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EUROPEAN UNION
2 Seas Mers Zeeën
SOLARISE
European Regional Development Fund

Low-carbon technologies

TOTAL PROJECT BUDGET: 4.35 M €

INCLUDING AN ERDF BUDGET OF: 2.61 M €

Application and Integration of PV in the Built Environment

Hugo de Moor Avans University

www.interregsolarise.eu

Outline

Energy Transition Challenges

Role of PV

Integration in the built environment

Examples in Solarise WP4

Energy Transition

Joint Effort of:

- SME's — Technical Expertise e.g. Installation
- Municipalities — Connect, Support
- Citizens — Owners, Tenants
- Education & Research

Interreg Projects

- Solarise — Application, Value Creation
- Terts — Shop owners, Bars
- Rhedcoop — Connecting stakeholders

etcetera

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Interreg Projects of Middelburg

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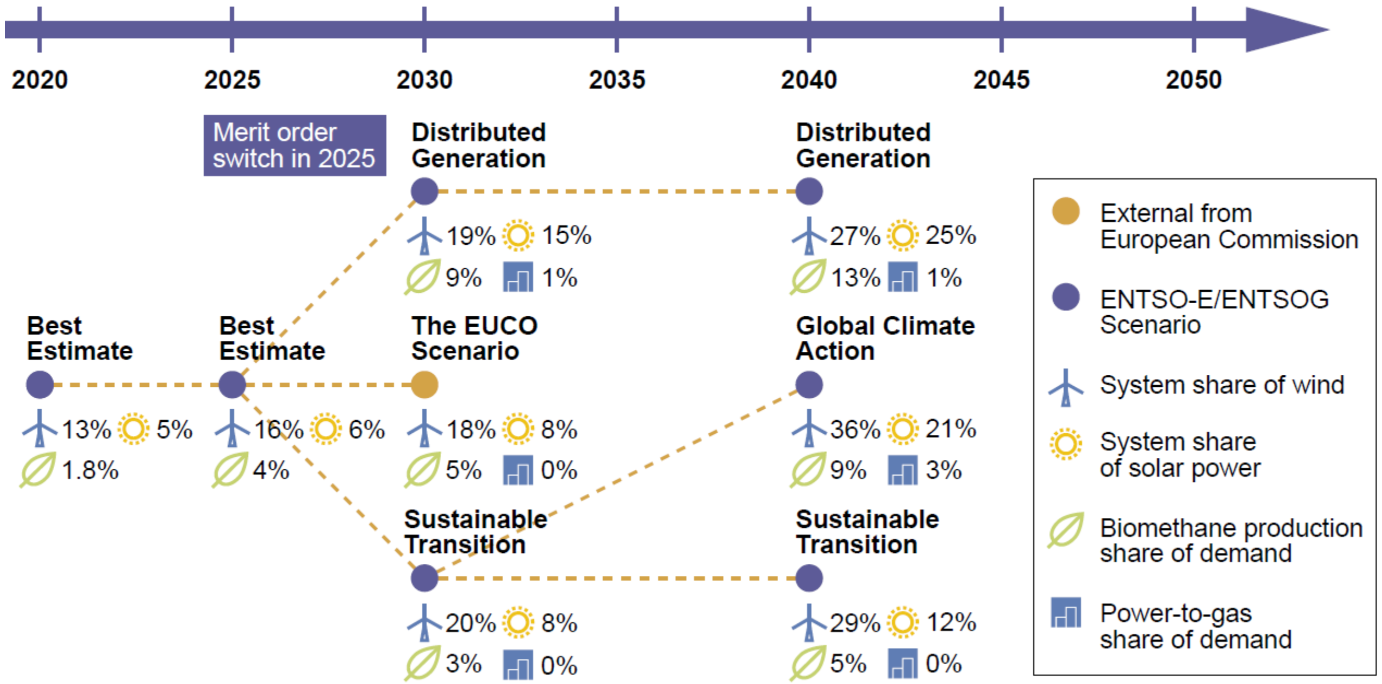
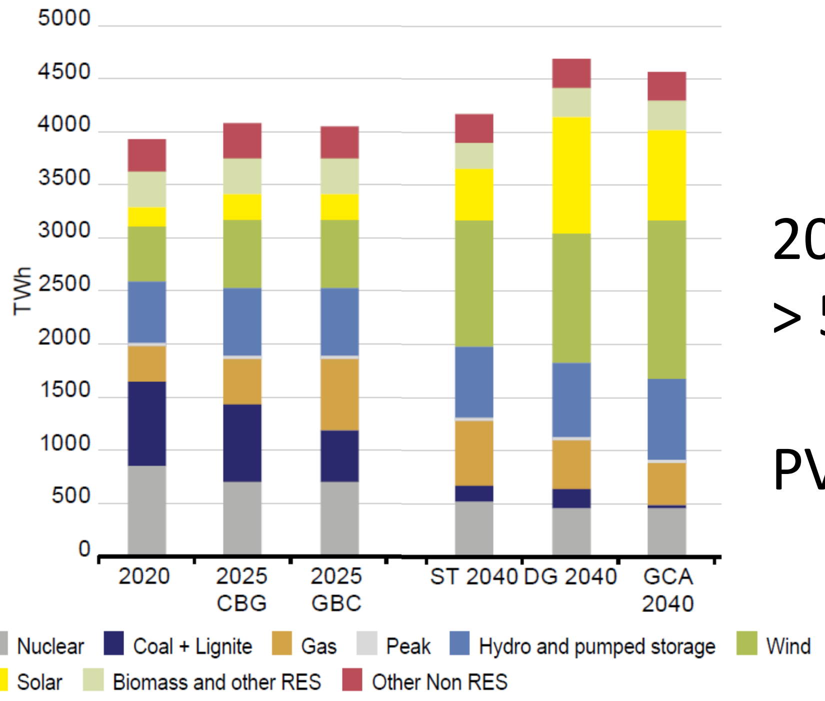
Role of Renewable Energy Systems (RES)

