Solar Installations in the SOLARISE project
WP4

Hugo de Moor — Avans University
Tiny Maenhout & Ronald de Bruijn — Middelburg

Avans University of Applied Sciences

- Grid of the Future Technology and business models
  - Heat and Electricity supply, storage and use
  - E-mobility
- Solar
  - Application of Solar Foils

Close contacts with:
Solliance (Thin-Film) and SEAC (Buildings) (TNO-IMEC-Uni's)

Role in Solarise:

- Observing Partner Supporting Middelburg with background research

Outline

Introduction on WP4

General Considerations for PV in the built Environment

PV Installations in WP4

WP4 Demonstration projects Solar + (Storage)

Objective of Solarise:

Facilitate the large-scale deployment of solar electricity/heat generation

WP4 Demonstrations

- Historical/public buildings
- Low-income Housing
- Solar Farm

PV on and near Buildings

PV requires considerable surface area

⇒ Use surfaces already available

- buildings: roofs, facades
- road infrastructure: sound barriers, pavement, parking lots

land (temporarily) not in use

- waste dump
- close to industrial sites
- water

PV area available

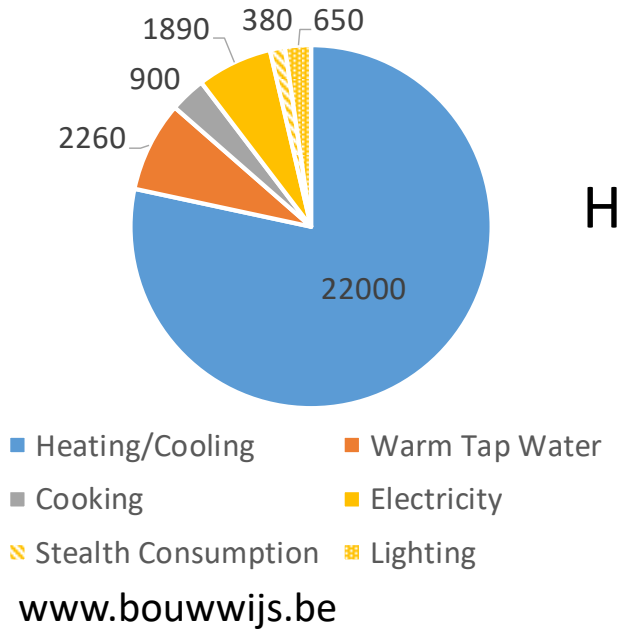
Typical NL Social Housing

5 m width, 10 m deep, 30º roof

$\Rightarrow$ 29 m^2

150 kWh/m^2 = 4300 kWh/a

Typical Household 3000-4000 kWh/a



www.bouwwijs.be

Heat Demand is dominant

PV area needed

> 2050
100% RE

+

++ Wind

Biomass

++

and seasonal storage

More surface area
Higher efficiency PVT?

Saving potential E: 30 – 50%

But

Increase in E-demand
Heat and Transport (E-Car)

