SUSTAINABLE ENERGY WEEK
13-17 June 2016

AMANAC-EMIRI Association

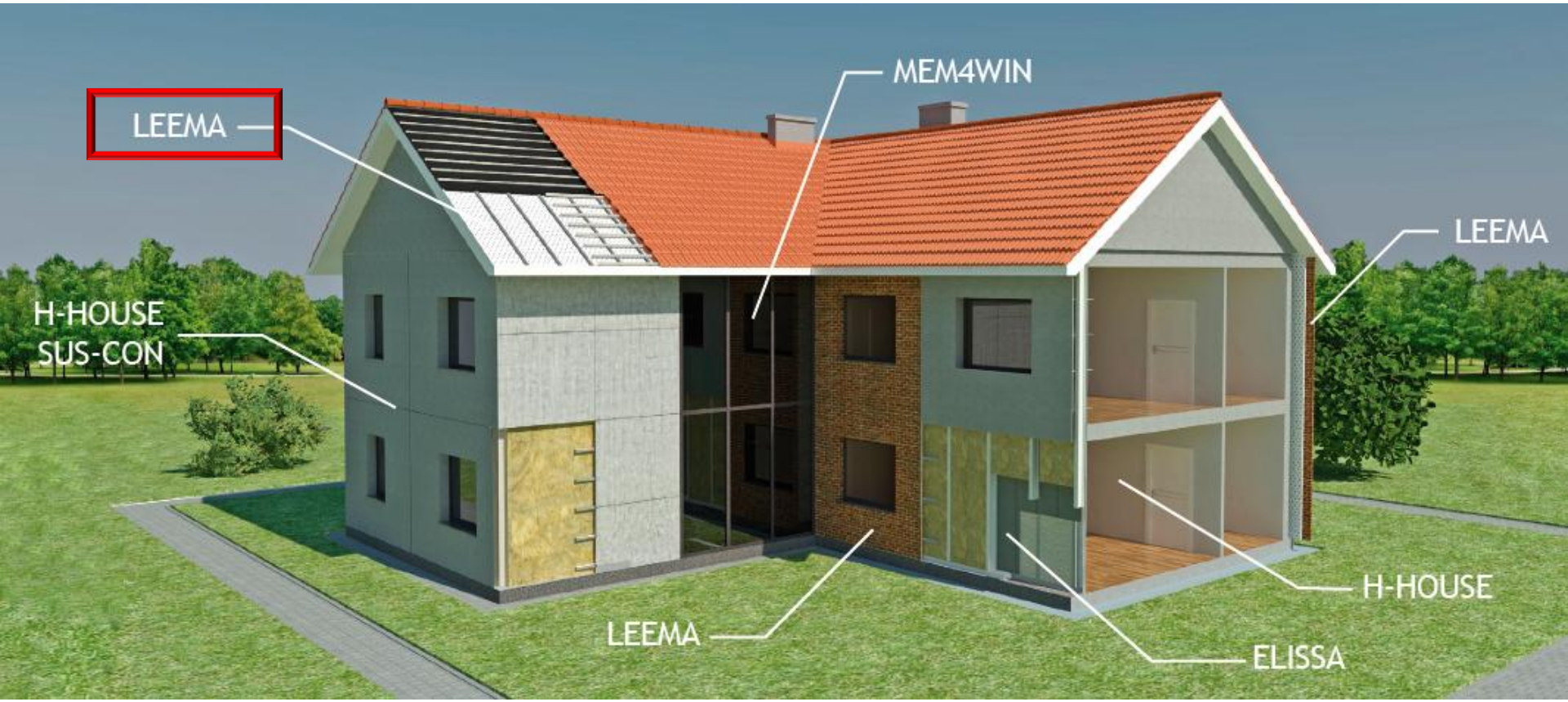
Success stories: "Advanced materials and solutions for low carbon energy and more sustainable buildings in Europe"

BUILDING THE ENERGY UNION TOGETHER

SUSTAINABLE ENERGY WEEK

An initiative of the European Commission

AMANAC Success stories - LEEMA



SUSTAINABLE ENERGY WEEK
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"Success stories - Advanced materials and solutions for low carbon energy and more sustainable buildings in Europe"

LEEMA - Low Embodied Energy Insulation Materials and Masonry Components for Energy Efficient Buildings

www.leema.eu

Christos Dedeloudis - IMERYS

EU Sustainable Energy Week 2016

June 16, 2016 - Brussels

1. Introduction

Large Industries	S&B INDUSTRIAL MINERALS	GR
	Etex Group (Redco)	BE
	SCHLAGMANN BAUSTOFFWERKE	DE
	THERMAL CHERAMICS de FRANCE	FR
	Morando S.r.l.	IT
	FIBRAN	GR
SME	FENIX TNT S.r.o.	CZ
	AMS Solutions	GR
Universities – Research Institutes	NATIONAL TECHNICAL UNIVERSITY OF ATHENS	GR
	MPA University of Stuttgart	DE
	Centre Scientifique et Technique de la Construction (BBRI)	BE
	MFPA University of Weimar	DE
	D'APPOLONIA SPA	IT
	Architects Council of Europe (ACE)	BE

- ✓ Development of a **new generation of inorganic insulation materials and building insulation masonry components ("3I") with lower embodied energy (>50%)** and **lower cost (15%)** and upgraded properties compared to the commercial ones
- ✓ Improvement of **durability and energy performance** at building level
- ✓ Safer and cleaner indoor building environment due to **incombustibility and absence of organic/fibrous compounds**
- ✓ Use of **wastes of industrial minerals exploitation, recycled rejects from the glass industry and industrial by-products**

