LARGE AREA UNIFORM INDUSTRY COMPATIBLE PEROVSKITE SOLAR CELL TECHNOLOGY

LUMINOSITY is an industry-driven project that aims to leverage flexible perovskite solar cell technology for commercial-scale production using established industrial processes.

AIMS

- use roll-to-roll (R2R) processing methods
- target photovoltaic module power conversion efficiency of >20% at an area of >900 cm^2
- close the efficiency gap between lab-scale and fab-scale processed devices
- bring the technology readiness level (TRL) up to 7

OUTCOMES

R2R produced, flexible single-junction perovskite PV modules that:

- have an operational stability >20 years that rivals the lifetime of current commercial thin film PV technologies
- are economically and environmentally feasible

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UHASSELT

LUMINOSITY has partnered with **Hasselt University** to ensure the production of economically viable and sustainable flexible perovskite modules. The **Environmental Economics (EEC)** research group, part of the **CMK research institute**, specializes in *techno-economic assessments (TEA)* and *life cycle assessments (LCA)* of clean technologies.

PRELIMINARY LCA RESULTS

A cradle-to-gate (from raw materials acquisition to module assembly) LCA was conducted to estimate the environmental impacts of 1 m^2 flexible perovskite modules with different cell stack architectures (Fig.1).

Global warming potential (GWP) results

Approximately **29** kg CO_2-eq/m^2 *for all scenarios*

- **Within** project target *(<30 kg CO_2-eq/m^2)*
- **69% lower** than CIGS module *(94 kg CO_2-eq/m^2)*
- **80% lower** than a c-Si module *(143 kg CO_2-eq/m^2)*

