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# Overview of the project "DELIGHT"— DEsign and Evaluation of LIGHTweight Composite PV Modules for Integration in Buildings and Infrastructure

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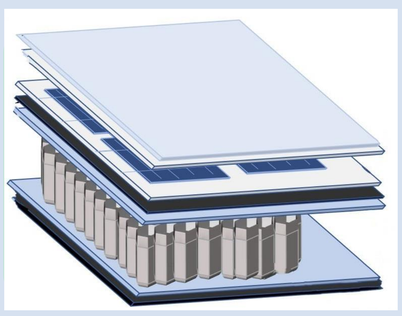
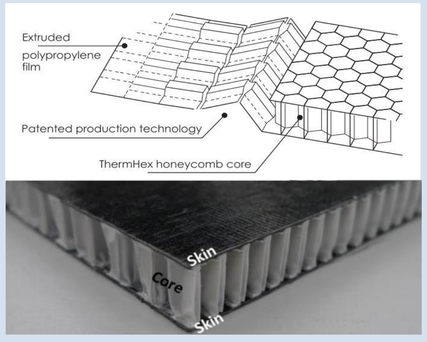
## 1. Introduction and motivation:

- Project 'DELIGHT' addresses the quest of resolving the challenges associated with fabrication & commercialization of the lightweight building integrated photovoltaic (BIPV) modules using the materials sourced from Europe.
- This 3-years project brings together the leading experts of their respective domains, with a common goal to rapidly develop a commercial lightweight PV product using environment-friendly materials (e.g., recycled PET).
- Distinct features of the project include realizing a BIPV product that is:
  - ✓ Aesthetically pleasing,
  - ✓ Weighing less than 6 kg/m$^2$,
  - ✓ Reliable against mechanical and environmental stressors,
  - ✓ Electrically safe and tolerant to partial shading.



