PV GLASS

DESCRIPTION

Amorphous silicon photovoltaic glass (a-SI PV glass) features a combination of functionality, efficiency and aesthetics. This material can be the perfect substitute for conventional architectural glass placed in buildings offering the same mechanical properties. In addition, it also generates free clean on site energy (active solar properties). PV glass panes physical features such as their shape, colour, size, thickness and grade of transparency can be all customized to meet the requirements of the projects in which they will be used. PV glass is in compliance with all international safety standards when used in construction for architectural purposes.

INDICATORS

POTENTIAL DEGREE OF USEFULNESS

100%

Already demonstrated in Lighthouse cities Yes

Cultural heritage compliance Yes

PERFORMANCE

Visual Light Transmission Dark, 10%, 20%, 30% and no obstructed views.

Efficiency 2.8% - 5.76%

Greater energy production (kWh) at the same installed power (kWp).

Better behaviour under the presence of shadows/overcast

Low temperature coefficient (better performance under high temperature)

COST

From 200 to 225 €/m^2 (only considered the PV glass)

DIMENSION

Double laminated PV glass: maximum dimension 1245x635 mm

Triple laminated PV glass: from 1245x635 mm to 4000x2000mm

TIME

35 years of life spam

SAFETY

Manufactured according to the architectural glass standard requirements

Manufactured according to the PV standard requirements

SUSTAINABILITY

Multifunctional constructive material

Energy generation on site

KEY REQUIREMENTS

This type of BIPV solution could be used replacing fixed planes of glass on the existing buildings or as a double skin enhancing the hygrothermal behaviour of the building envelope. It should be taking into account:

- Maximum dimensions must not exceed 1245x635mm (in any of the dimensions),
- For bigger dimensions is necessary to develop a triple laminated glass, for example 2000x1000mm.

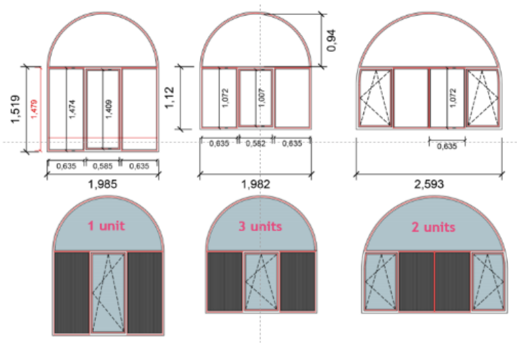
ENVISAGED DEMONSTRATION IN POCITYF

LOCATION

Escola Basica 1º Ciclo de São Mamede. H3FV+P2 Évora, Portugal (38°34'27.4"N 7°54'26.7"W)

TIMELINE

Permanent; at least until 2024 analysing the impact of solutions implemented



DETAILS

The conventional glass of the six windows showed on the previous point, located on the court yard elevation, will be replaced partially with a-SI PV glass with a 20% of transparency. Due to the dimensions of the current glass panes, the PV solution will be based on a triple laminated glass, with the same dimensions of the existing ones. A total of 12 units will be implemented with the following dimensions and power:

- 10 units of 1072x635 mm with 23Wp/unit
- 2 units of 1474x635 mm with 32 Wp/unit

The total power installed reach 294 Wp.

TARGETED OUTPUT

It is estimated that the installation will generate 261 kW per year. This means in 35 years of life spam: 9,135 kWh of electricity generated and 3 Tn avoided emissions of CO_2.

IMPACT ON COMMUNITY

There are not direct impacts on the citizens. The installation will be located in an inner area on the building only accessible to regular school users. Also, the small dimensions of this installation (8,68 m²) drives this demonstrative to a real example of PV glass integration on historical buildings, but measure the improvement of the energy performance will be not possible, due to it is not representative as a refurbishment.

CULTURAL HERITAGE BUILDINGS COMPLIANT

The assessment categories proposed by the standard UNI EN 16883:2017 - Conservation of cultural heritage - Guidelines for improving the energy performance of historic buildings, have been considered. The evaluation scheme considers the following categories: 1. Technical compatibility; 2. Heritage significance of the building and its settings; 3. Economic viability; 4. Energy; 5. Indoor environmental quality; 6. Impact on the outdoor environment; 7. Aspects of use. All this points could be improved by the use of PV glass. For this type of solution, the main aspects to consider are related to the Technical compatibility. Due to the fact that the PV solution is based on glass, and will replace the current glass solution, the system will comply with the requirements in terms of: hydrothermal risk, structural risk, waterproof, fire safety design and installation, connections and also reversibility of the solution. Also is remarkable that this type of solution will comply with the Heritage significance by the absence of visual, spatial or material impact. On the other hand, this is a multifunctional solution that enhance the traditional constructive solution by improving the solar filter of the glass (linked with the IE quality) and generating energy on site linked with Economic viability, Energy performance and the impact on the outdoor environment).

ETT1 - POSITIVE ENERGY (stand-alone) Buildings

2nd life batteries

betteries

DESCRIPTION

Residential homes are being equipped with 2nd life modular and mobile battery systems to store power from PV system installed on the roof. The fully digitized battery systems re-use li-ion battery modules from electric vehicles (EV), extending the productive life of EV battery modules up to another 7 years. The battery system is made up of two standardized stacks of 2nd life battery modules (7 modules per stack including BMS) and a master battery management unit (managing the stacks and providing all necessary external communication functionality via GSM and WIFI to the betteries cloud). In addition, the battery system includes an HMI module for indication and can be configured, if necessary, with additional external ventilation and / or cooling system for operation in hot environmental conditions.

