25e journée du CUEPE
19 mai 2017, Genève

# Transformation Photovoltaïque

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# Understanding the barrier

A broad survey

70 PNR Virage énergétique Programme national de recherche


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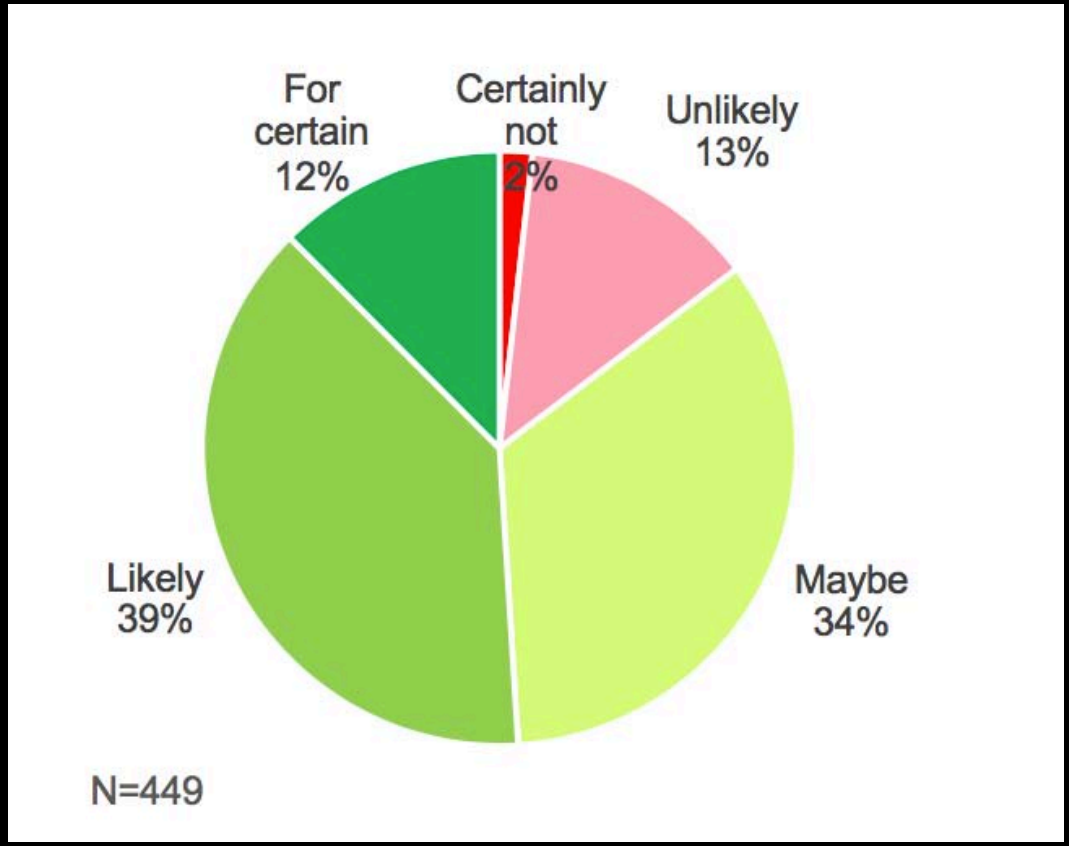
active interfaces