RES Share of demand for electricity and gas





2040
\> 50% RES

PV growth >>

Scenario's Entso-e/g (EU grid operators) 2018

PV Significant Implementation Challenge

PV requires considerable surface area

$\Rightarrow$ 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

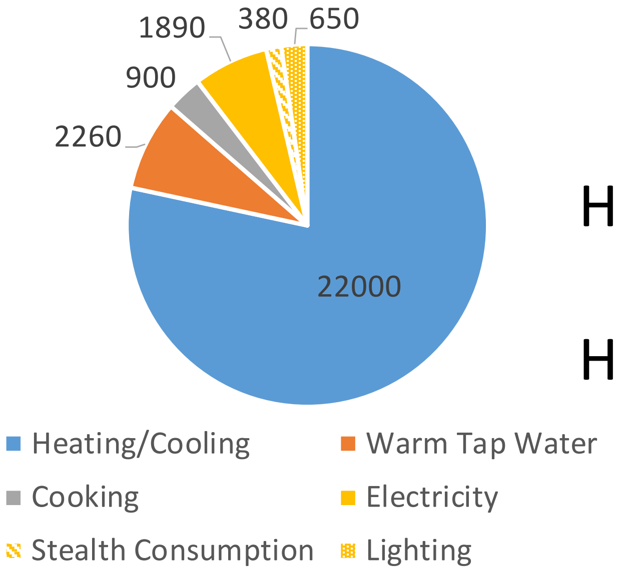
Typical NL Social Housing

5 m width, 10 m deep, 30º roof

$\Rightarrow$ 30 m^2

150 kWh/m^2 = 4500 kWh/a

Typical Household 3000-4000 kWh/a

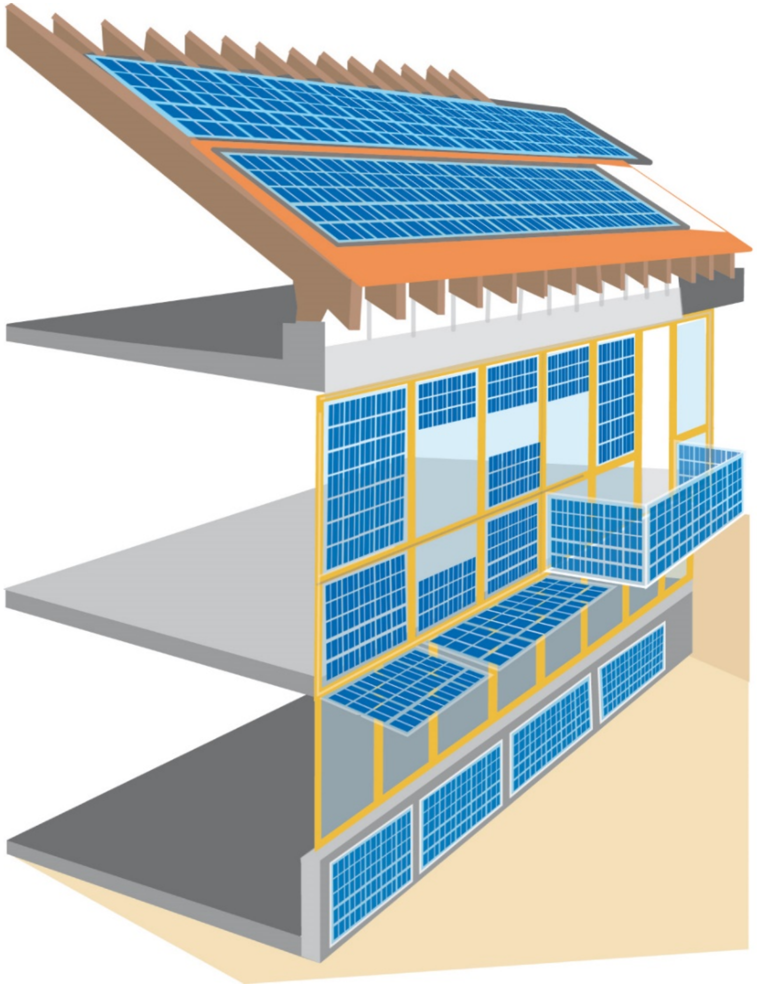


www.bouwwijs.be

Heat Demand is dominant