INDICATORS

POTENTIAL DEGREE OF USEFULNESS

23% energy savings' share on annual consumption

Already demonstrated in Lighthouse cities Yes

Cultural heritage compliance No

PERFORMANCE

Nominal battery capacity 4,500 Wh

Useable battery capacity 3,600 Wh

Non-operating temperature: -20 to +50°C
ambient operation temperature: 10 to +40°C

COST

190-290€/kWh depending on configuration

DIMENSION

758 x 700 x 700 mm

100 kg per cabinet

TIME

Cycle lifetime: 1,500 cycles

Calendric lifetime: 7 years

SAFETY

Safety critical parts pre-tested and evaluated in accordance with all applicable safety standards, i.e. CE, UN 38.3. etc.

SUSTAINABILITY

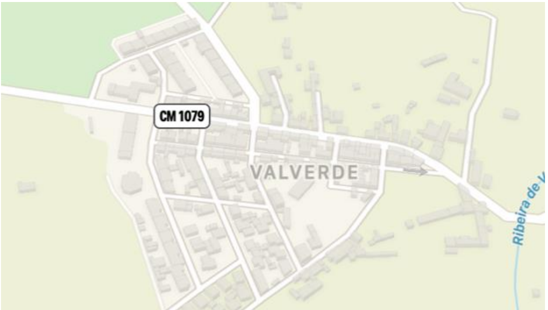
2nd life EV (electric vehicle) batteries

Avoids 34k g CO_2 emissions per kWh in comparison to usage of 1st life li-ion batteries for storage

KEY REQUIREMENTS

The battery systems serve as integral energy storage device of a residential PV system. As such, sizing of the storage system needs to be optimized under consideration of available PV power (roof top area) and daily demand of the residential home to optimize the amount of self-consumption vs storage cost.

ENVISAGED DEMONSTRATION IN POCITYF



LOCATION

The solution will be installed in 10 residential homes in Valverde village, Évora, Portugal.

TIMELINE

The installations are scheduled to be fully installed by May 2022.

DETAILS

The picture on the left shows typical residential homes incorporation the PV system. PV installations are rather small 3-4kWp (the picture shows a 1.5kWp system).

Given on the space constraints of these buildings the typical installation of the battery storage system in a room with moderate ambient temperatures (e.g., in the basement) may not be possible, hence the storage system can be configured with an optional passive or active cooling system to allow e.g. installation under the roof.

TARGETED OUTPUT

If a PV system is combined with a battery storage system, the usage of (grey) electricity from the electricity grid can be substantially reduced despite the intermittent nature of solar energy production. In addition, using cheaper 2nd life battery storage instead of new Li-ion batteries improves the economics for such PV + Storage systems, in particular, for small PV systems.

Furthermore, by extending the productive usage of an EV battery by another 7 years through a 2nd life application, the CO_2 footprint of e-mobility can be reduced by up to 30%, as the CO_2 emissions to produce the battery are shared over a longer productive life.

IMPACT ON COMMUNITY

Residents using the batteries for storing PV-power from their roof in combination with the microgrid controller platform will benefit from a global energy efficiency improvement of 10%.

PV CANOPY

DESCRIPTION

A photovoltaic canopy offers energy generation, sun protection and shelter. Depending on the type of canopy, the electricity yielded can be consumed in different ways: self-consumption for surrounding buildings, courtesy lighting, ad-box illumination, back-up systems, as well as injection to the grid. Design options are almost unlimited: one, two or multiple slopes, different tilts and orientations, multiple glass design options (silk-screening, ceramic frits, colours, etc.) PV glass on canopies can be supported using a variety of structural systems, including point-supported systems, U channels and skylight-like structures.

INDICATORS

POTENTIAL DEGREE OF USEFULNESS

100%

Already demonstrated in Lighthouse cities **Yes**

Cultural heritage compliance Yes

PERFORMANCE

Crystalline silicon glass can be easily customized, especially in terms of shape, even trapezoids can be fabricated without difficulty using this technology.

Greater nominal power capacity per m^2 (Wp/ m^2).

Crystalline silicon glass installations take up less area for a given amount of kWp to be reached compared to amorphous silicon glass installations.

Crystalline Silicon glass’ efficiency can go up to 16%.

COST

From 240 €/m^2 to 280 €/m^2

(only considered the PV glass)

DIMENSION

Adapted to the project (customised solution)

Maximum dimension 4000x2000mm

TIME

35 years of life spam

SAFETY

Manufactured according to the architectural glass standard requirements

Manufactured according to the PV standard requirements

SUSTAINABILITY

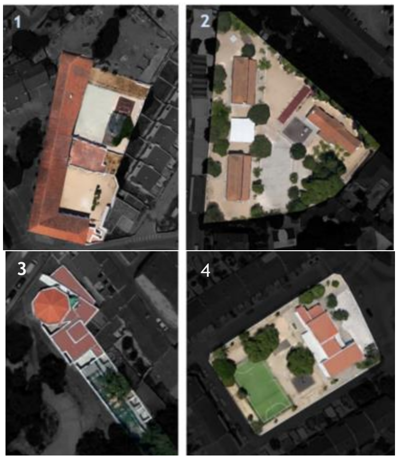
Energy generation on site

Possibility of be linked to E.movility

KEY REQUIREMENTS

The most critical aspect to consider for the use in Historical Areas is linked to the visual impact on the surrounding area. Also should be taking into account how will be managed the energy production in order to be aligned with the local energy infrastructures.