# How likely would Swiss owners install PV?

A broad survey

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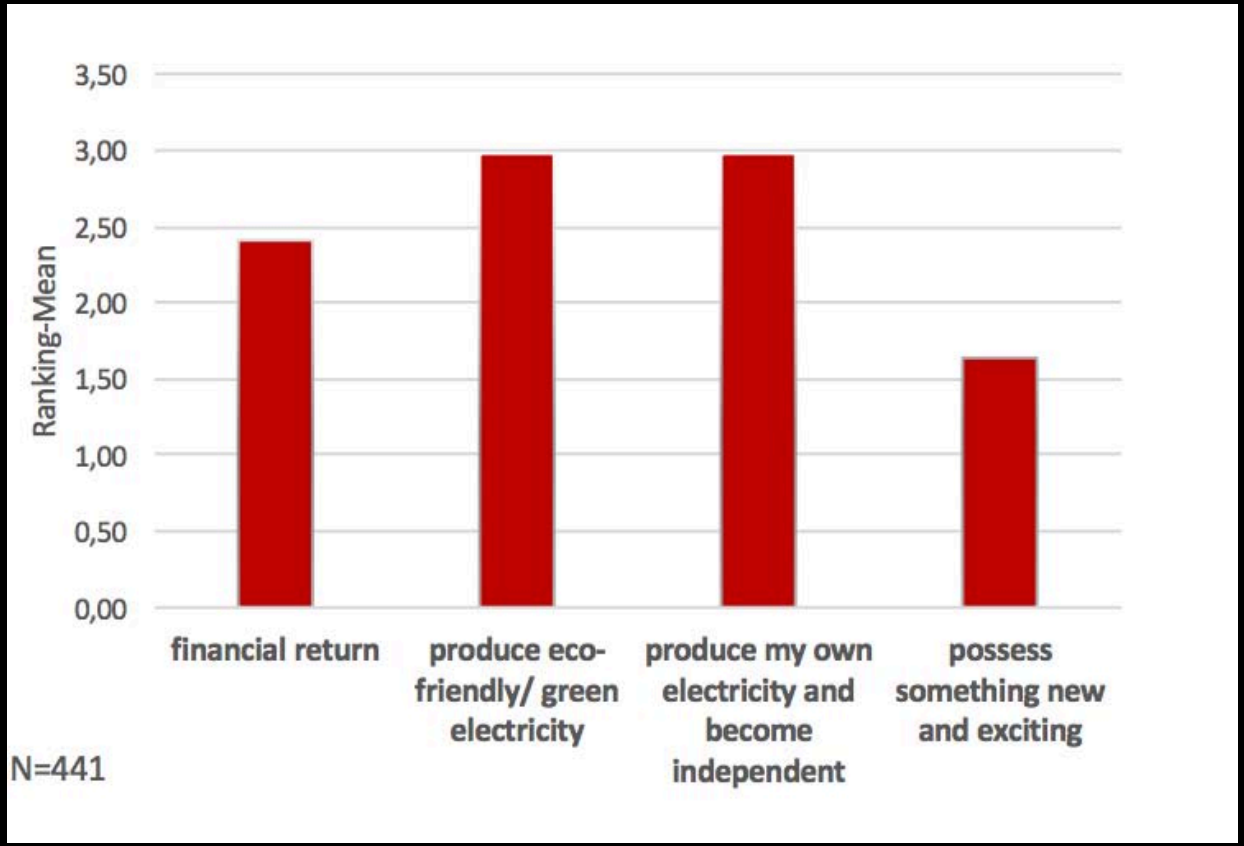
# What are their main motivations?

A broad survey

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# PV as a new construction material

multi-functionality

## PV modules

- Produce electricity
- Optimized for powerful PV plant

## Active Construction Materials

- Holds essential architectural functions, both technical and aesthetic
- Comply with construction and safety norms

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# PV as building element

A new paradigm

Active façades should become a construction standard:

- The active element acts as a building material
- It give to the building an architectural and esthetic value
- It does produce energy and therefore generate revenues and become cheaper than a conventional façade

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# Cost comparison

**s o m e  n u m b e r s**

activefacade@issol.ch

| | Glass | PV Techology | Active Glass |
|---|---|---|---|
| Laminated Monolytic Glass | 40 | 90 | 130 |
| Safety Glass for façade | 80 | 90 | 170 |
| Safety Glass with different shapes, thickness | 120 | 90 | 210 |
| Colored Safety Glass | 150 | 120 | 270 |
| Colored Safety Glass with many diffrent shapes | 180 | 120 | 300 |
| Printed (Quadri Color) Safety Glass | 200 | 120 | 320 |

- Average cost of Active Glass: 280 €/m2
- Cable, Inverters, Mounting: 120 €/m2

Total average cost of an active façade: 400 €/$m^2$

Annual production per $m^2$ for a façade: 130 kWh, electricity value: 0,23 €/kWh, revenues per $m^2$: 30 €/year

- return of investment is less than 10 years.