Heat Pump: Gas -> E

PV on Buildings

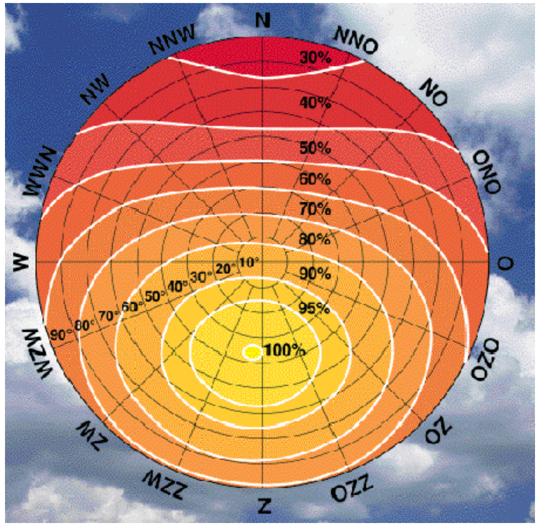


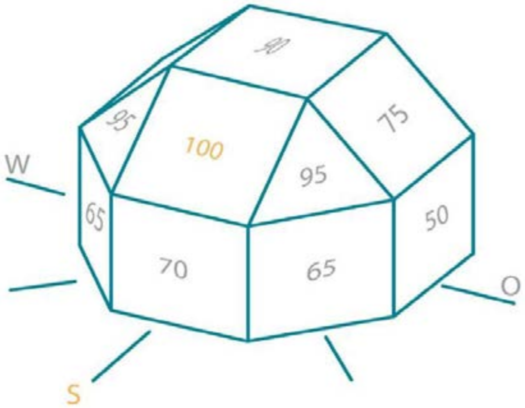
Roof

Facade

Parapet

Sun protection





PV on Buildings

Sloped Roofs

Facade

Overhead Glazing

Flat Roof

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PV on Historical Buildings

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

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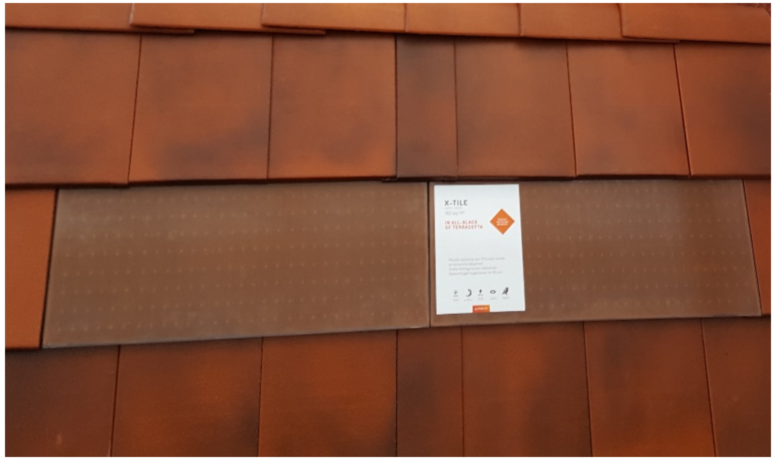
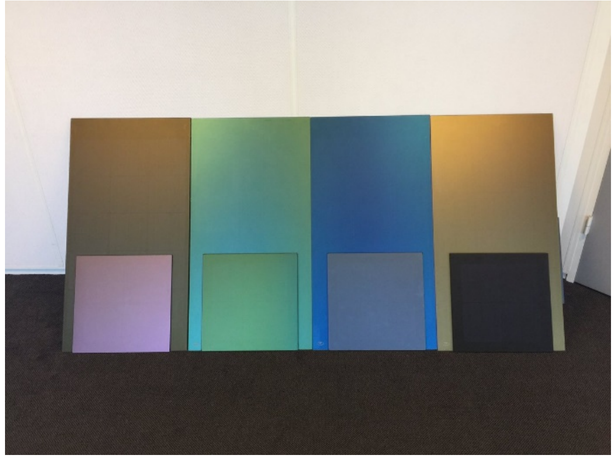
PV on Historical Buildings