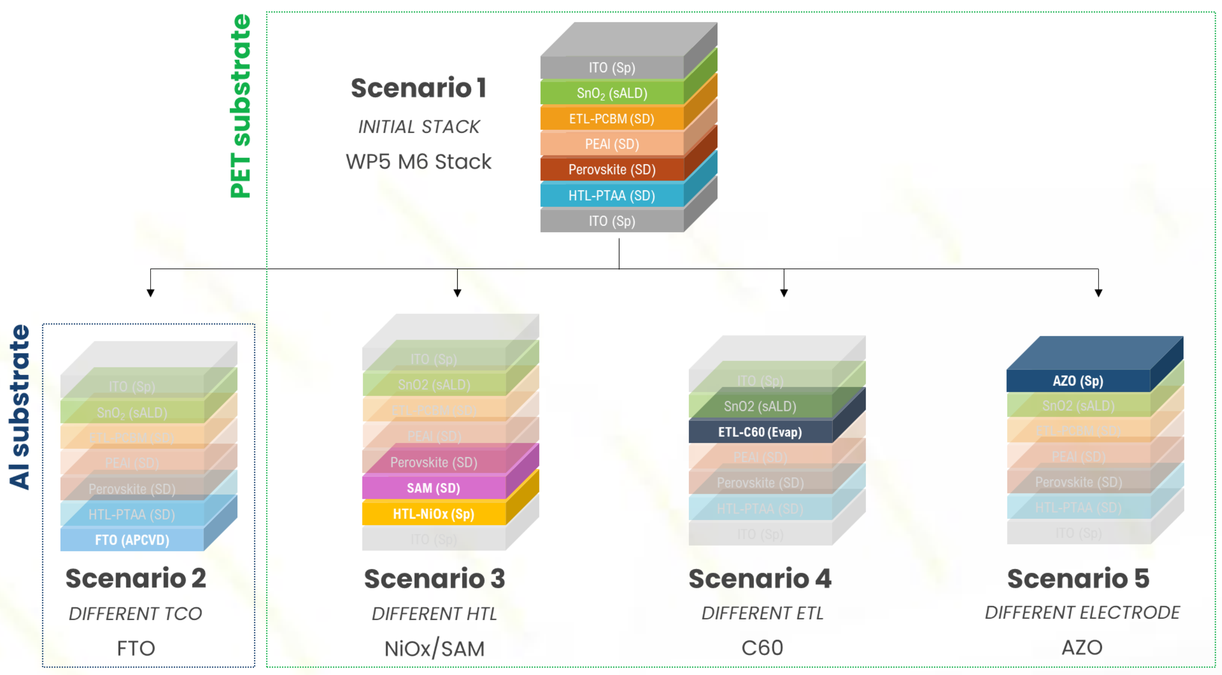

Fig. 1: Stack architecture of flexible perovskite modules per scenario

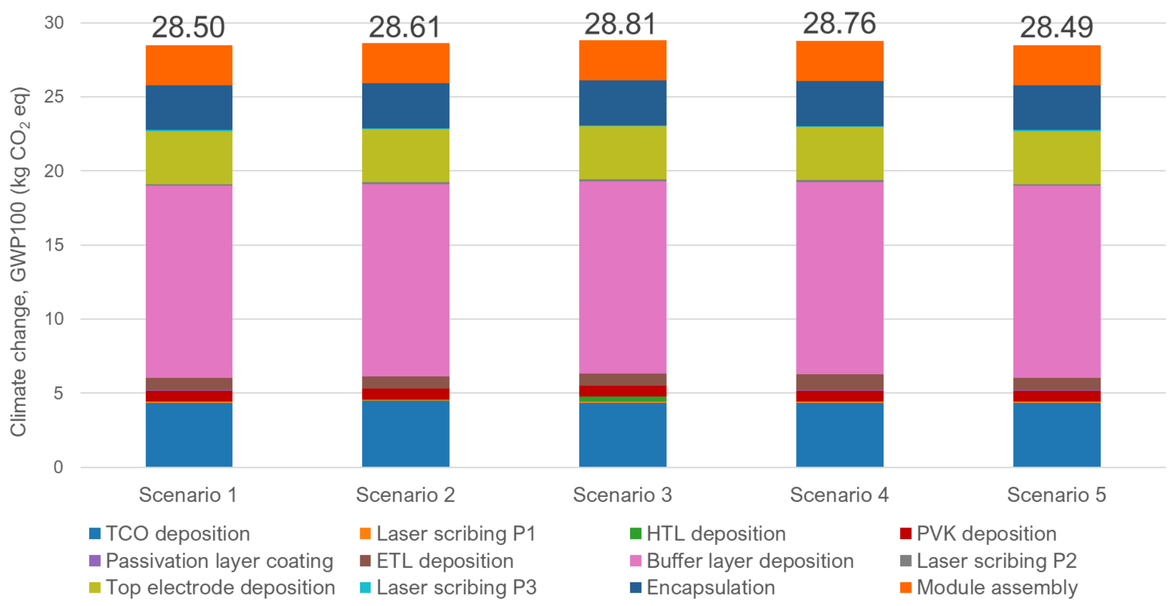

Fig. 2: GWP results per process per scenario

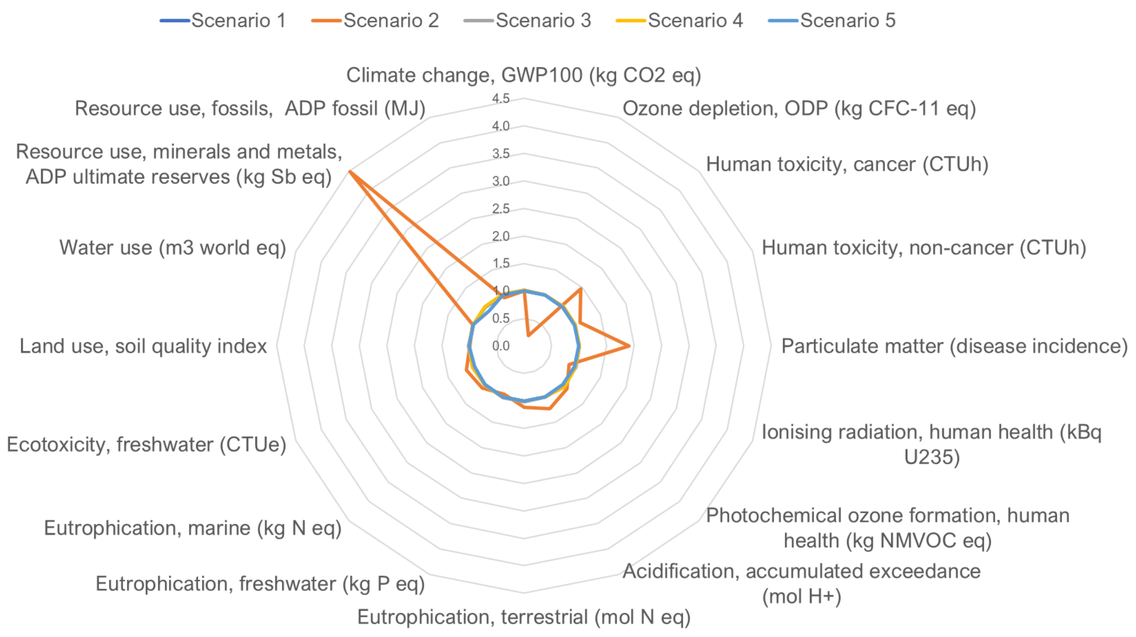

Fig. 3: Normalized impact results (EF3.1) of scenarios 2-5 to scenario 1

Hotspot analysis

High nitrogen use in buffer layer deposition, and use of PET film and aluminum substrates in transparent conductive oxide (TCO) deposition contribute the most to environmental impacts (comprising ~61% of GWP, see Fig. 2)

Scenario analysis

All scenarios have similar impacts except scenario 2 due to the use of aluminium substrate instead of PET film, resulting in higher resource use, particulate matter and human toxicity impacts but lower ozone depletion impact (Fig. 3)

Want to find out more? Visit **www.luminosity-project.eu** or scan me

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