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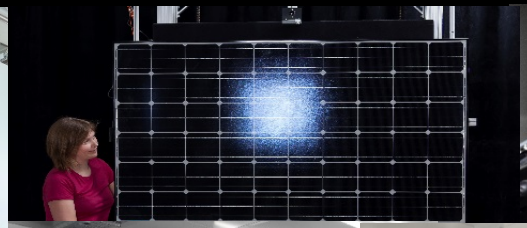
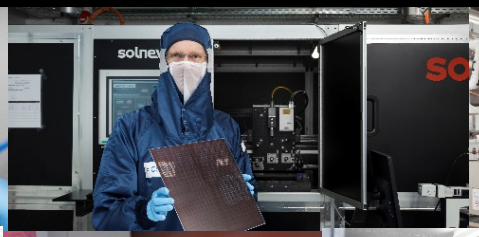
# CSEM key infrastructures

From coatings, to cells, to modules, to systems

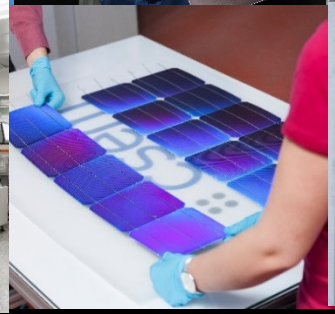
| Technology infra-structure Platforms | Thin film Coating & lasering | Cells Pilot lines | Modules R&D lines | Polymers com-pounding | Testing and reliability with SUPSI | storage R&D center (with BFH) |
|---|---|---|---|---|---|---|
| | Metrology and characterization | | | | | |

Over 2000 $m^2$ of lab and facilities in Neuchatel






# Module technology at CSEM

Strategic topics

## Photovoltaïque intégré au bâtiment (BIPV)

- Architecture et esthétique
- Approche transformative à bas coût

## Produits spéciaux

- mobilité, portable, electronique
- Fait « sur mesure »

## Matériaux et fiabilité

- Formulation dédiée & extrusion d'encapsulant
- Tests et prédiction de modes de dégradation

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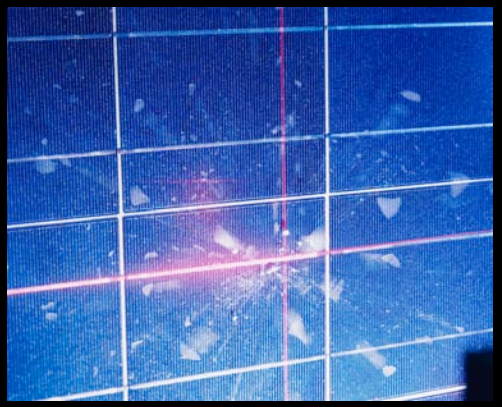
# Polymer platform

**For dedicated encapsulant**



- ✓ 30m$^2$ lab , packaging foil of 0.1 to 2.5 mm thick and width of 20 cm
- ✓ Compounder / pelletizer (capacity: 4 Kg/h)
- ✓ Flat cast film extrusion / chill roll (capacity: 10kg/h)
- ✓ Rheological analysis, characterization
- ✓ Accelerated aging and testing (DH, TC, UV)
- ✓ Customized encapsulant and polymeric material
- ✓ Lifetime assessment
- ✓ Deep knowledge and understanding of failure mechanisms