ENVISAGED DEMONSTRATION IN POCITYF

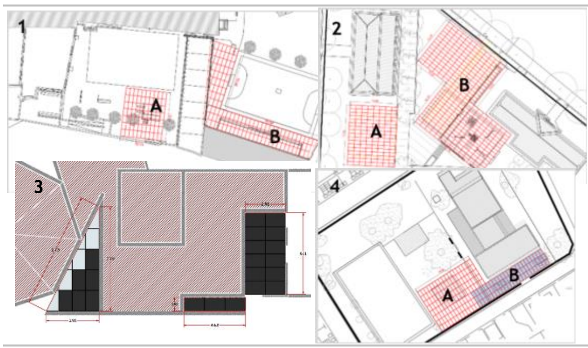


LOCATION

1. Escola Basica 1º Ciclo de São Mamede. Évora, Portugal (38°34'27.4"N 7°54'26.7"W)
2. *Escola do Rossio de S.Brás*. Évora, Portugal (38°33'59.0"N 7°54'20.9"W)
3. LVpDÉ *Centro Interpretativo*. Évora, Portugal (38°34'04.3"N 7°54'44.4"W)
4. Escola Basica Quinta da Vista Alegre. Évora, Portugal (38°34'38.1"N 7°55'13.0"W)

TIMELINE

Permanent; at least until 2024 analysing the impact of solutions implemented



DETAILS

Units installed: 925

Power per unit: 265 Wp, 212 Wp for site 3

Total power installed: 241,28 kWp

Surface covered: 1338,91 m^2

TARGETED OUTPUT

1. For São Mamede it is estimated that the installation will generate 65.104 kW per year. This means in 35 years of life spam: 2.276.645 kWh of electricity generated and 738 Tn avoided emissions of CO_2.
2. For *Rossio* it is estimated that the installation will generate 68.104 kW per year. This means in 35 years of life spam: 2.383.640 kWh of electricity generated and 773 Tn avoided emissions of CO_2.
3. For LVpDÉ it is estimated that the installation will generate 5.666 kW per year. This means in 35 years of life spam: 5.469.730 kWh of electricity generated and 1774 Tn avoided emissions of CO_2.
4. For Vista Alegre it is estimated that the installation will 156.278 kW per year. This means in 35 years of life spam: 198.310 kWh of electricity generated and 64 Tn avoided emissions of CO_2.

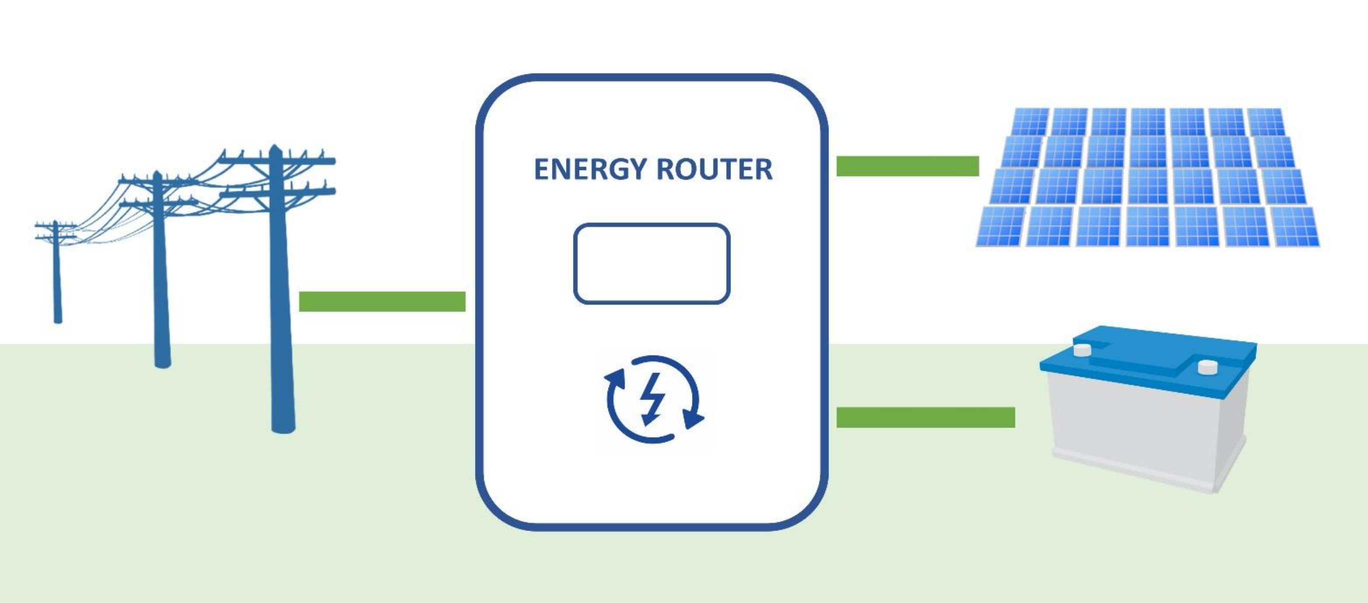
IMPACT ON COMMUNITY

On a context of a city centre, the aesthetical value of a constructive solution is a key factor. The perception of this kind of installations by the people determines in most cases the replicability of these solutions. The conventional PV modules based on glass-tedlar must be mounted over a metallic sheet, with a very low aesthetic value is not allowed for the Historical Heritage Cities. Also this solution with a high level of replicability, generate distributed points of energy production that constitutes a very good option of integration of renewable energy sources at district level.