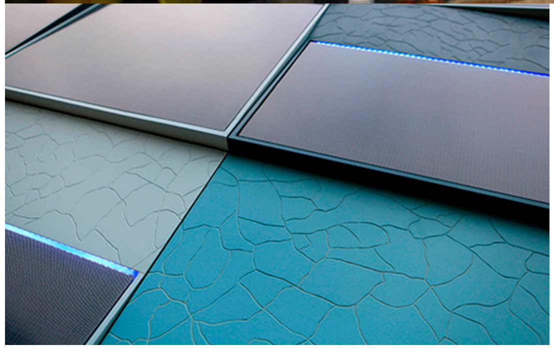
Roof Tiles and slates were PV is hardly visible

PV on Buildings Special Modules



If only esthetical integration is needed
=> Special modules

Special PV on Buildings



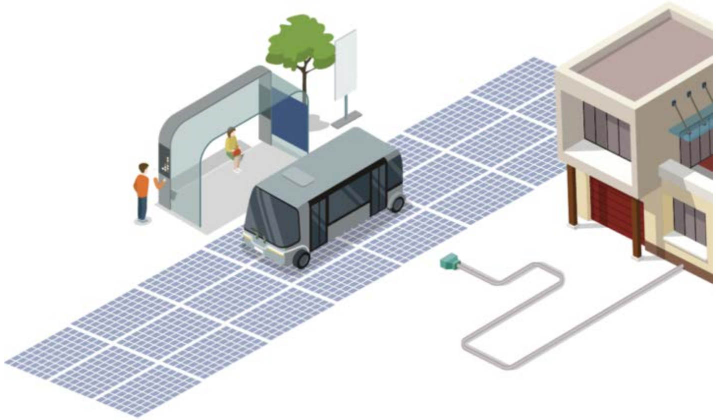
Solarix façade   Kuijpers Installatie Helmond

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

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
- Living Labs: Solar Energy, Storage, smart grids

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

Historic Pastorium
Thermal solar roof tiles
8.7 MWh/year

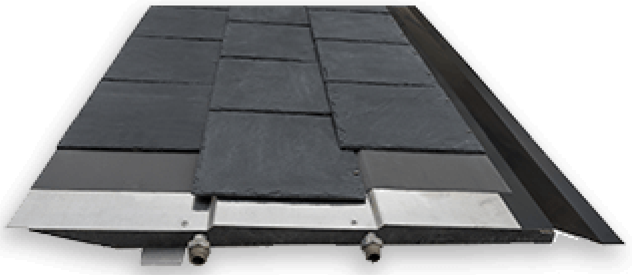
Village Hal new
Solar-air absorber
15.6 MWh/year

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

Investor: Municipality 110 k€
Status: Budget Approved
Permit: not granted yet
Start: Dec. 2019
Finished: Dec. 2020

Zoersel Village Hal

WP4 Installations Zoersel



Thermoslate

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 directly 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

More information in the next presentation of Kirsten Firth and Dan Goodchild

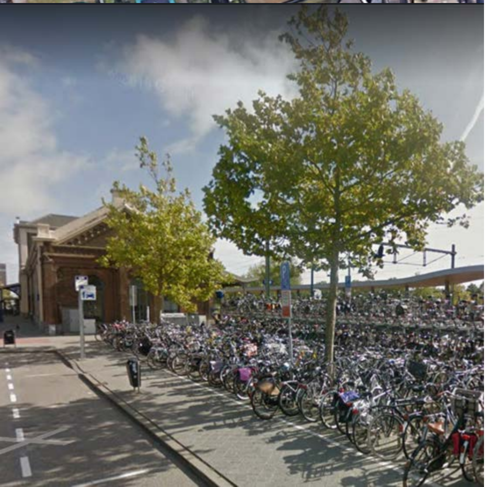
WP4 Installations Middelburg

Many buildings have been reviewed…









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WP4 Installations Middelburg

Now School and Neo-Medieval City Offices
Later presentation of Menno van den Donker 14:20

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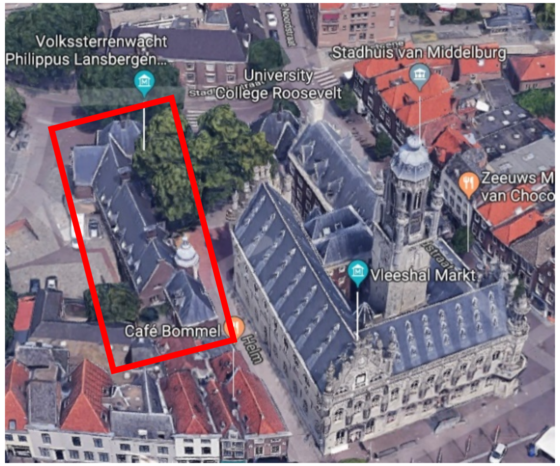
De Helm