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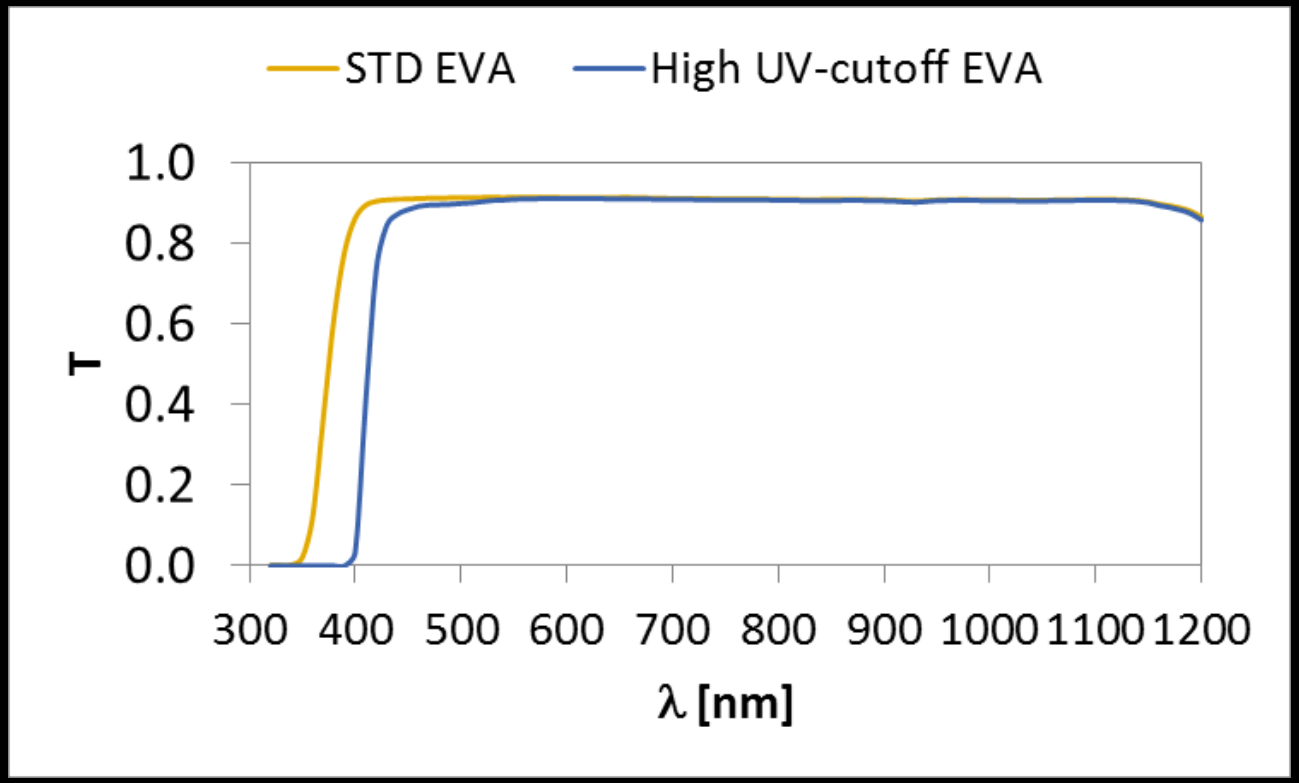
# Polymer platform

