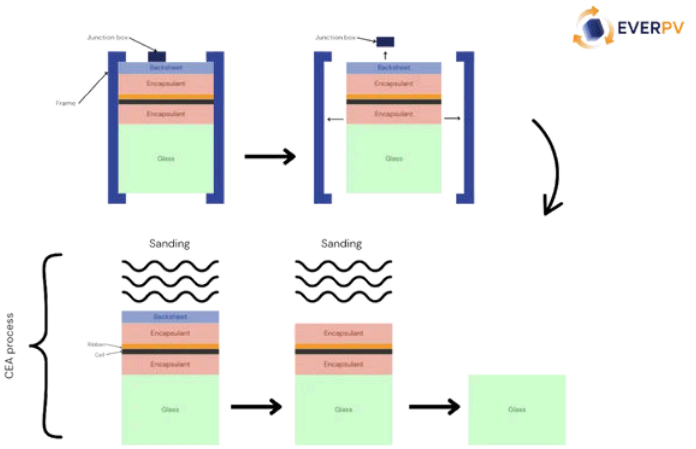
Exploring CEA's innovative delamination process for end-of-life solar PV panels

End-of-life management will become a significant component of the solar PV value chain. The recycling of solar PV panels at their end-of-life and the recovery of their materials can unlock a large stock of raw materials. The recovered material can be injected back into the economy in a circular way, and used in the production of new solar PV panels, thus securing the future raw material supply.

The EVERPV project aims to improve two recycling techniques of end-of-life solar PV panels. These techniques are focused on delamination, i.e. separating the different layers of the solar PV panel to recover materials. Specifically, EVERPV is focusing on two delamination processes: thermo-mechanical recycling from ENEA and 9-Tech, and grinding from CEA. We're diving into CEA's grinding process.

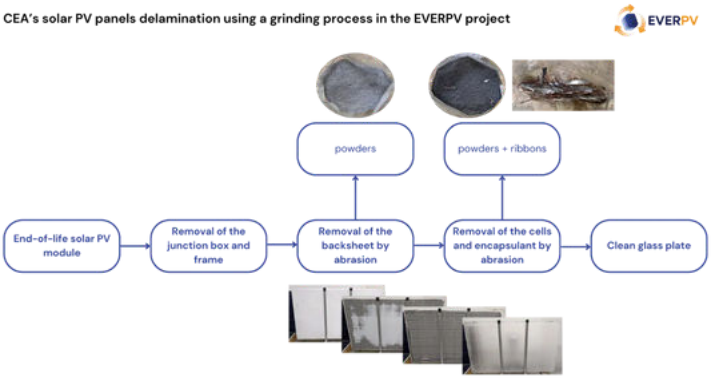
The first step of the process is to remove the junction box and cables of the end-of-life solar PV panel. The junction box is an electronic device connecting the solar PV panel to the rest of the electrical system. Then, the aluminium frame is removed and the CEA delamination process can start.

Illustration of CEA's grinding process for end-of-life solar PV panels delamination



The CEA technology is used to process glass-backsheet silicon cells modules and it consists of removing the different layers via abrasion. The sanding starts from the rear side of the solar PV panel, first by removing the backsheet and then by removing the cells and encapsulant together, until there is just the glass left. This process allows the collection of powders, ribbons, and intact glass plates. From the powders, the metals (silicon, aluminium, silver) can be recovered through the combination of simple physical processes such as sieving and chemical processes using mild acid and/or basic solvents.

CEA's solar PV panels delamination using a grinding process in the EVERPV project



Nearly 300 end-of-life solar PV panels have been processed at CEA using this delamination technique. Several hundred kilograms of powder and several tonnes of glass have been recovered for the EVERPV project and analysed.

CEA's process is highly relevant for solar PV panel recycling, it offers a cost-effective solution thanks to its reliance on standard industrial equipment and the durability of the abrasive belt. Moreover, the materials recovered are in powder form, allowing straightforward physical processes to extract metals, while preserving the solar glass and ensuring its high purity.

Pilot line using the technology developed and patented by CEA at ENVIE 2E Aquitaine in France

Since the first week of July 2025, the pilot line using the technology developed and patented by CEA is fully operational at ENVIE 2E Aquitaine in France. Hundreds of end-of-life solar PV panels have already been processed successfully!

Discover more about the project on the EVERPV website

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