CULTURAL HERITAGE BUILDINGS COMPLIANT

The assessment categories proposed by the standard UNI EN 16883:2017 - Conservation of cultural heritage - Guidelines for improving the energy performance of historic buildings, have been considered. The evaluation scheme considers: 1. Technical compatibility; 2. Heritage significance of the building and its settings; 3. Economic viability; 4. Energy; 5. Indoor environmental quality; 6. Impact on the outdoor environment; 7. Aspects of use. Due to the fact that the PV solution is based on glass, and will replace the current glass solution, the system will comply with the requirements in terms of: structural risk, waterproof, fire safety design and installation, connections and also reversibility of the solution. Also is remarkable that this type of solution will comply with the Heritage significance by the absence of visual or material impact. On the other hand, this is a multifunctional solution that enhance the traditional constructive solution by improving the solar filter of the glass (linked with the IE quality) and generating energy on site linked with Economic viability, Energy performance and the impact on the outdoor environment).

Energy Router



DESCRIPTION

The Energy Router is a power electronics device (single or multiphase), based on modular power electronics building blocks, that manages the energy transfer from/to different sources (distribution grid, RES-based distributed generators DGs), loads (directly connected to either AC or DC) and energy storage system. The Energy Router executes intelligent algorithms that assure the fulfilment of operation rules and that choose the best available option, providing energy services for, both, electrical grid and consumer. By managing the building's energy flux, the Energy Router is able to increase the building's self-consumption and decrease electricity costs.

INDICATORS

POTENTIAL DEGREE OF USEFULNESS

Context dependent

Already demonstrated in Lighthouse cities No

Cultural heritage compliance Yes

PERFORMANCE

Rated power: 10 kW/10 kVA at 400 V_{rms} 50 Hz

Operating Power Factor Range: 0.7 Lag to 0.7 Lead

THD: < 5%

SiC Mosfet technology for low switching losses.

COST

To be defined

DIMENSION

Size: (W x H x D): 300 mm x 500 mm x 200 mm

Weight: 70 kg

TIME

Installation time: 2h

Working time: 24h/per day

SAFETY

Insulation Class II (IEC 61140)

Watchdog timer

Monitoring and controlling capabilities

Local and remote emergency interruption

SUSTAINABILITY

Lead Free and RoHS Compliant

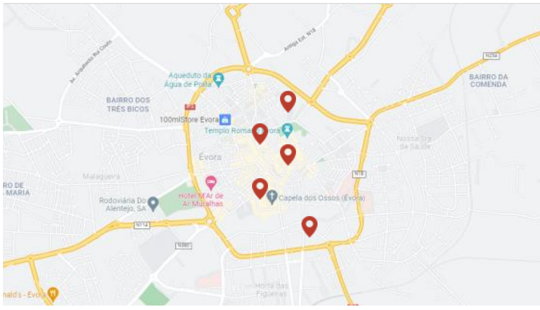
Promotes energy efficiency

High level of modularity to facilitate maintenance

KEY REQUIREMENTS

The installation of the Energy Router requires low-voltage three-phase power connection, PV system connectivity and ethernet (IEEE 802.3) or Wi-Fi (IEEE 802.11). An available space of 1 m^2 is needed to accommodate both Energy Router and energy storage system. For safety reasons, the contact with the Energy Router should not be allowed to buildings' users.

ENVISAGED DEMONSTRATION IN POCITYF

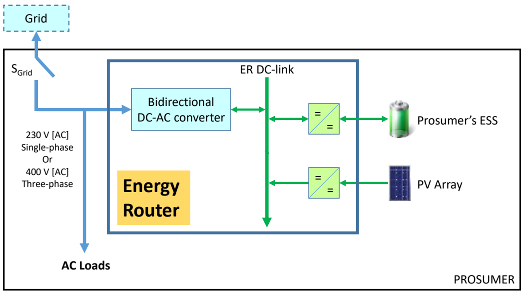


LOCATION

During POCITYF, Energy Routers will be installed in 5 Évora municipal buildings (some building will have more than one Energy Router).

TIMELINE

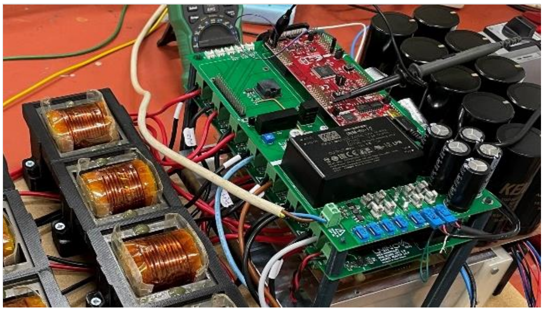
All Energy Routers will operate for, at least, two years in Évora municipal buildings.



DETAILS

Ten Energy Routers will be installed in municipality buildings for POCITYF demonstration.

Each Energy Router allows the connection of two PV strings, supporting MPPT (maximum power point tracking) and RPPT (reference power point tracking). A 5kW ESS can be connected to the ER. The connection to single-phase and three-phase systems is supported.



TARGETED OUTPUT

The Energy Routers will be used to provide energy flexibility to the PEBs. As Energy Routers have an energy storage system, this will allow to improve self-consumption and to improve buildings self-sufficiency and reduce electricity costs by transferring energy consumption from peak period to the off-peak period.