Custom made EVA

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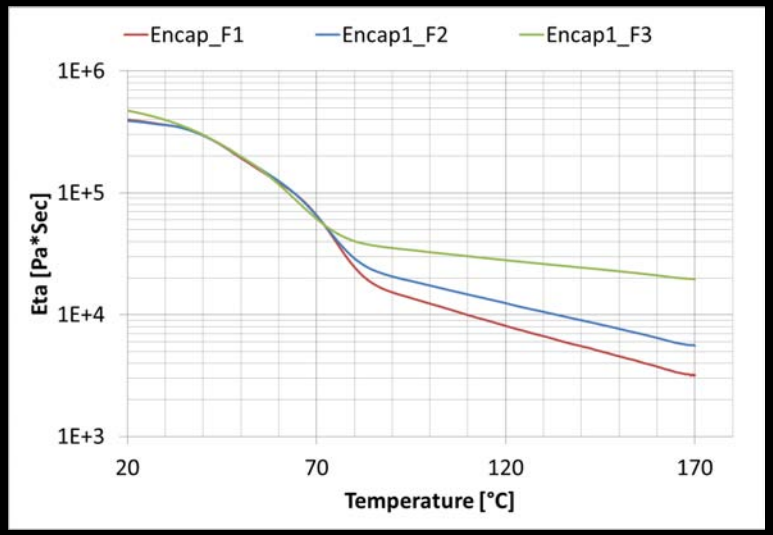
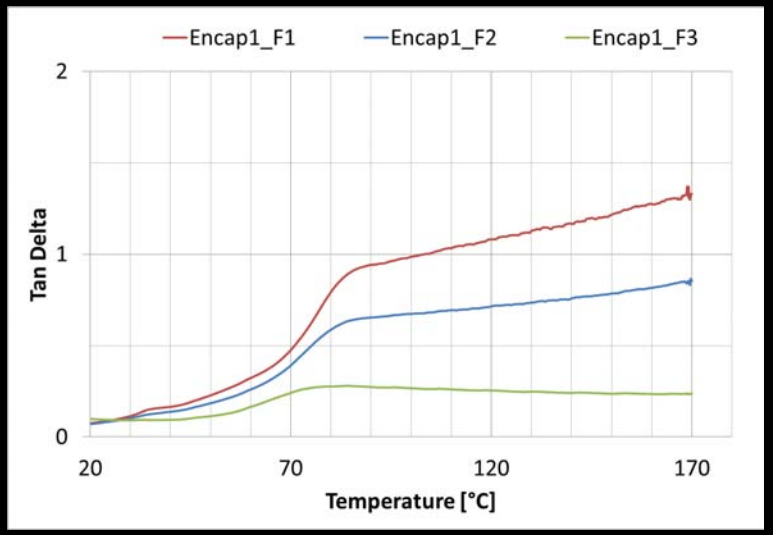
# Polymer platform

**Custom made PO**




- PO-based encapsulant formulation with customized viscosity profile to adapt to the pre-defined lamination cycle of the PV modules
- Enhance the creeping resistance of the encapsulant

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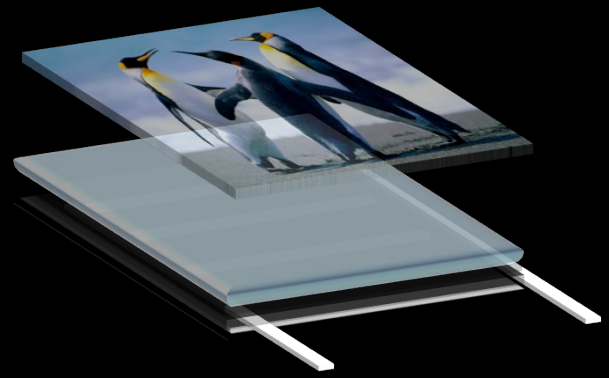
# BIPV elements

**Coloured and reliable**

- ✓ Encapsulation & lamination process
- ✓ Coloring technics on glass and plastic
- ✓ General system view ( energy management)
- ✓ Climatic chamber for IEC testing and more
- ✓ Expertize in design & architecture
- ✓ Architectural integration
- ✓ Customized products
- ✓ Ultra-reliable
- ✓ Easier implementation of PV in buildings
- ✓ Better societal acceptance of PV

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# BIPV elements

**The white PV modules**

SOLAXESS

*A reduction of around 10°C at the back of the module is measured when outdoor temperature is at 25°C.*