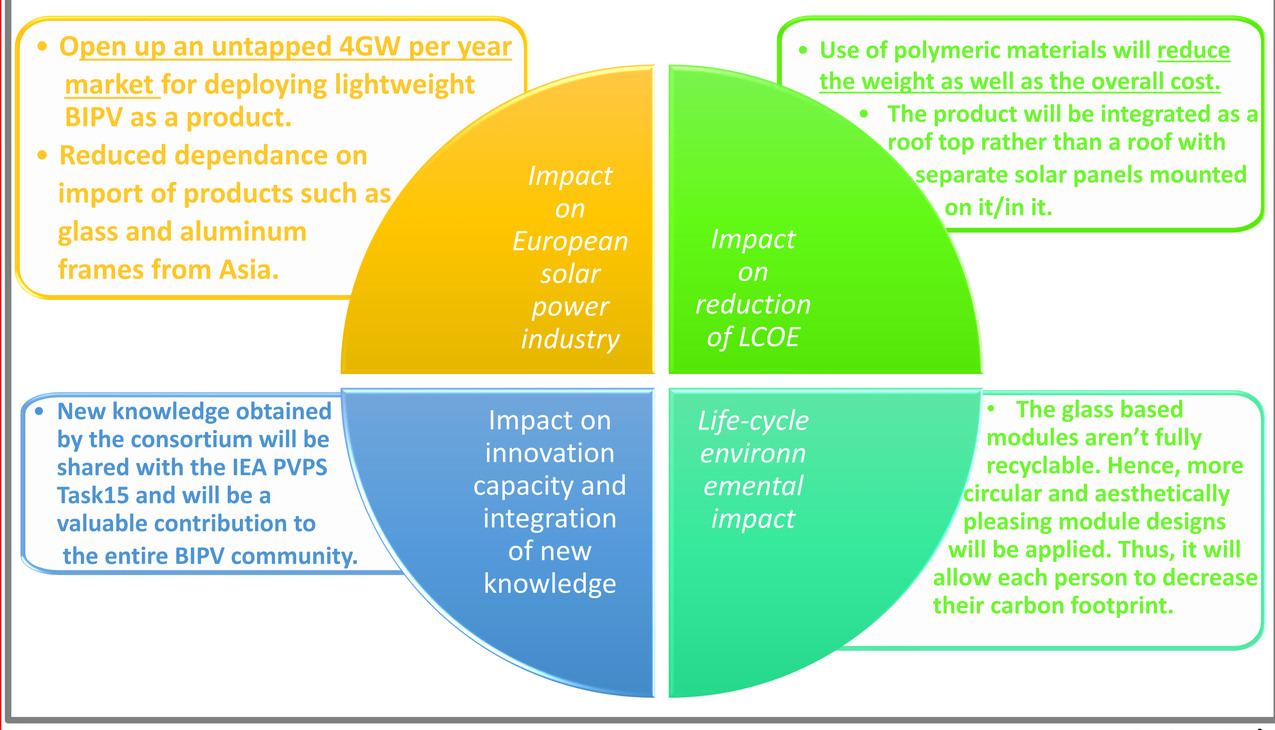



**Generation -1**
i. Glass/glass modules
ii. Very high weight
iii. High transportation cost
iV. Requires special attention to mounting of modules

**Generation -2**
i. Composite sandwich structure to replace glass.
ii. Aluminium core
iii. ETFE front sheet

**Generation -3**
i. Use of polymeric core instead of aluminium
ii. Use of recycled PET as a front sheet
iii. Environment friendly, lightweight and economic design

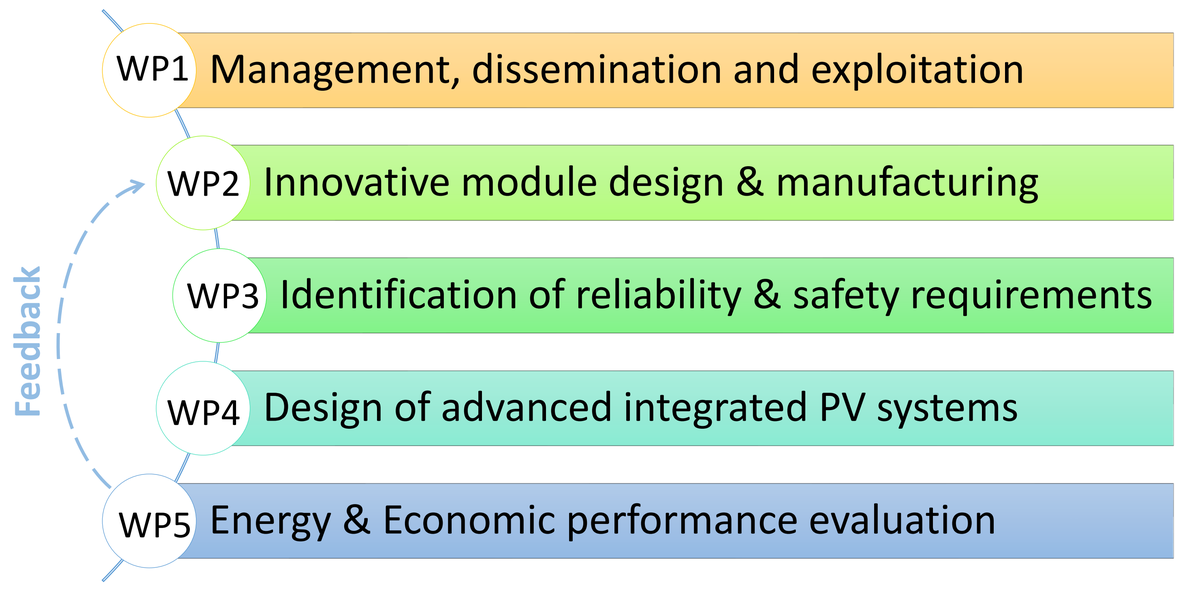
## 2. Impact of the project




## 3. The consortium and the deliverables of EPFL in it:

- The DELIGHT project brings together leading experts in the field of photovoltaics to carry on a research line in the field of lightweight PV modules.
- **EPFL and IMEC** have demonstrated the capacity to manufacture reliable glass-free PV structures using composite materials.
- **IMEC and Kalyon** will work towards improving module designs and efficiency.
- **Rembrandtin, PCCL and OFI** will work on the integration of novel and more sustainable materials, like non-fluorinated polymer front sheets, composite backsheet made of recycled polymers (**Econcore**), or colored encapsulants (**Solaxess, EPFL**) and to scale up lightweight PV modules.

