the supply chain are being developed and could have major impact in the next 2-3 years
- Embed LCA and other sustainability analyses at early stage of tech development to ensure new materials and devices are fully sustainable, screening with simplest indicators
- Design for easy recycling, and develop recycling methods for new light harvesting.

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