



Conference organized by:

PhotoVoltaic TECHNOLOGY PLATFORM

Energy Efficiency in Buildings & Building-integrated Photovoltaics: Where Sustainability meets Aesthetics

London, UK,
8 July 2015, 10.00- 17.30
RIBA Venues,
66 Portland Place, London W1B 1AD

Realising the synergies between the PV and the construction sectors

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ECTP INNOVATIVE BUILT ENVIRONMENT

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With a yearly turnover around € 1.2 trillion, the European **Construction Sector**, including its extended value chain (e.g. materials & equipment manufacturers, construction & service companies), is the largest European single activity (**10% of GDP**) & the biggest industrial employer (**14.6 million direct jobs**).

ECTP
INNOVATIVE BUILT ENVIRONMENT

The **European Construction Technology Platform** (ECTP) gathers around 180 member-organizations from the Construction sector and other sectors from the whole supply chain of the **Built Environment**.

Its main mission is to develop new **R&D&I** strategies to improve **competitiveness**, meet **societal needs** & take up **environmental challenges**.

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INFRASTRUCTURE MOBILITY
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MATERIALS SUSTAINABILITY
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HERITAGE REGENERATION
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ACTIVE AGING DESIGN
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ENERGY EFFICIENT BUILDINGS
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It would be great if (for example)…

Smart systems and control could allow energy usage optimization whilst guaranteeing optimal comfort, a healthy environment and numerous other services (security, assistance to elderly people…)

Existing buildings could have high insulating envelopes to reduce energy use much below 50 kWh/m^2/year while achieving thermal comfort

Buildings could satisfy their own energy needs or even contribute excess power to the community (zero/positive energy buildings)

Renewable and non polluting energy sources could be easily integrated

Equipment could be operated at optimal energy performance level (lighting, HVAC…)

Users could change their behavior towards a reasoned usage of energy and being proactive

ENERGY EFFICIENT BUILDINGS
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A European Roadmap for Energy Efficient Buildings

A value chain & challenge based approach

PV PV PV

Design | Structure | Envelope | Energy equipment | Construction process | Energy Performance | End of life

Design

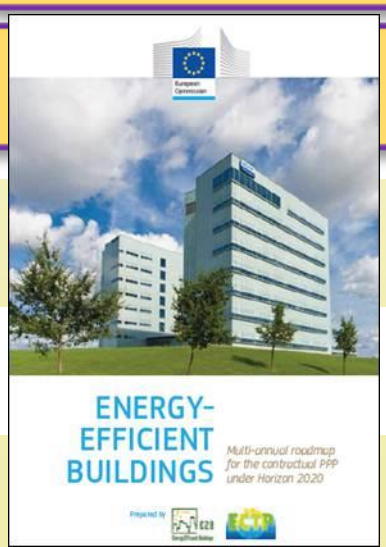
Technology building blocks

Construction process

Energy performance monitoring and management

End of life

Cross-cutting



Roadmap 2014-2020

"Turning energy efficiency into a sustainable business"

Some Challenges and Drivers related to PV

- Renewable energy sources have not yet reached mature integration into existing or new buildings to provide users with heat and/or electricity that are independent from fossil fuel uses. Innovation is still needed to optimise renewable energy impacts and uses at building and district level.
- Interaction with other research areas especially the integration of supply systems for renewable energy including storage systems would be mandatory.
- The energy equipment must adapt to the new smart grids and to lower unit energy demands from more energy efficient buildings, which requires sizing down the current portfolio while keeping energy efficiency at the highest level possible as well as unit investment cost down. Beyond existing technologies, breakthrough solutions can be expected from heating/cooling systems combined with renewable energy sources, storage (heat and electricity) and building or district integrated solutions in combination with smart grid technologies.
- Growing interaction between buildings or districts and grids/networks: building design would more and more benefit from evolving electricity, heating and cooling distribution networks which integrate more decentralised and renewable energy sources, as well as emerging flexibility in the consumers' demand (demand response schemes).
- Future buildings would be able to communicate with each other and their environment. They would manage the energy use taking into consideration the availability of local renewable resources and the more profitable periods for network connections.