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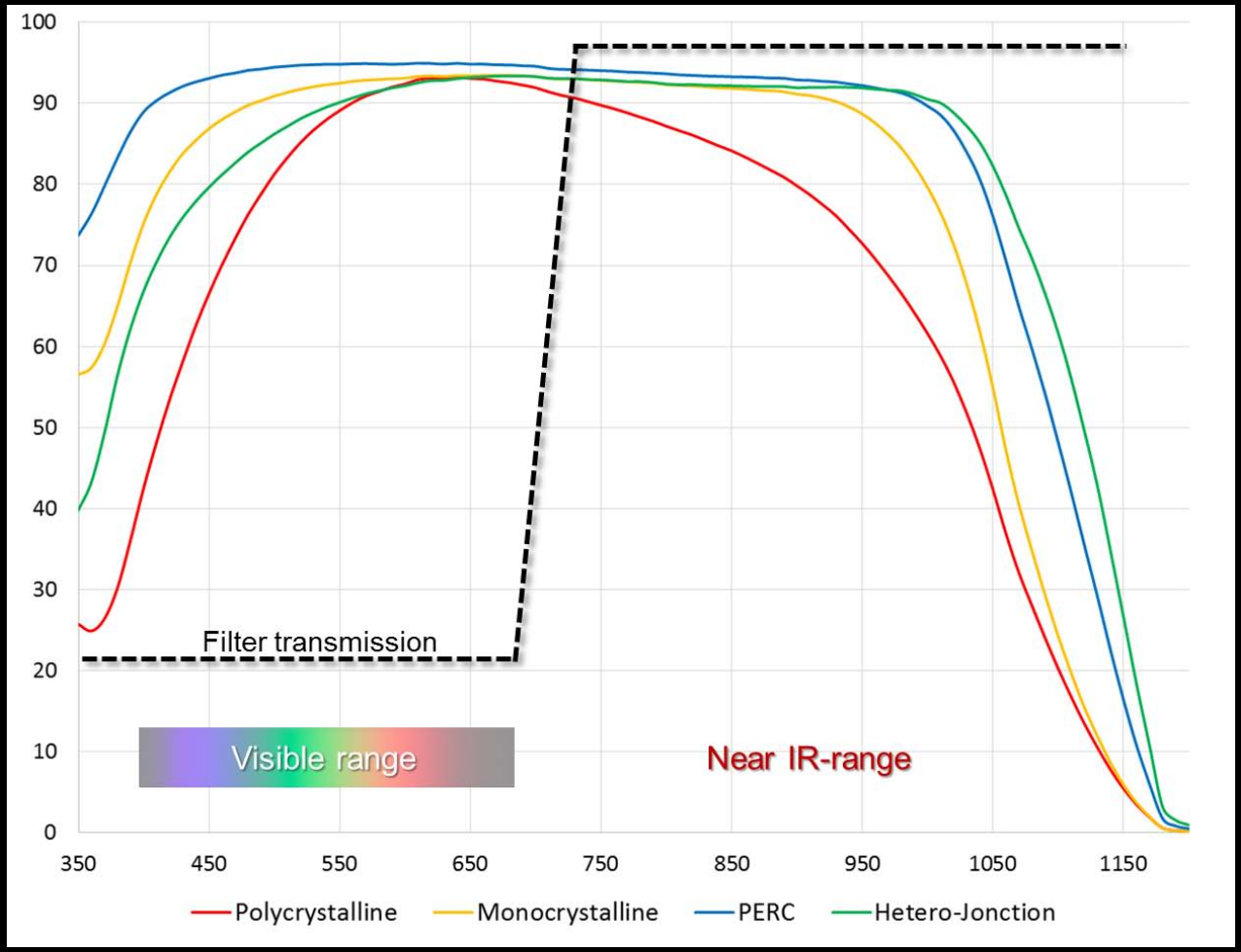
# White and coloured

**Efficient spectral selectivity**

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# PV instead of tiles

**from lab to fab**

Silicon thin-film solar tiles
(Archinsolar project)
60W /m$^2$

Silicon m- crystaline
130W/m$^2$

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# Photovoltaic in buildings

**SFOE P&D project**

Ecuvillens, Mai 2017

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# A future solar city in Neuchâtel?

