**Link:** [**https://solar-power-tech.com/e-posters/sfs\_eposter\_03/**](https://solar-power-tech.com/e-posters/sfs_eposter_02/)

**Abstract**

The current dependence on fossil fuels for energy generation is clearly unsustainable; thus, renewable forms of energy generation are being developed. Wind, hydroelectric and solar are the most relevant in the Portuguese context, with a significant increase in the installed capacity of solar power, planned until 2030 [1]. Although increasingly important in the Portuguese electricity mix [2], renewable energy generation still face significant barriers. One of the most relevant is the imbalance between supply and demand, mainly due to the varying weather conditions, in which energy storage is consensually seen as a promising solution.

Various storage technologies are available, each one suitable for different conditions and application. When selecting the best option, not only the economic but also the environmental performance of the technology must be considered. In this work, the potential environmental impacts of a solar redox flow cell (SRFC) is assessed. A SRFC is a promising device since it uses a phototoelectrochemical (PEC) device for solar charging the redox pairs dissolved in electrolytes, which can be discharged in a redox flow battery (RFB) to generate electricity. Therefore, it is suitable to be used in small and decentralized energy generation systems, *e.g.* buildings or in areas lacking an electricity distribution grid. Even though the design of the SRFC is still under optimization, a *cradle-to-gate* Life Cycle Assessment (LCA) was done according to the ISO 14040 and 14044 standards [3], including the life cycle steps from the extraction of raw materials, to the production of the used components, and unit assembly. The main goal is to identify the aspects that contribute the most to the unit’s potential environmental impacts. The functional unit is the production of one PEC cell prototype [4] and the inventory data was mainly obtained from the PEC developers, complemented with data from the literature and Ecoinvent V3.4 life cycle inventory database. The ILCD Midpoint+ V1.10 impact assessment methodology was used to evaluate the potential environmental impacts.

The production of the body, casing and frames have a high contribution to the total environmental impacts in most categories, due to the use of aluminum and stainless steel in these components. The remaining components contribute between 11 % and 14 % to the total impacts, except in the ozone depletion category (OD). In this category, the Nafion® ionic membrane contributes with 89 % to the total impacts, followed by the stainless steel frames. Since most impacts are related to the metal components, in the future studies that will include the end-of-life module, it is expected that there will be a substantial environmental benefit due to the recycling and reuse of these materials.