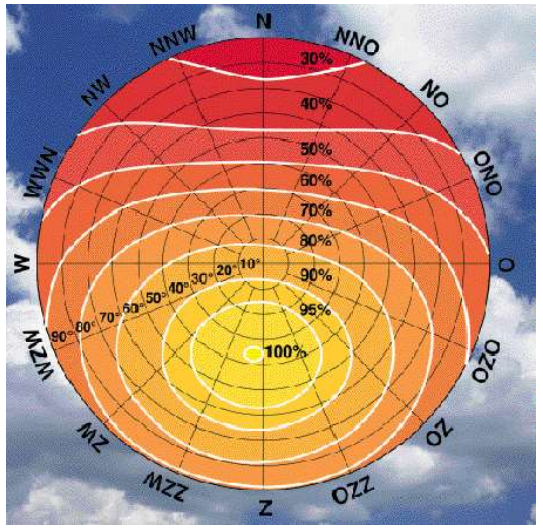
PV on Buildings

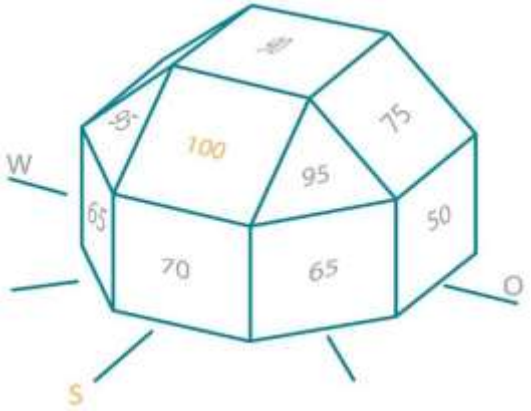
Roof

Facade

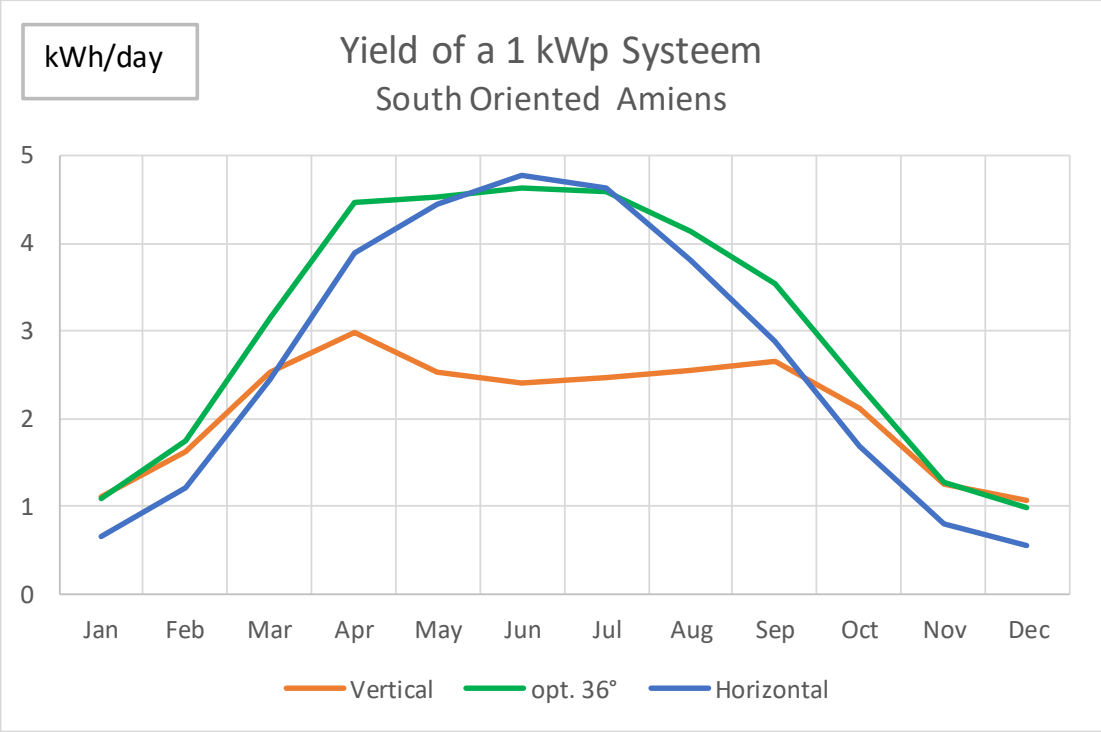
Parapet

Sun protection





PV Yield

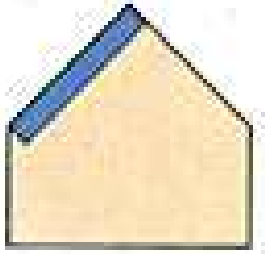


Daily Irradiation	Wh/m2/day		
	Horizontal	Optimal	Vertical
Gent	2970	3420	2400
Amiens	3120	3580	2480
Portsmouth	3220	3800	2690
Heerhugowaard	3000	3510	2490

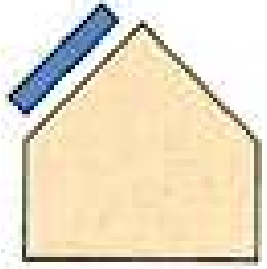
PV on Buildings BIPV and BAPV

EN 50583-1

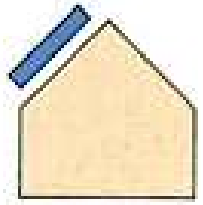
BIPV Building Integrated PV
Construction product providing a function as defined in
the European Construction Product Regulation CPR 305/2011