IMPACT ON COMMUNITY

Energy Routers installation does not require electrical service interruption due to its plug and play feature. The Energy Router will be installed in a conditioned access location which will not affect the movement of people in the building. Therefore, only positive impacts on local community are expected (e.g., reduction of electricity costs).

CULTURAL HERITAGE BUILDINGS COMPLIANT

Energy Routers will be installed in existing technical compartments, which are located inside building boundaries. Therefore, when comparing to the existing scenario, no additional impact is expected.

ETT1 - Positive Energy Buildings and Districts

Bidirectional smart inverters

DESCRIPTION

Bidirectional smart inverter is a prototype solution developed by INESCTEC during several years. It uses the best available technologies and methods to meet the requirements of residential market. The main features to highlight is a appealing and lightweight design, compact dimensions, quiet and efficient operation and low maintenance. The previous versions were already demonstrated in field within the scope of project such as Sustainable, Sensible and InteGrid (EU-funded).

The main distinctive feature is the possibility to combine three interfaces (PV, battery, and grid) in a single device, aiming to be a complete solution for self-consumption. The conversion core is built with SiC carbide technology providing high efficiency and power quality in a compact size. It includes a comprehensive range of features such as complete tool-free connections, BMS interface for batteries, and rich communications interfaces such as Wi-Fi and Bluetooth. It can be easily integrated with smart home and energy management systems through REST API, Modbus or MQTT protocols.

INDICATORS

POTENTIAL DEGREE OF USEFULNESS

75%

Already demonstrated in Lighthouse cities Yes

Cultural heritage compliance Yes

PERFORMANCE

High conversion efficiency

Compact dimensions and easy installation

Complete solution for PV and storage

COST

(estimated) <800€/equipment in mass production

DIMENSION

Size: 450x350x80mm

Weight: approx. 10 kg

TIME

Installation <1h (inverter only)

(estimated) Lifespan >10 years

SAFETY

IP20 protection for indoor installations

Rugged steel enclosure

Password protected

SUSTAINABILITY

Leverages self-consumption for residential consumers

KEY REQUIREMENTS

To have a PV plant and optionally battery storage, to maximize the benefits.

ENVISAGED DEMONSTRATION IN POCITYF

LOCATION

The solution will be tested PEB1 – Evora City centre.

TIMELINE

At least one years (for baseline and KPI determination).

DETAILS

The smart bidirectional inverters will be field demonstrated in at least one residential installation of PEB1, being the other installations still under evaluation due to lack of certification approvals (it is a prototype).

TARGETED OUTPUT

The expect output is an efficient and cost-effective solution that can be adopted by a mass market of residential consumers.

IMPACT ON COMMUNITY

This solution aims to enable the average household consumption to better use their own generated electricity and is expected to encourage them to invest even more in renewable energy generation aiming to be net zero or positive in terms of energy balance, in a near future.

PV SKYLIGHT

DESCRIPTION

A photovoltaic skylight generates clean and free energy at the same time that it provides bioclimatic properties of thermal comfort. It has an optimized solar filter, which absorbs almost all of the ultraviolet and infrared rays, which are harmful to the occupants of the building. If it is used, the air chamber of the insulating glass guarantees a better thermal performance inside the building. The advantages mentioned above help to reduce considerably the CO_2 and other greenhouse gas emissions, which significantly reduces the carbon footprint of buildings. The solution could be implemented replacing the existing glass by a BIPV glass with the same properties, but with the added value of the energy generation on site.

INDICATORS

POTENTIAL DEGREE OF USEFULNESS

100%

Already demonstrated in Lighthouse cities N

Cultural heritage compliance Y

PERFORMANCE

Crystalline silicon glass can be easily customized, especially in terms of shape, even trapezoids can be fabricated without difficulty using this technology.

Greater nominal power capacity per m^2 (Wp/ m^2).

Crystalline silicon glass installations take up less area for a given amount of kWp to be reached compared to amorphous silicon glass installations.

Crystalline Silicon glass' efficiency can go up to 16%.

COST

From 240 €/m^2 to 280 €/m^2

(only considered the PV glass)

DIMENSION

Adapted to the project (customised solution)

Maximum dimension 4000x2000mm

TIME

35 years of life spam

SAFETY

Manufactured according to the architectural glass standard requirements

Manufactured according to the PV standard requirements

SUSTAINABILITY

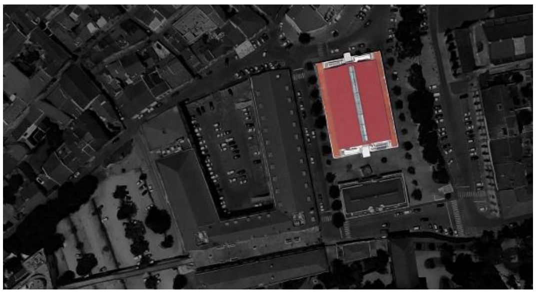
Multifunctional constructive material

Energy generation on site

KEY REQUIREMENTS

The most critical aspect to consider for the use in Historical buildings is linked to the structural system. The existing structural system should be compatible with the use of a glass/glass solution, allowing the replacement of the existing finishing material by a double laminated glass.