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A European Roadmap for Energy Efficient Buildings

Overview of priorities along time

Core area	Priority	Short Term (2014-16)	Medium term (2017-18)	Long term (2019-20)
Design	Integrated (holistic) design	✖	✖	✖
	Tools to disclose existing knowledge and technologies (e.g. ICT BIM)		✖	✖
Structure	Sustainability, adaptability and affordability of structures		✖	✖
Envelope (incl. finishes)	Energy and environmental performance of the full envelope	✖	✖	✖
	Prefabrication		✖	✖
	Multifunctional and adaptive components, surfaces and finishes	✖	✖	✖
Energy equipment	Thermal storage	✖	✖	✖
	Distributed/decentralised energy generation on a district level		✖	✖
	Advanced heating and cooling, domestic hot water including renewable energy sources and heat recovery	✖	✖	✖
Construction process	ICT aided construction		✖	✖
	Improving delivered energy performance	✖	✖	
	Automated Construction Tools	✖	✖	✖
Performance monitoring	ICT systems interoperability	✖		
	Open data standards		✖	✖
	Prediction – reality (incl. occupancy modelling)	✖	✖	✖
End of Life	Innovative solutions and decision-support on renovation or new building		✖	✖

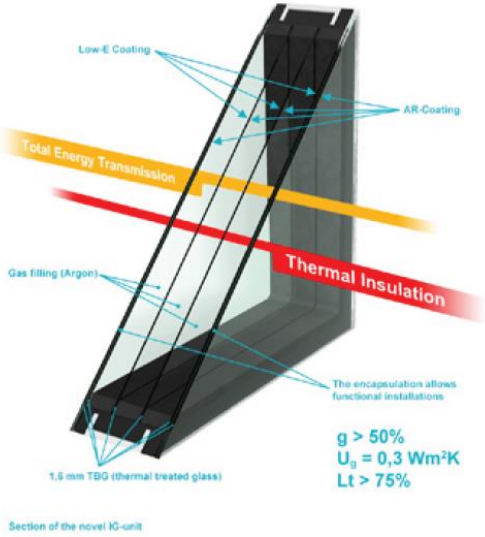

PV


PV

MEM4WIN

Ultra-thin glass membranes for advanced, adjustable and affordable quadruple glazed windows for zero-energy buildings

- **Novel, insulated glass unit for quadruple glazing which contains ultra-thin glass membranes**
- **Incorporated into frameless, openable windows which can be directly incorporated into façades**
- **Expected properties**
  - heat transfer coefficient of 0.3W/m²K
  - weight reduction of more than 50%
  - cost reduction of 20%
- **Integrated features**
  - ink-jet printed Organic **Photovoltaics**
  - fully integrated solar thermal collectors for energy harvesting
  - micro-mirror arrays for energy control and advanced day lighting



Section of the novel insulated glass unit

KEY FACTS

Start date: October 2012

Duration: 42 months

Total budget (€): 6.6M

Website: www.mem4win.com

Coordinator: LiSEC Austria GmbH, Austria

Partners: Austria: Profactor, Tiger Coatings, University Linz. Germany: Aixtron SE, Belectric OPV, Energy Glas, University Kassel. Italy: CNR, Durst Phototechnik. South Korea: Korea University. UK: Aixtron Ltd, University of Cambridge.

Energy-hub for residential and commercial districts

- Maximise the local use of renewable energy in a district by matching energy demand and supply
- Local use of a large renewable supply such as a **photovoltaic** panel array or a large wind turbine
- Excess renewable heat can be stored in advanced Thermo-Chemical Materials (TCM) in distributed storage vessels or boreholes

"The newly constructed "Balk van Beel" apartment building in Leuven, Belgium, where a smart energy management system was installed

KEY FACTS

Start date: December 2010

Duration: 48 months

Total budget (€): 11.7M

Website: www.e-hub.org

Coordinator: TNO, The Netherlands

Partners - Belgium: Ertzberg, ISPE, VITO. Finland: VTT. France: EDF. Germany: Fraunhofer-ISE, HSW. Italy: Finlombarda, D'Appolonia, University of Genoa. The Netherlands: ECN. Poland: Mostostal. Spain: Acciona, Solintel. UK: ICAX.





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