BAPV Building Attached PV
Modules mounted on a building envelope
not fulfilling a function



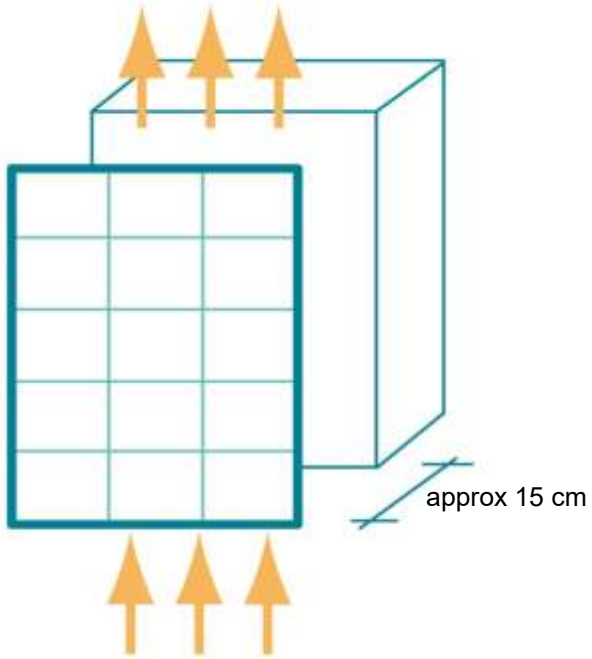
PV on Buildings BIPV and BAPV



Properties	BIPV	BAPV
Esthetics	++	0
Costs	--	+
Material Use	0	--
Wind	+	-
Rain	-	+
Humidity	-	+
Fire Safety	-	+
Heat	--	-
Mass Production	--	+

