

2018

EeB PPP Promising Technologies

# Energy building system



**ENERGY EFFICIENT BUILDINGS**

AN ECTP COMMITTEE FOR INNOVATIVE BUILT ENVIRONMENT



# Anerdgy roof edge technology

## Multifunctional roof edges combining attractive design with sustainable energy generation



The so-called roof edge technology provided by ANERDGY is a multifunctional system that integrates sustainable energy generation by wind and solar to produce electricity at all time.

It features a highly efficient wind turbine system that uses wind energy and the pressure differential around the building. Moreover, it has a basic modular configuration, designed to serve multiple purposes, wherein the shell of the module provides free space for integration of additional technologies. A flexible number of photovoltaic panels on this surface may maximize the electricity yield at all time.

Particularly in new building design, the multifunctionality of the system is underlined by the fact that the technology potentially can take over other building functions like lightning protection and roof edge protection, and consequently reduces overall installation costs.

The first real application of the system was completed in October 2016 in Berlin, Germany. Presently, the technology is being applied in several case studies, e.g. in France, in order to create reference projects. The main challenge is to overcome the non-harmonized building regulations in EU members states and the path towards building permits, which is often locally defined.

The targeted market is residential buildings, but also offices and small industrial buildings belong to the potential application area. The roof edge technology is preferably used in locations with an average wind speed above 3 m/s. The focus is on flat roof buildings primarily, with a minimum roof

surface of 30 m<sup>2</sup>. Apart from new buildings, full and deep renovation of flat roof buildings is targeted.

The roof edge technology has a solid IP position, based on a comprehensive portfolio of technical and design-oriented patents. A profound market analysis shows a potential of a mainstream market of more than 1 B€/year in 10 EU member states. A major advantage - offering a solid competitive position compared to the conventional installation of renewable energy technologies in and on roofs (e.g. PV) - is that the roof edge technology creates space and therefore wins the space competition on the roof. Moreover, the seamless integration in the building edge offers a clear aesthetic plus.

- **Aesthetic integration of technology in roof edges**
  - **Modular**
  - **All time electricity production due to solar (PV) and wind-based generation**
  - **Highly cost-effective as traditional envelope systems may be integrated in one building edge system**
- Technical completion: between 1 and 2 years
  - Can be used in new constructions
  - Can be used in renovation/ retro-fitting
  - Compatible with existing solutions

**Project: ZERO-PLUS**, Achieving near Zero and Positive Energy Settlements in Europe using Advanced Energy Technology, [www.zeroplus.org](http://www.zeroplus.org)

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## IHC-2025 HCPV system

### High efficient generation of solar heat and electricity



The IHC-2025 HCPV System is a focus concentrating solar collector for hybrid generation of heat and electricity. The solar radiation is reflected by high quality silver plated mirrors on a receiver including a high performance multi-junction PV cell and a heat exchanger, mounted on the back of the photovoltaic cell. One module includes 20 basic receivers, for a total peak power at reference conditions of 1kW electric and 2 kW thermal, with a total efficiency in solar energy conversion of about 75%. The outflow temperature range (50°C - 70°C) is compatible with the supply of domestic hot water.

The IHC-2025 modules can be connected together for reaching the desired output and easily integrated into the heating and electric networks of single buildings or neighbourhoods. The camera-based solar tracking system offers a very precise and reliable automation, combined with IoT access to all the data about the energy produced.

A product prototype with 4 system units has been successfully manufactured and demonstrated within a relevant environment while demonstrations under operational environments will soon take place within a group of houses in France and in Cyprus.

Further technical improvement is being carried out in order to improve the whole system performance while starting the steps towards the consolidation of the supply chain and the industrialisation of the process in order to bring the technology into the market.

The cost of the technology for the production of 1kWe plus 2kWth makes this product very competitive for the housing sector, since it adds the value of saving space against traditional technologies for solar energy production. Therefore, the main target market is residential buildings, although it can be also implemented within small buildings with similar demands in terms of domestic hot water temperature.

The unique selling proposition of this technology is the combined production of electricity and heat that offers higher efficiency at a similar price as other PV and solar thermal existing technologies. The product also offers the potential to add other solutions, as lighting supply, which will require further investigation while could position this product as a clear reference technology in the field of poly-generation systems for buildings.

- **Integration of high-performance multi-junction PV cells in a modular array of micro-dishes**
- **Hybrid generation of electricity and heat**
- **Combined solar efficiency (electricity + thermal) higher than 75%**
- **Optimal use of available space**
- Technical completion: between 1 and 2 years
- Can be used in new constructions
- Can be used in renovation/ retro-fitting
- Compatible with existing solutions

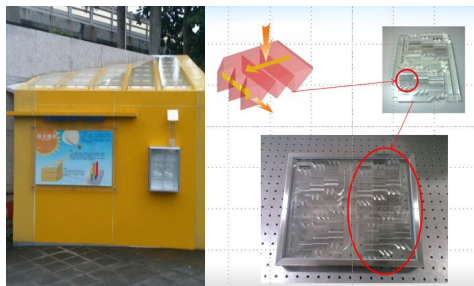
**Project:** ZERO-PLUS, Achieving near Zero and Positive Energy Settlements in Europe using Advanced Energy Technology, [www.zeroplus.eu](http://www.zeroplus.eu)

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# NLIS

## Natural Lighting Illumination Systems



Indoor artificial lighting accounts for more than 30% of the electricity consumption. At the same time, it is well demonstrated that the use of natural light improves the indoor environment. Therefore, the development of technologies in order to improve the exploitation of natural light as a resource can benefit buildings both reducing its consumption and improving the comfort conditions.