ENVISAGED DEMONSTRATION IN POCITYF



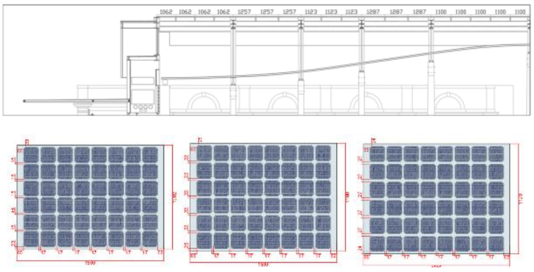
LOCATION

Mercado Municipal 1º de Maio – Évora, Portugal

(38°34'07.3"N 7°54'34.3"W)

TIMELINE

Permanent; at least until 2024 analysing the impact of solutions implemented



TARGETED OUTPUT

It is estimated that the installation will generate 20.008 kW per year. This means in 35 years of life spam: 700,280 kWh of electricity generated and 227 Tn avoided emissions of CO_2.

IMPACT ON COMMUNITY

With this solution it is possible to achieve two different challenges:

- The need to develop a solution suitable to be implemented in a historical building, not only from the aesthetic point of view, replacing the existing glass with an equivalent PV one without the possibility of modifying the main characteristics of these glasses,
- To reduce the energy demand through on-site energy production and improving the inner comfort values. From the aesthetic point of view, the technology selected is perceived from the interior of the building as conventional glass, without modifying the perception of the occupants.

Both factors lead to an improvement in the management of buildings, reducing operating and maintenance costs and improving the functionality and use of historic centres.

CULTURAL HERITAGE BUILDINGS COMPLIANT

The assessment categories proposed by the standard UNI EN 16883:2017 - Conservation of cultural heritage - Guidelines for improving the energy performance of historic buildings, have been considered. The evaluation scheme considers the following categories: 1. Technical compatibility; 2. Heritage significance of the building and its settings; 3. Economic viability; 4. Energy; 5. Indoor environmental quality; 6. Impact on the outdoor environment; 7. Aspects of use. All this points could be improved by the use of PV glass. For this type of solution, the main aspects to consider are related to the Technical compatibility. Due to the fact that the PV solution is based on glass, and will replace the current glass solution, the system will comply with the requirements in terms of: hydrothermal risk, structural risk, waterproof, fire safety design and installation, connections and also reversibility of the solution. Also is remarkable that this type of solution will comply with the Heritage significance by the absence of visual, spatial or material impact. On the other hand, this is a multifunctional solution that enhance the traditional constructive solution by improving the solar filter of the glass (linked with the IE quality) and generating energy on site linked with Economic viability, Energy performance and the impact on the outdoor environment)

ETT1 - Positive Energy (stand-alone) Buildings

Tegosolar PV

DESCRIPTION

Tegosolar PV is an Amorphous silicon (a-Si) panel, flexible, it adapts to roofs with any kind of shape, easy to install with either mechanical or thermal fixing systems applied by waterproofing operators, in order to prevent infiltrations it ensures maximum freedom for designers.

Tegosolar is easy to transport and install, it is applied adherent to the roof, avoiding wind load, is resilient to hail. It does not contain protective glass, an element potentially subject to breakage, it does not generate reflections.

Tegosolar can be walked on, checks and maintenance work on the roof can be carried out easily and quickly, its self-cleaning the external surface made with ETFE as it is an integral part of the roof, it cannot be forcibly removed by strangers.

INDICATORS

POTENTIAL DEGREE OF USEFULNESS

5%

Already demonstrated in Lighthouse cities No

Cultural heritage compliance No

PERFORMANCE

Maximum output power: 136/144 Wp

Voltage@Pmax: 33 V

Current@Pmax: 4,4 A

DIMENSION

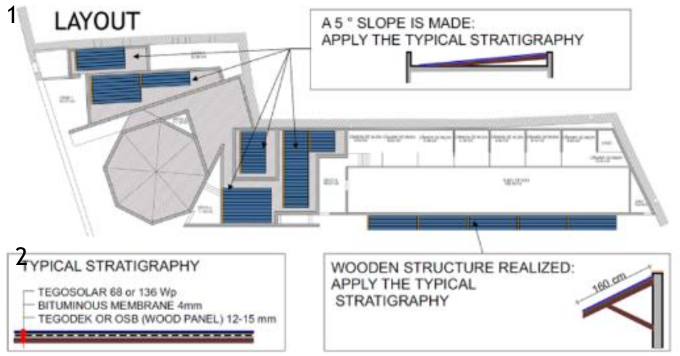
Length: 5442 mm

Width: 442 mm

Thickness: 6mm

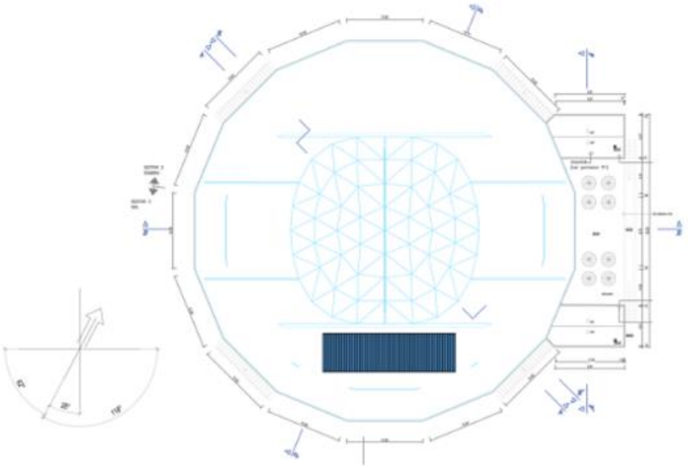
KEY REQUIREMENTS

Tegosolar must be used in pitched roof starting from 5˚, correct slope and exposition (to South) will give the best efficiency. The deck must be flat, the best are Plywood, OSB and similar.