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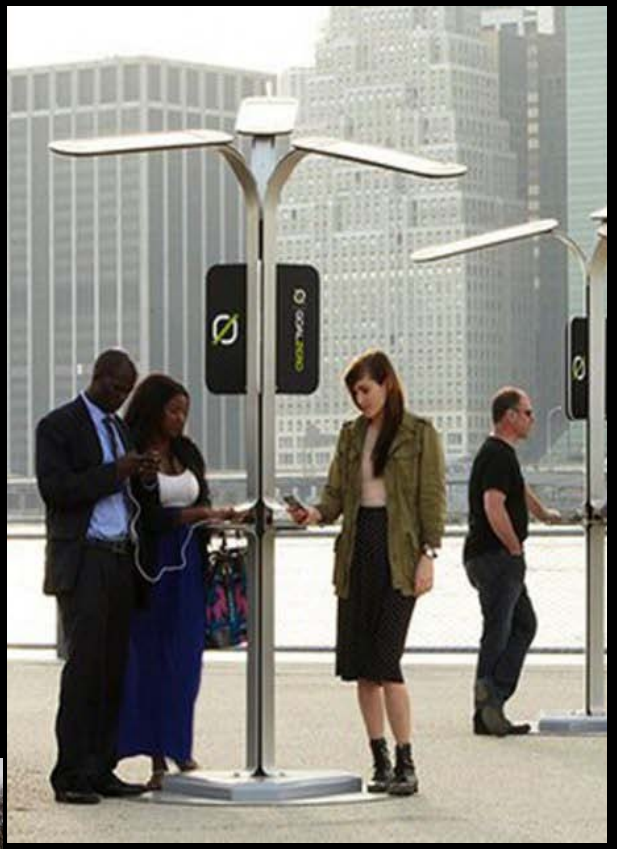
# Architectural city