NLIS is an efficient and modular system that allows capturing and transmitting natural light from the envelope to indoor spaces with no access to this source. This new product, which can be used for both new constructions and retrofitted buildings, integrates three module components for the light collection, transmission and distribution inside the building. The collection of light is made through the use of prismatic elements that can transform area light into linear light that can be then conducted and distributed in the indoor space. The design of collecting elements eliminates the need of tracking systems, reducing therefore the product and maintenance costs.

The features of this product make it suitable to replace the artificial lighting within parking garages, vertical farms, tunnels, etc. resulting into important electricity savings while improving the indoor conditions and generating healthier spaces through the use of natural light.

This product has been developed and tested within a relevant environment under the project CETIEB in a pilot-case where its performance is being evaluated, and it is now in the process of being demonstrated within real operating conditions. The next steps towards bringing

the technology into the market require further development in order to tailor the system to different applications while implementing an industrialisation process to manufacture the integrating components and the consolidation of the supply chain.

The unique selling proposition of this product is the fact of being a product that offers the access to natural light in spaces where there is no direct access to this source. Therefore, its main target market is where large lighting systems are required to illuminate spaces both during day and night, as underground parking spaces or tunnels. The main advantage of this products lies on offering a high-performance and modular solution at a price that is 50% lower than in competing products, which makes this solution very competitive within this specific market.

- **Modular design**
- **Reduction of the electricity consumption and increase of the indoor well-being**
- **Expandable and adaptable to large systems and different indoor requirements**
- **Low cost and low maintenance**
  - Technical completion: between 3 and 5 years
  - Can be used in new constructions
  - Can be used in renovation/ retro-fitting
  - Compatible with existing solutions

**Project:** CETIEB, Cost-Effective Tools for Better Indoor Environment in Retrofitted energy Efficient Buildings,  
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# Reversible low-E coat window

## Smart rotatable window with a spectrally-selective coating



Thirty percent of non-residential buildings in Europe are public buildings. As their energy consumption for heating and cooling is about forty percent higher than that of residential buildings, the smart rotatable window system primarily focusses on retrofitting of public buildings.

The key feature of the smart window is based on the simple and robust principle of a rotatable window sash. Basically, the window sash can be rotated along the central axis (180 degrees either vertically or horizontally) from a winter to a summer position and vice versa, thereby changing a spectrally selective coating (or low e coating) from the inner glazing to the outer glazing unit position and vice versa, respectively. In the winter position, the inner radiant heat is reflected into the room ('radiator effect'), whereas in the summer position, the incident solar heat is reflected out ('awning effect').

Apart from this key principle, the direct practical consequence of the reversible glazing is the ease of cleaning from the inside of the building.

Moreover, the smart window system integrates the following two special features:

- An adjustable sealing system. The innovative use of hydraulic gaskets that either results in hermetically sealed locked windows or may provide basic ventilation in the open position, even when the window is fully locked.
- An electromagnetic locking system.

Presently, the window is based on a wooden frame. Each window is user- controlled,

manually or electronically. As such, the reversible window will contribute to lower energy consumption for heating and cooling as well as comfortable indoor conditions throughout the year.

Successful demonstration of the smart window concept has taken place in different retrofitting projects at sites throughout Europe, including a university campus in Bilbao, a museum in Malmö and a vocational school in Ankara. Further technical improvement is in progress with respect to the gaskets and an advanced option of automated control to introduce an even easier to handle, fully operational rotatable window. The next step to bring the technology closer to the market involves a faster production line for upscaling.

The simplicity and robustness of the smart window system form key USPs. The estimated price range is € 600 /m<sup>2</sup>, making it competitive with conventional reversible window systems on the market.

- **Simplicity in managing energy flows and comfort through rotating the window**

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- **Integrates adjustable air infiltration, energy performance and comfort in a single window system**

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- **Robustness**

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- **Easy to apply both in new and retrofitted public buildings system**

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- Technical completion: between 1 and 2 years
- Can be used in new constructions
- Can be used in renovation/ retro-fitting
- Compatible with existing solutions

**Project:** A2PBEER, Affordable and adaptable public buildings through energy efficient retrofitting, [www.a2pbeer.eu](http://www.a2pbeer.eu)

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This technology brochure highlights the highly promising innovations from selected co-funded European projects under the 7th Framework Program (FP7) and the 8th Framework Program (H2020).

The Energy-Efficient Buildings (EeB) Public Private Partnership (PPP) is a joint initiative of the European Commission (EC) and the Energy Efficient Buildings Committee of the European Construction Technology Platform (ECTP).

This initiative aims at promoting research on new methods and technologies to reduce the energy footprint and CO<sub>2</sub> emissions related to new and retrofitted buildings across Europe.