LOCATION

1. LVpDE Centro Interpretativo,
2. ARENA.



TIMELINE

During 2022

DETAILS

1. Technical properties: 9,25 kWp, Surface used 144,5 mq, energy 13157 kWh, specific annual yeld 1418 kWh/kWp. CO_2 Emission Avoided 11625 kg/y,
2. Technical properties: 7,2 kWp, Surface used 100,8 mq, energy 10505 kWh, specific annual yeld 1456 kWh/kWp. CO_2 Emission Avoided 9291 kg/y.

IMPACT ON COMMUNITY

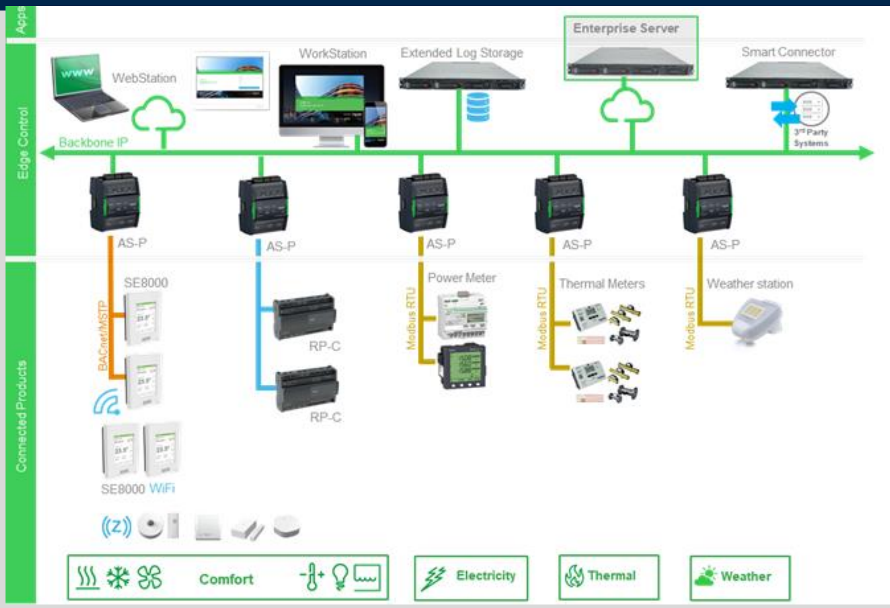
There is not a particular impact on the community, only installation conditions for a few days. The solution will be installed on the roofs so there is also no landscape impact.

CULTURAL HERITAGE BUILDINGS COMPLIANT

Tegosolar is integrated on the roof, then the only minor impact could be on the blue colour which is typical of PV systems.

ETT1 - POSITIVE ENERGY (STAND-ALONE) BUILDINGS

EcoStruxure BMS architecture



DESCRIPTION

Schneider Electric, based on the project requirements and on the needs of the various SunHorizon's partners, has engineered a monitoring platform based on EcoStruxure Building technologies. The architecture is divided in 3 levels: *Connected Products*, *Edge Control* and *Apps, Analytics and Services*.

Data are produced by *Connected Products*, handled by the *Edge Control* technologies and shared with third parties' services through the *Smart Connector*.

INDICATORS

POTENTIAL DEGREE OF USEFULNESS

90%

Already demonstrated in Lighthouse cities N

Cultural heritage compliance Yes

PERFORMANCE

Monitoring of the system consumption

Management of the building system (energy and H&C)

Insert value here

COST

5.000€/equipment

DIMENSION

Size of the central box (AS-P and PS): 45x61x16cm

Scalability: District level

TIME

Dashboard with live data from the field components

Storage of the data every 15 minutes

SAFETY

Access to information only by credentials

Alarms for system problems

SUSTAINABILITY

Important for a better management of the building, reducing wastes

KEY REQUIREMENTS

Installation of monitoring components in the system in order to manage the building

ENVISAGED DEMONSTRATION IN POCITYF

LOCATION

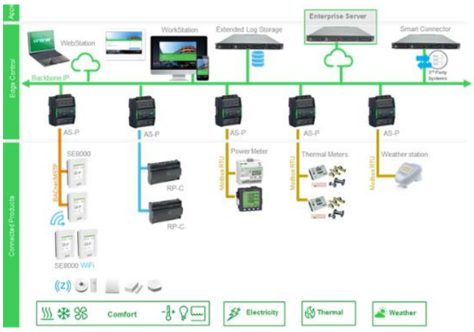
The BMS solution will be installed in 9 buildings in Evora

TIMELINE

Installation within 6 months

DETAILS

installing mostly wireless devices, we aim to improve the existing building system and to manage in a better way the consumption and waste in a historical buildings



TARGETED OUTPUT

Nowadays residential buildings consume up to 40% of total energy; Renovation is the real opportunity to add value to the buildings themselves. An improvement from a technology point of view and a proper organization of data's flow are important. With the use of the platform EcoStruxure we want to manage in an efficient way the structure and the processes from raw data until final data.

IMPACT ON COMMUNITY

Low impact with minimal reduction of the functionality of buildings, the installation is partly based on wireless, faster than standard installations.

Community Solar Farm

DESCRIPTION

The Community Solar Farm (CSF) is an emergent concept of implementing photovoltaic modules at district-level, instead of implementing at building-level. This relates with the concept of Renewable Energy Community that was introduced in the Renewable Energy Directive with the goal to improve self-generation and self-consumption of energy.

