SUSTAINABLITY ISSUES OF A NEW BUILDING INTEGRATED PHOTOVOLTAIC SYSTEM

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BACKGROUND

Providing a safe, clean and sustainable energy supply to all world citizens is one of the greatest challenges of this century.

Sustainable energy could be defined as *the provision of energy that meets the needs of the present without compromising the ability of future generations to meet their own needs.* Then, sustainable energy has two main key components: **renewable energy and energy efficiency**, which are often named the twin pillars of sustainable energy policy.

REELCOOP Project

REELCOOP, an EU-FP7 funded project which stands for *REnewable ELectricity COOPeration* (www.reelcoop.com), aims to develop renewable electricity generation technologies and promote cooperation between several EU Partners.

This project addresses five important renewable energy areas:

- Photovoltaics (PV).
- Concentrated Solar Power (CSP).
- Solar Thermal (ST).
- Bioenergy .
- Grid Integration.

Three novel prototype systems, representative of both micro-scale (distributed) and large-scale (centralised) approaches to electricity generation, are being developed and tested.

MATERIALS

One of the prototypes is a solar PV ventilated façade (6 kW electrical output) and involves the development of both c-Si and dye-sensitized solar cells, as well as the study of the ventilation effect in PV façades.

It is currently installed at Yazar University (Izmir, Turkey, 2016). The c-Si modules use an innovative glass-glass configuration with high mechanical stability, without the need of an aluminium frame (Figure 1). The installation of the modules followed a novel procedure accomplished within 5 working days, considering façade and all electrical connections (Figure 2).

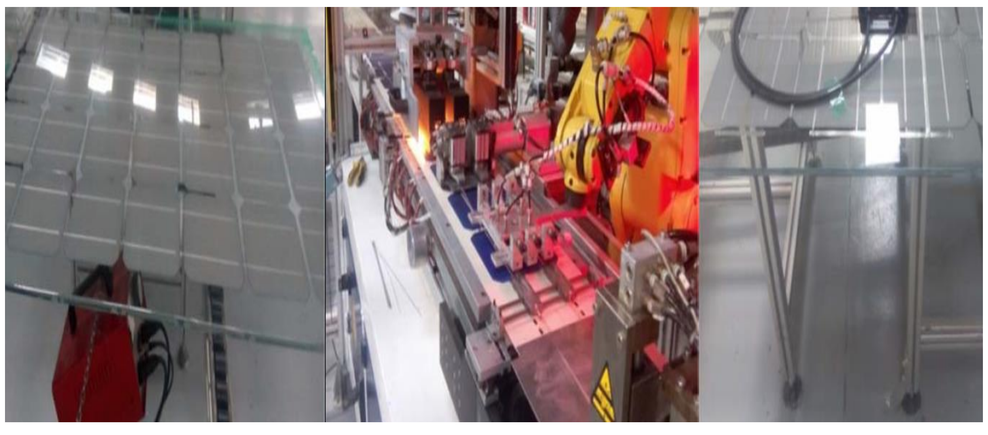

Figure 1. PV modules manufacturing processes (left) and final product (right).

Figure 2. PV modules installation process at Yazar University, Izmir.

METHODOLOGY

From a cradle-to-cradle approach, several methods and guidelines will be applied in order to assess the sustainability of this novel prototype. A complete list is presented within the figure 3. Results are expected to be ready on February 2018.

Methods & Guides

- Guidelines on LCA of PV electricity [1]
- Guidelines on LCA for PV and buildings [2]
- External costs [3]
- LCA- Input-output [4]
- FISA framework [5]

System boundary of the Building Integrated Solar Photovoltaic System [2]

PRODUCTION	TRANSPORT & INSTALLATION	USE	END OF LIFE
Modules and cells. Inverters and cabling. Transformers. Fixation to the façade. Elements to produce energy and the mounting system. Elements to insure all building functions.	Transport to the building. Transport of the PV modules with all electrical elements, the fixation and the insulation materials. Installation on façade. Energy and materials needed to install the BIPV on the building.	Maintenance. Cleaning (frequency should be specified). Transport of maintenance agents. Repairs. Replacements (consider lifespan of elements).	Deconstruction. Dismantling. Transport to the recycling or disposal place. Recycling and reuse. Waste processing. Disposal. Treatments.

Figure 3. Research Framework for assessing the sustainability of the new BIPV system in REELCOOP project.

REFERENCES

[1] Frischknecht R *et al,* 2016, Methodology Guidelines on Life Cycle Assessment of Photovoltaic Electricity, 3rd edition, IEA PVPS Task 12, International Energy Agency Photovoltaic Power Systems Programme. Report IEA-PVPS T12-06:2016, ISBN 978-3-906042-38-1.
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