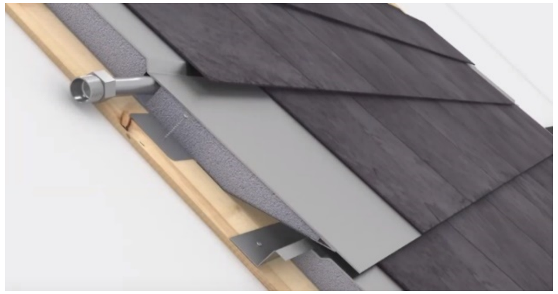
Objective:

Demonstrate that solar energy can be harvested in a historical city centre

- Aesthetics
- Yield vs Costs

- De Helm: Thermal system under the Slates

Q-Roof



Thermoslate

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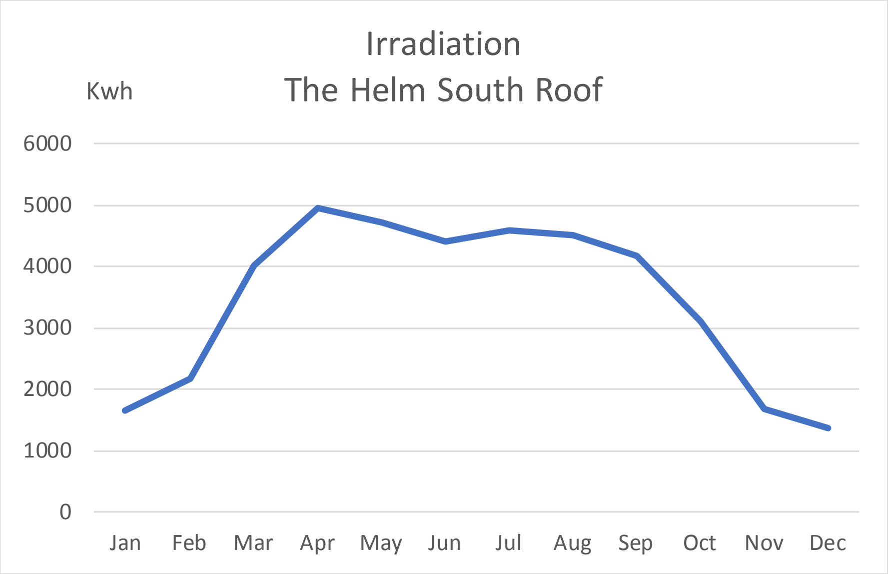
De Helm

Approval by the building regulation Committee (WARK)

Measuring the yield

Evaluation of the building process

Slope: 70°
Orientation: (South 3° towards east)
Surface area: 34 m^2



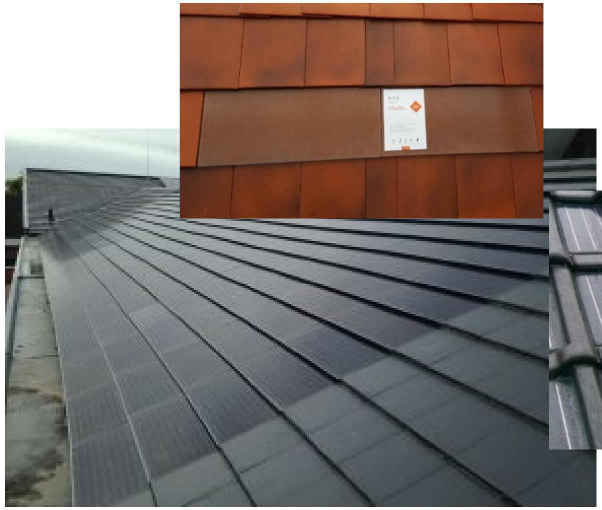
WP4 Installations Middelburg

School UCR

Objective:

Demonstrate that PV can be attractive near a historical city centre

- Aesthetics
- Yield vs Costs



Exasun

ZEP Tiles

Han-Tiles

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WP4 Installations Middelburg

School UCR

Approval by the building regulation Committee (WARK)

Measuring the yield

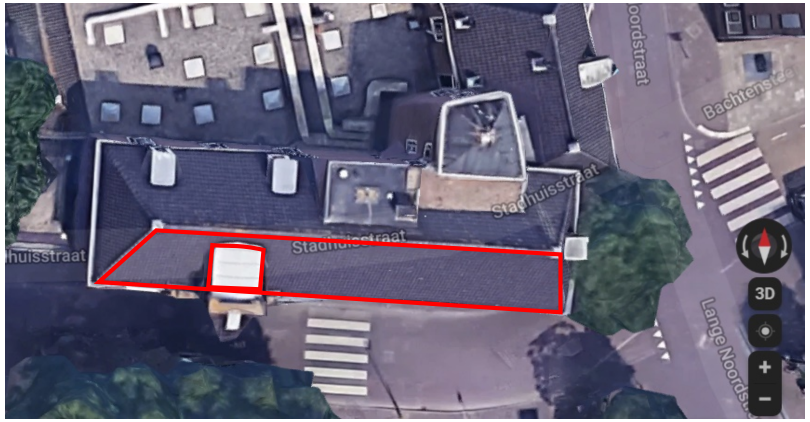
Use the elektricity with storage and grid connection in a local DC-grid