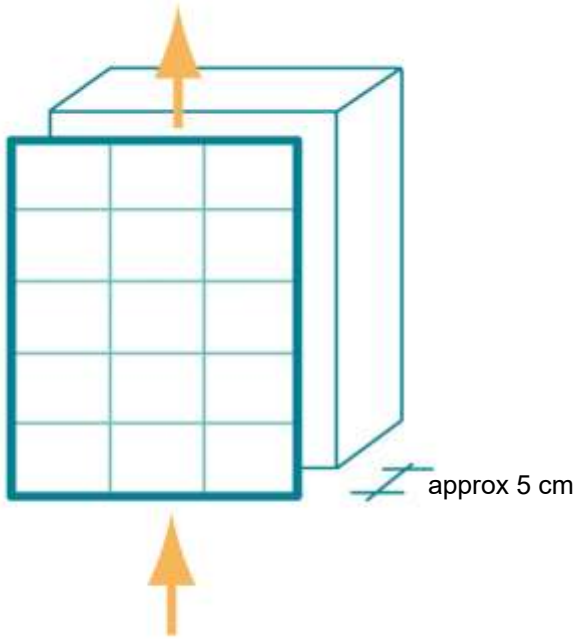
PV on Buildings Temperature Loss

Well ventilated



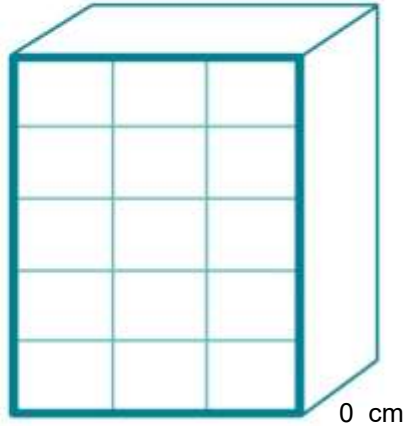
No temperature loss

Poorly ventilated



approx 5% temperature loss

not ventilated



approx 10% temperature loss

PV on Buildings

Sloped Roofs

Facade

Overhead Glazing

Flat Roof

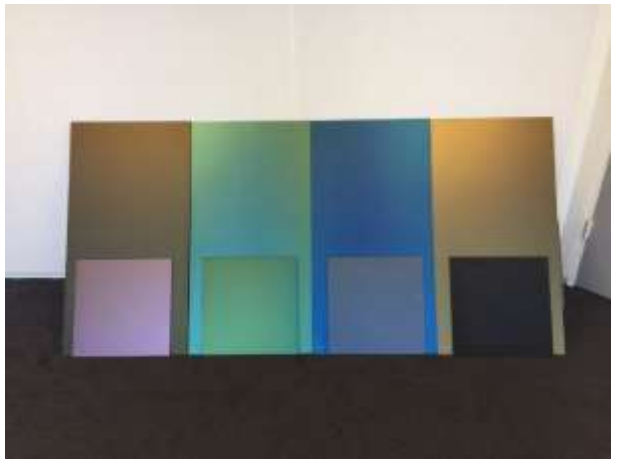
PV on Historical Buildings

Invisibility from the streets is often required (Unesco World Heritage)
=> Flat roof systems, (“invisible” PV on roof tiles, slates)

PV on Historical Buildings

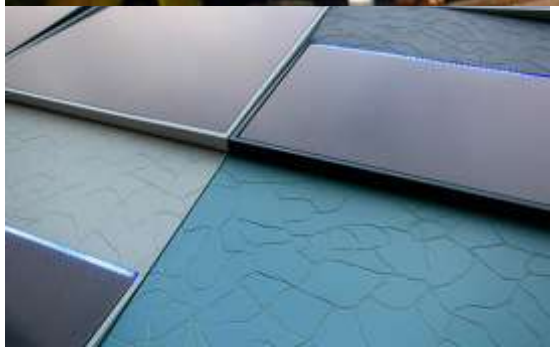
Roof Tiles and slates were PV is hardly visible