### Work-flow:




### Deliverables of EPFL:

- The objectives defined under WP3 (Identification of reliability & safety requirements) will be the responsibility of EPFL. The present day challenge is to widely demonstrate BIPV in real buildings to be able to ensure performance, reliability, durability, and replicability in a cost competitive way.
- EPFL will primarily work towards designing the tests and performing the reliability tests with the following specific goals:
  - ✓ Increase the understanding of potential failure mechanisms,
  - ✓ Implement mitigation strategies to prevent degradation,
  - ✓ Align and extend lifetime of BIPV solutions to service lifetime of other building products (35+ years).

## 4. Initial Exhibits:

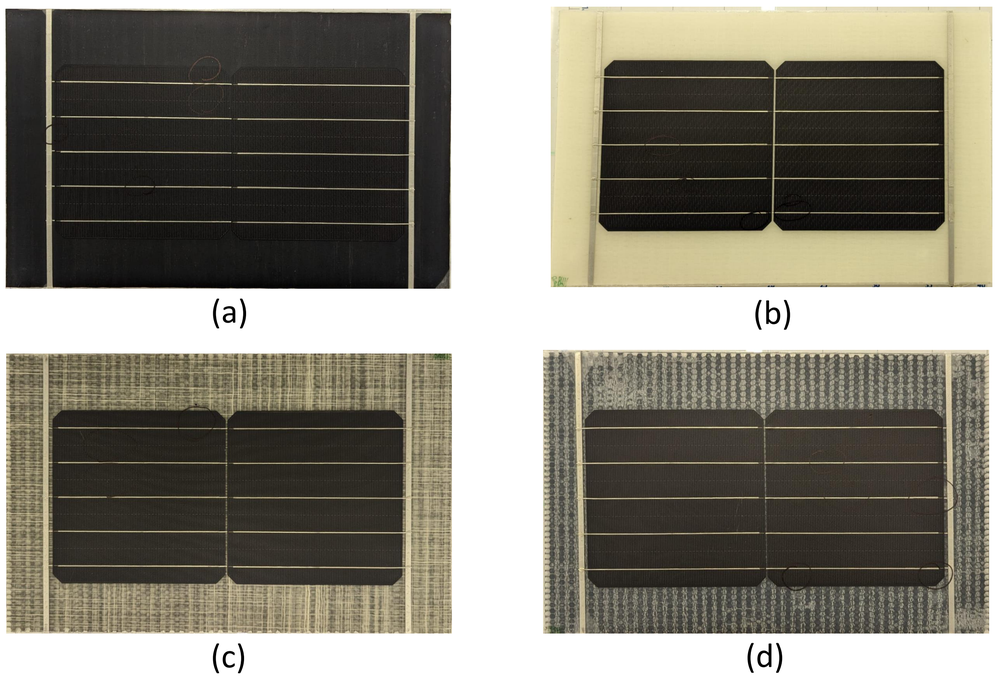



Figure 1: Representative images of lightweight modules having polymeric cores: (a) PPGF6, (b) PPGF8, (c) PETGF, (d) BOPET. The details of the architecture has been presented in table 1.

Table 1: Details for each type of lightweight architectures shown in figure 1. Note that, all the lightweight modules have architecture of PET front-sheet/encapsulant/solar-cells/encapsulant/skin/core/skin.

| Exhibit # | Colour | Thickness | Composition | | Weight (g) |
|---|---|---|---|---|---|
| | | | Core | Skin | |
| (a) PPGF6 | Black | 12 mm | White PP core | Black PP/GF | 451 |
| (b) PPGF8 | White | 12 mm | White PP core | White PP/GF | 483 |
| (c) PETGF | black core + greyish skins | 11 mm | Black PET core | Greyish PET/GF | 421 |
| (d) BOPET | black core + transparent skins | 10 mm | Black PET core | Transparent BOPET | 334 |