FRELP PROJECT LIFE+12/ENV/IT000904

FULL **R**ECOVERY **E**ND OF **L**IFE **P**HOTOVOLTAIC

New technology to divide the components of silicon photovoltaic panels at the end of life

BACKGROUND

The stock of photovoltaic (PV) panels has been rising sharply in recent years and is currently estimated at some three million tonnes in the EU.

However, sustainable solutions for the recovery of PV waste are still not well developed, and if not disposed of correctly, this waste can cause both environmental and human health problems.

It is forecast, for example, that from 2015 onwards, 30.000 t/year will be disposed in Europe, and over the next 20 years this amount could reach 500.000 t/year, including:

350.000 t/year of glass;

90.000 t/year of aluminium;

30.000 t/year of plastics;

20.000 t/year of crystalline silicon cells;

10.000 t/year metals.

Since 2012, PV has been included in the EU WEEE Directive, which requires manufacturers and importers to facilitate and finance the take-back and recycling of their discarded end-of-life products.

Current technologies recycle only aluminium and glass in low-value industries. They do not allow for recovery of metals, especially crystalline silicon, which is used in more than 90% of PV cells worldwide. Silicon production implies energy costs that are equivalent to three years of PV energy production, which represents a serious drawback in terms of its environmental performance from a life-cycle approach.

OBJECTIVES

The LIFE FRELP project aims to test and develop innovative technologies for 100% recycling of end-of-life PV panels in an economically viable way:

- full recovery of aluminium and connectors for recycling in suitable industries;
- development of a new technology for the detachment of EVA (Ethylene-vinyl acetate) from glass, preserving glass purity for integral recycling in valuable flat and hollow glass;
- recovery of energy from EVA sandwich by pyrolysis, maintaining the ability of crystalline silicon and metals to be processed;
- development of a new acid leaching technology for the full recovery of (metallic) silicon, to be used as iron silicon alloys or amorphous silicon for the production of thin films;
- full recovery of metals, silver, copper, aluminium through micro and nano-filtering of eluate and/or electrolysis, to be used for recycling in suitable industries.

EXPECTED RESULTS

The expected results, demonstrated at a pilot plant treating 3.500 t of PV panels during the project lifetime, are:

- 2.500 t of glass, 650 t aluminium, 20 t connectors, 90 t fuel, 50 t gas, 140 t of pure silicon, 5 t of silver, 15 t of copper, …;
- a considerable reduction in energy consumption and CO_2 emissions due to the use of glass cullet in the glass melting furnace, substitution of virgin silicon with recycled silicon, production of energy by EVA pyrolysis.