PV on Buildings Special Modules


If only esthetical integration is needed
=> Special modules

Special PV on Buildings



Solarix façade Kuijpers Installatie Helmond

PV can also surprise you

PV and road infrastructure

Sound barrier

Solar Road

Bus Lane

Parking Shed

High Speed Train

PV on “useless” land and water

Zonneberg Waste Dump

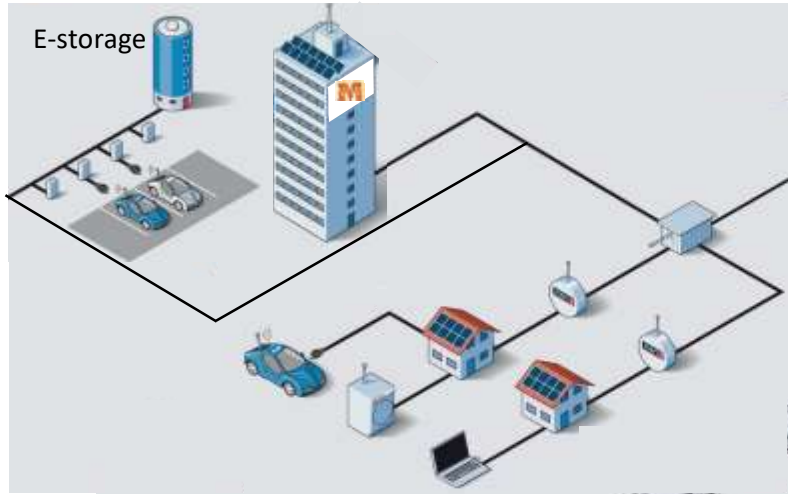
HH’waard Industrial area

Solar on water

Storage

PV → Grid

PV → Grid + Storage



Conventional: Grid as virtual storage

Future: Low-cost storage to control PV-supply and demand

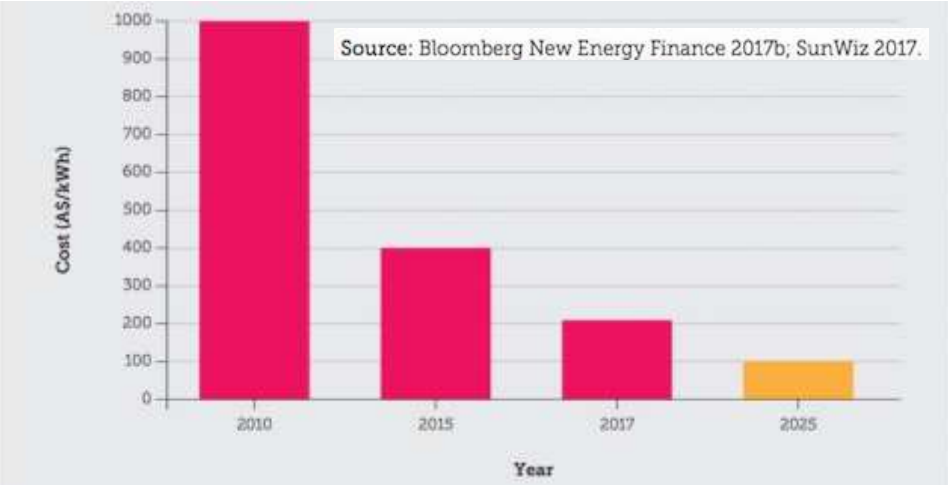
Storage

Why Storage?

- Needed to stabilize the grid (RE-sources)
  - Peak Shaving (local)
  - Grid Balancing (Regional-National)

- It becomes affordable

Storage



Cost Reduction !

Home Battery
5 – 15 kWh
0,5-1,5 day

Car Battery
40 kWh
V2G

WP4 Installations Fourmies

Approved
Designed

2 other pilots to be defined by the feasibility study

Fourmies Louis Aragon elementary school

WP4 Installations Fourmies

Fourmies Louis Aragon elementary school

420 m^2 PV
97 kWp 396 Modules
High Quality Mono (Black)
9x18 and 9x26
Roof Integrated
85 MWh to the grid

Investor: Municipality
137 k€
Status: Approved
Start: Jan. 2020 PV
Grid Connection: Spring 2020

WP4 Installations Zoersel

Zoersel Village Hal

Historic Pastorium
Thermal solar roof tiles
8.7 MWh/year

Village Hal new
Solar-air absorber
15.6 MWh/year

Thermal system connected to ice storage; source for water-water Heat Pump

Investor: Municipality
110 k€
Status: Budget Approved
Start: Oct. 2019
Finished: Nov. 2020

WP4 Installations Zoersel

Thermoslate

xample

WP4 Installations Brighton Hove

Now:

Solar only feeds the communal (landlord) supply Tenants receive very little direct benefit

Objective:

To give the benefits of solar to tenants and leaseholders within these flats.

Options:

1 Offer rooftop generated solar electricity at a 'hyper local' tariff to residents within the block
2 Multi-arrays directy going to consumer units in each flat
3 Battery storage to maximise communal electricity consumption, reducing service charges.
4 PVT Heat and Electricity reduce running costs in seniors accommodation
5 Renewable heating – utilising solar PV to run heat pumps in order to reduce heating costs

WP4 Installations Brighton Hove

3 Housing blocks across Brighton & Hove

Total budget k€200
Options appraisal back: May 2019
Pilot models selected: June 2019
Installation completed: Dec 2019

All investment will be retrofitted on blocks of multiple occupancy (i.e. flats or seniors accommodation).

Details will depend on site specific requirements and the pilot proposed.

WP4 Installations Middelburg

Archives of Zeeland (Zeeuws Archief)

500 m2 Roof
60 kWp
50 kWh/year
Light weight Black PV panels
Batteries for peak shaving 30 kWh
Self consumption + neighbouring buildings

Total budget k€150

Budget Approval	2019
Start of construction	2020
Connection to the grid	2020

WP4 Installations Middelburg

De Helm

De Helm replacement of Slates

Other projects will depend on budget and building permits

- Solar wall
- Cold Façade
- Sound Barrier (Railway station)

All projects will aim at self consumption and charge points for bicycles and cell phones

Solar Farm Heerhugowaard

9,4 MWp
8,9 GWh/year
0,1 km^2
System in operation

Heerhugowaard Solar Farm de Vaandel

Investment of Ecorus ≈ 5 M€ not part of Solarise

Thank you for your attention