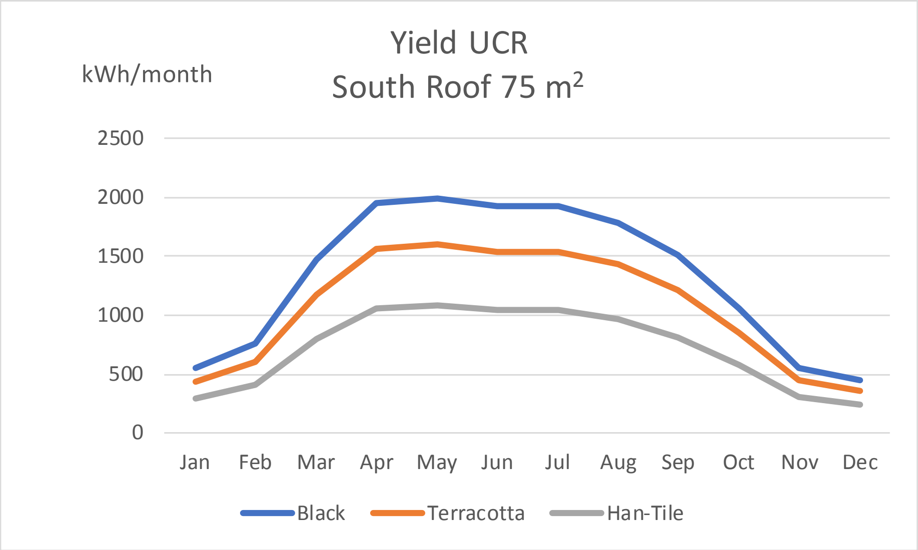
Charging e-bikes, smart phones etc.   Connection with SEND-Lab Avans

Slope: 40°

Orientation: (South 4° towards west)

Surface area: 75 m^2





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Solar Farm Heerhugowaard

9,6 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

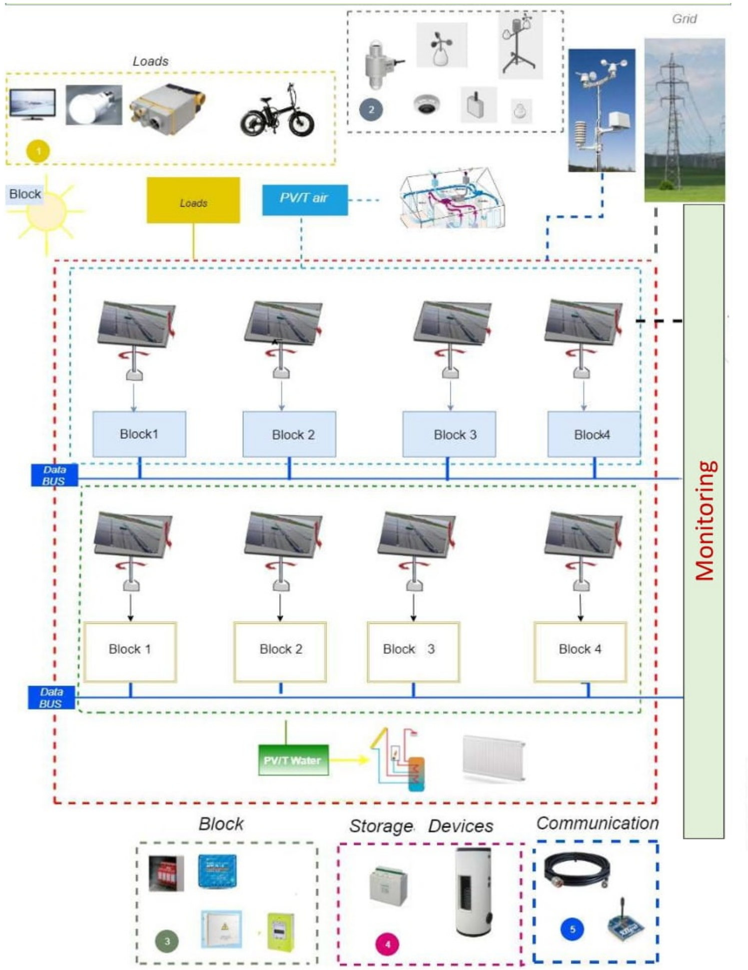
WP4 Living Lab

Amiens: Sollab PV/T Panels

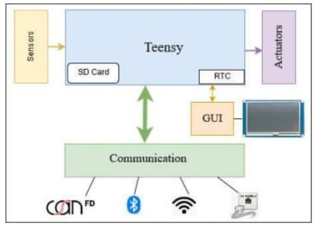
Consultation to select the installer: November 2019
Start of the building work: January 2020
Start of the solar installation: March 2020

