Life Cycle Inventoryof Current PV Module Recycling Processes in Europe

Introduction and Purpose

- PV module recycling is required in Europe under WEEE regulations
- Few environmental assessments have been published on PV module recycling technologies
- The purpose of this study was to collect energy and material flows (life cycle inventory) for currently operating recycling facilities in Europe that are treating PV modules in order to better understand the process design and support life cycle assessment of their environmental impacts
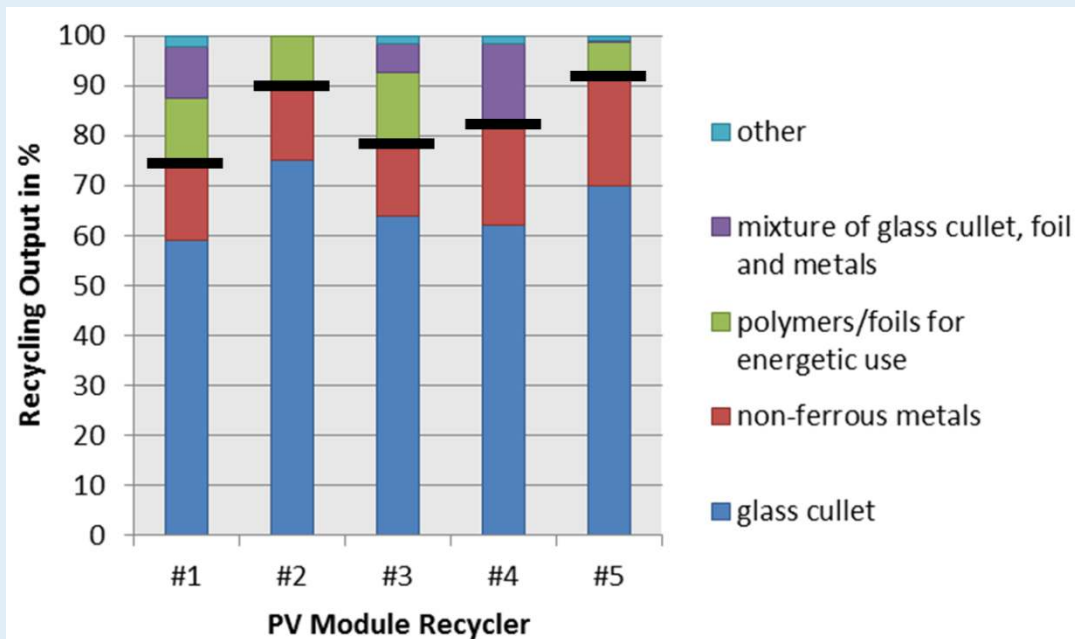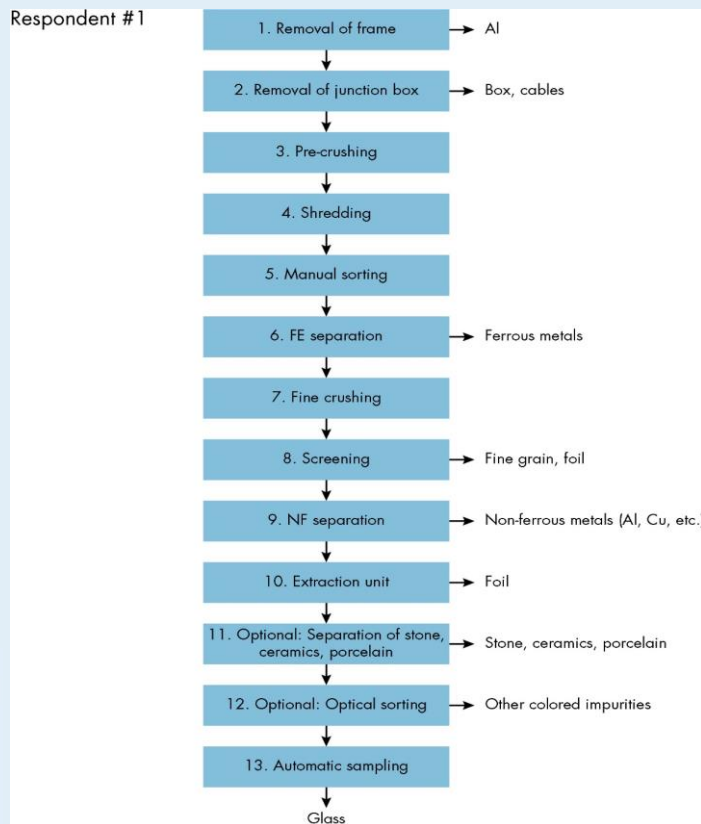
Approach

- Survey of known recyclers in Europe
    - 9 surveys sent
    - 5 returned

Respondent	Company	Country	Process	Type of Recycler	PV Volume (t/yr)
#1	Anonymous	Germany	Mechanical	Glass	1,200
#2	Exner Trenntechnik GmbH	Germany	Mechanical	Metal	100-250
#3	Maltha	Belgium	Mechanical	Glass	1,000
#4	Nike	Italy	Mechanical	Glass	600
#5	Sasil S.r.l.	Italy	Combination of mechanical, thermal, and chemical	Prototype PV recycling system	(1 t/hr tests)

LCI Synthesis

- Electricity is main energy source for recycling operations, with all but one using 50-100 kWh per tonne of module input
- Higher material recovery rate can be achieved with greater input energy - Respondent #2 used more electricity for more intense mechanical process; whereas Respondent #5 additionally used thermal energy.

Example of a PV-module recycling process performed as a batch run in a laminated-glass recycling plant, which is considered the reference process of this study since it sets a cost benchmark for PV module recycling in Europe today.

Fraction of recycling output (percent of total output mass) by material category for each of the five respondents. (Polymers are included in mixture for respondent #4.) The bold black lines indicate the total material recovery rate of the process.