Évora's Community Solar Farm will have the following features:

- It will be divided in two areas, being able to supply energy to two positive energy blocks
- The CSF close to Évora City Centre will have a total capacity of 5.17 MW_n and the CSF next to the industrial area will have a total capacity of 2.64 MW_n
- On average the CSFs will provide 9.61 GWh and 4.81 GWh per year, being able to supply 3 150 and 1 575 homes respectively.

INDICATORS

POTENTIAL DEGREE OF USEFULNESS

100%

Already demonstrated in Lighthouse cities **No**

Cultural heritage compliance **Yes**

PERFORMANCE

Improves local renewable energy generation

Promotes decentralised energy production

COST

1.4 M€ per GW_n

(including grid connection)

DIMENSION

5.17 + 2.64 MW_n

District-level application

High replicability potential for energy communities

TIME

Installation in Évora expected to start in 2022

SAFETY

Equipment safety guaranteed according to EU standards

SUSTAINABILITY

Increases renewable energy generation

Increases local energy generation

KEY REQUIREMENTS

To implement the Community Solar Farm it is necessary to have grid availability to inject the photovoltaic power generated and, available space to install the modules.

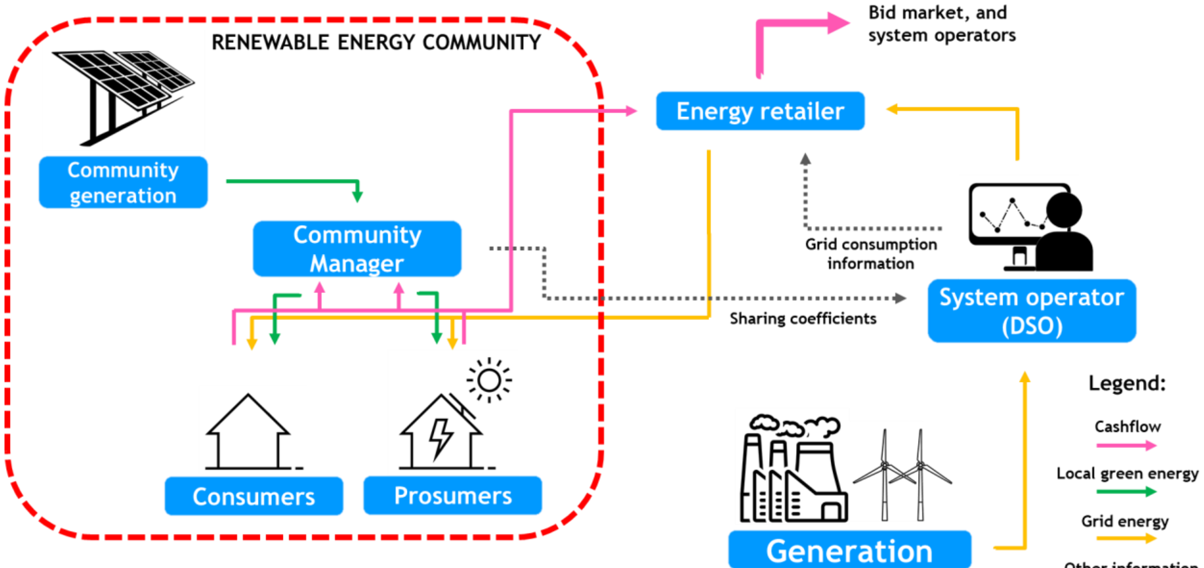
ENVISAGED DEMONSTRATION IN POCITYF

TIMELINE

The CSFs will be installed in Évora during 2022.

DETAILS

The typical business model associated to CSFs in Portugal has a Community Manager role that supports the activities in the energy community but can also enter as developer and investor, supporting the roll-out and implementation of the solar farm (image below shows the energy and money flows in this business models including the Community Manager).



Adapted from:
Inês F.G. Reis, et al., Business models for energy communities: A review of key issues and trends, Renewable and Sustainable Energy Reviews, Volume 144, 2021

TARGETED OUTPUT

The Community Solar Farm benefits mainly from the scale factor and ability to combine multiple consumers to reduce excess energy. Compared to traditional single installation, the community installation has a larger scale that usually mean a smaller price per capacity installed which can benefit end-users by reducing the necessary investment fees. Regarding the reduction of excess energy, the community-level installation adds multiple consumption profiles, meaning that some users consume more energy at certain hours than others, and this contributes to a more balanced consumption profile which in turn increases the ability to self-consume the energy that is being generated on-site.

Overall, the goal of the solution is to reduce installation costs and increase self-consumption, providing both financial and environmental benefits. Studies made have shown a potential of reducing grid energy consumption by 7% due to increased self-consumption for Valverde village, in Évora.

IMPACT ON COMMUNITY

The Community Solar Farm is, as the name indicates, a solution for the community. The main benefit for the community members is the ability to generate their own energy, reducing on their energy bills while also increasing the renewable energy consumption. Besides that, by implementing the Community Solar Farm and setting up a renewable energy community, the community members will also benefit from community-level development, for example investment on electrical vehicle charging infrastructure, or community-level retrofit opportunities.

CULTURAL HERITAGE BUILDINGS COMPLIANT

The Community Solar Farm solution is fully compliant with cultural heritage guidelines as it can be dislocated from cultural heritage sites and still provide the energy to the building in those areas, meaning that, if the building ate located on a cultural heritage sites, the Community Solar Farm allows the building occupants to have the opportunity to install the renewable energy technologies that were previously unavailable to them. The energy is then monitored and it can be shared with community members even if they are not immediately next to the Community Solar Farm.