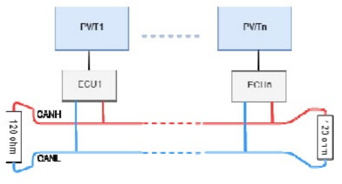
SOLLAB includes ioT blocks for PV/T's, storage, MPPT, smart measurements and IT communication through CAN Bus and web connection. Most tools are 'homemade' using low cost and open source materials and software. The next step is the installation implementation and exploitation of the *SOLLAB* as an open cyber physical solar energy platform with web-access for supervision, control and monitoring.

Presented at EU-PVSEC 2019 in Marseille



In this figure describing *SOLLAB*, each PV/T has a block which consists of a board based on Teensy 3.5 microcontroller that has native RTC for real time, an SD card for data storage, Can Bus controller, analog as well as digital inputs/outputs. We measure currents, voltages, temperatures, orientation, flow rates to control the hybrid panels. The communication uses different technologies as shown in the following figures:





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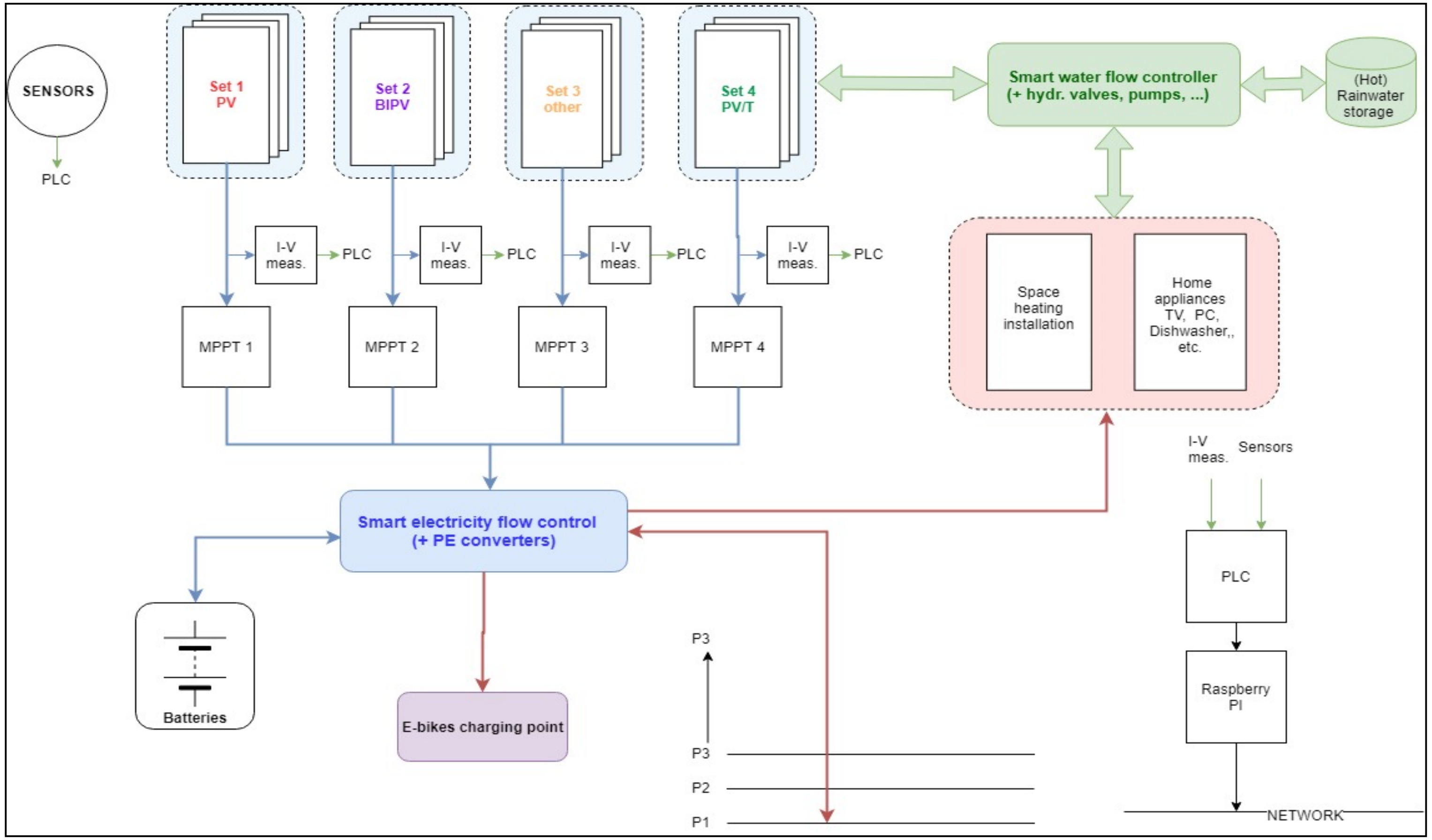
WP4 Living Lab