**Urban furnitures**



# Solar energy can be integrated everywhere

**Air, water, space**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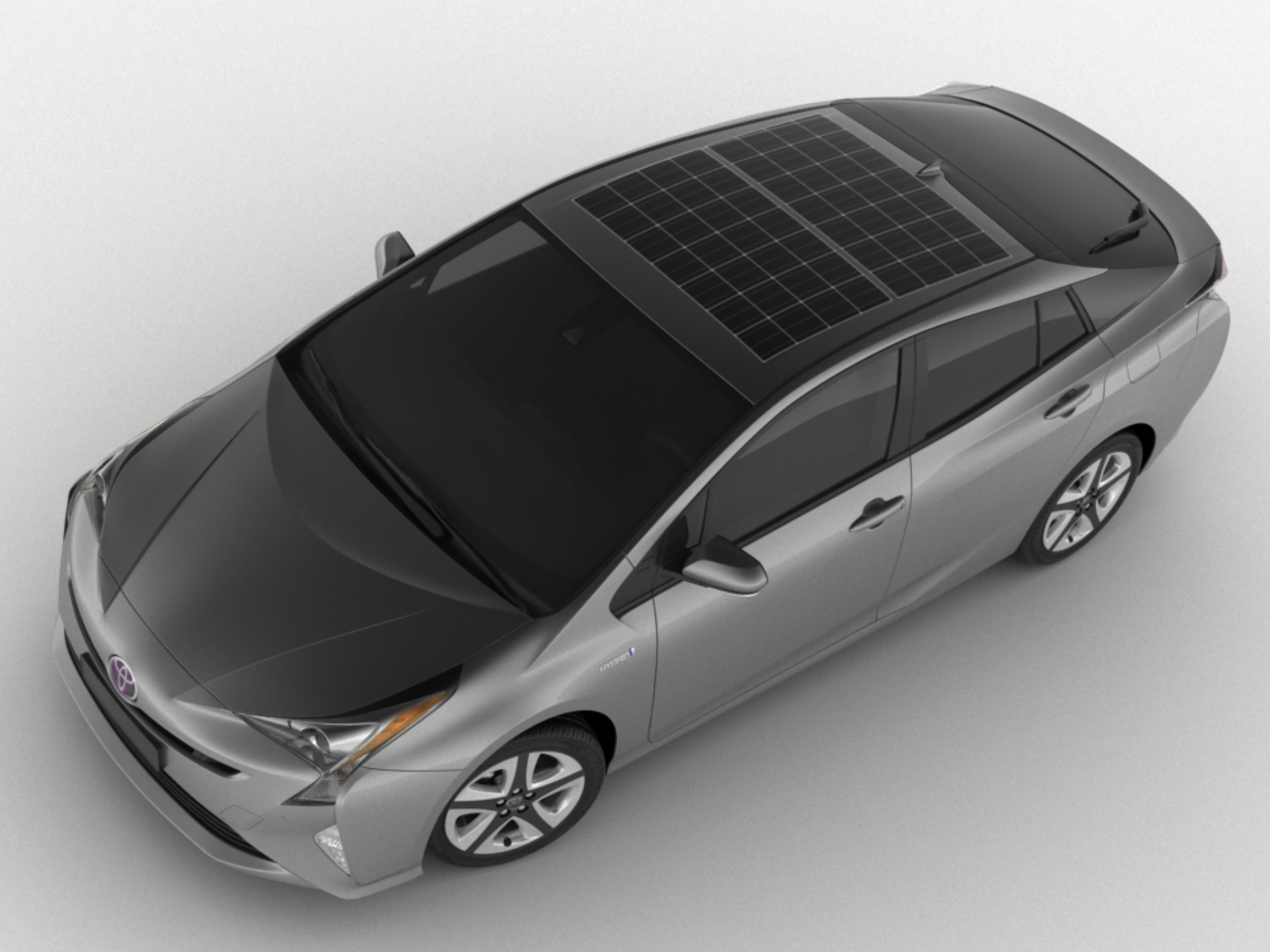
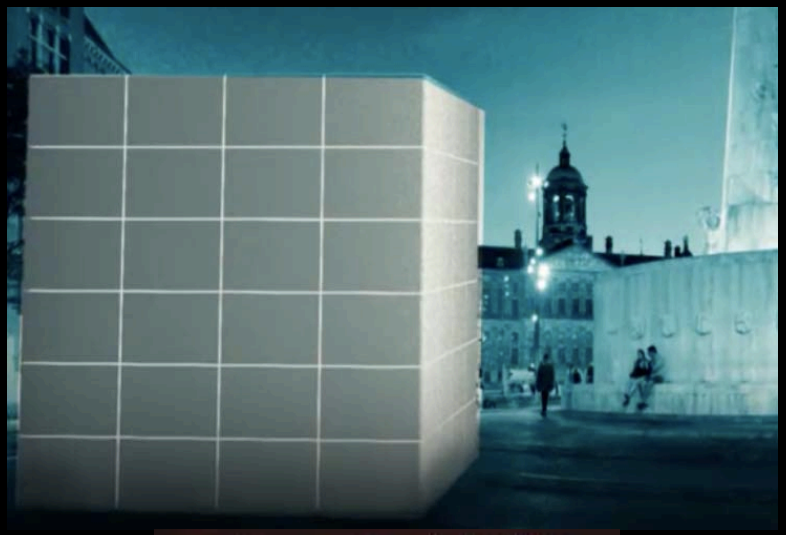


# Technology and Art

**An emotional experience**



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# Thank you for your attention!

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