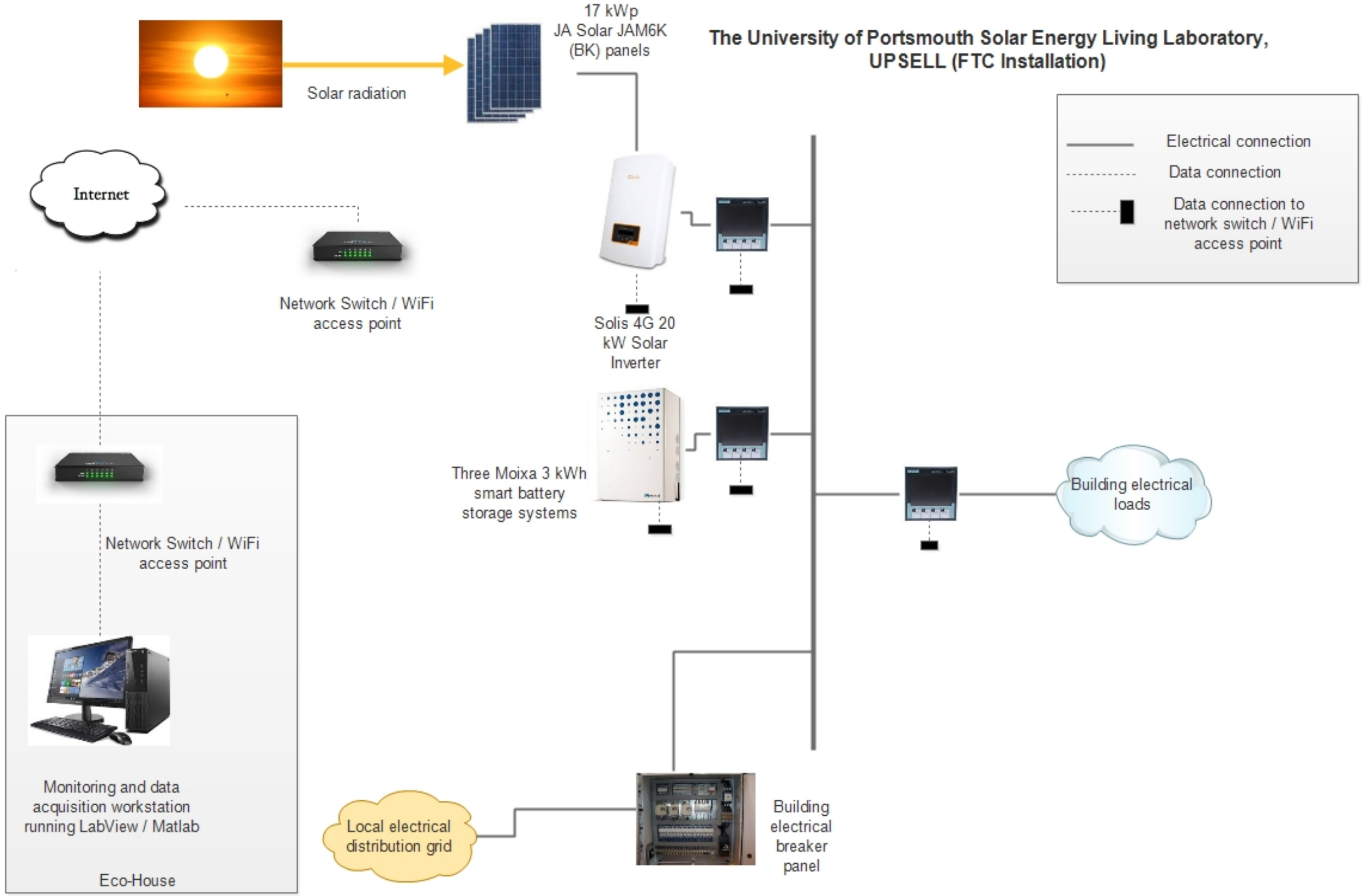
Gent: 5 kWp PV, PVT, Innovative Solar Energy

Construction started: Sept. 2019
Planned Opening: 13 nov. 2019



WP4 Living Lab

Portsmouth: UPSELL PV and Storage
2 Buildings: Eco-House
Future Technolgy Centre



Thank you for your attention