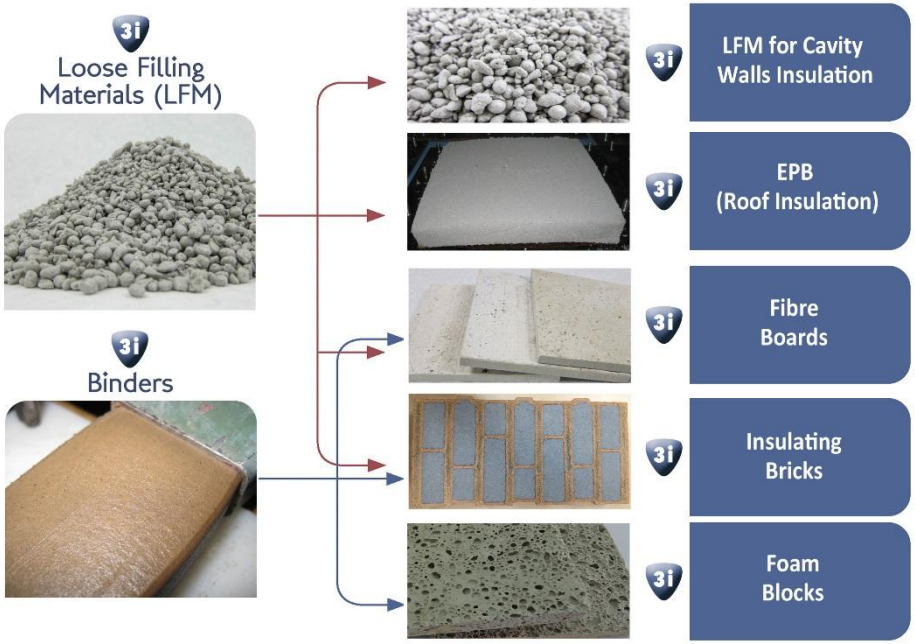
⇓

3i Insulating Inorganic Incombustible Materials and Masonry Components

2. Key exploitable results

Exploitable Results (ER)	Key Project Partner	Key Performance Criteria	Product photo
ER 4: *Inorganic, Insulating and Incombustible ("3I") Loose Filling materials (LFM) for use as cavity walls insulation or as lightweight aggregate in various products (boards, bricks etc.)*	Imerys, NTUA	Similar or lower bulk densities compared to materials now used in the specific applications achieving lower λ values (0,034 – 0,041W/mK depending on application) and produced with much lower embodied energy	
ER 9 : *Inorganic, Insulating and Incombustible ("3I") fibre Boards, replacing expanded perlite with the new 3I Loose Filling materials*	ETEX	A final fiber cement board can be produced with higher loadings of the 3i LFM than the normal expanded perlite resulting to a product with the same strength but lower density and λ and a significantly reduced embodied energy	
ER 11: *Inorganic, Insulating and Incombustible ("3I") Bricks, consisting of a clay brick body and 3I Loose Filling materials filling*	Schlagmann	Final brick and façade products with 3i LFM fillings that provide the same level of insulation (0,064 – 0,066 W/mK) and much better moisture uptake behaviour resulting to a more comfortable indoor environment provided by a lower embodied energy material	

3. Pilot Scale products



Bulk density: 60,6 kg/m³, Thermal conductivity: 0,038 W/mK, Wall settlement: 12%, Improved blowability, Lower EE: 60%

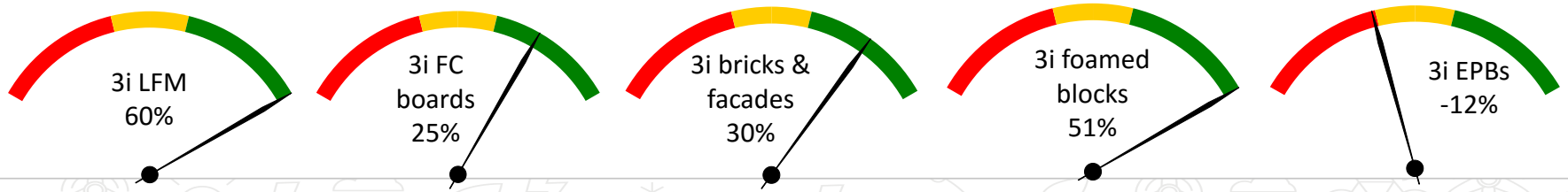
Density: ~290 kg/m³, Thermal conductivity: 0,068 W/mK, Bending strength: 850 kPa, Higher EE: 97%

Density: 1000 kg/m³, Thermal conductivity: 0,147 W/mK, Bending strength: 7,86 MPa, Lower EE: 20%

Apparent density (one brick): 527 kg/m³, Thermal conductivity: 0,064 W/mK, Filling density: 43,3 kg/m³, Lower EE: 13%

Density: ~770 kg/m³, Thermal conductivity: 0,104 W/mK, Compressive strength: 1,02 MPa, Lower EE: 5%

Improvement indexes* were calculated for all LEEMA products



*based on reduction of Embodied Energy, Global Warming potential, Eutrophication potential, Ozone depletion, Resource depletion and Water demand

4. Next steps

- Within the project LEEMA several products and technologies were designed with the main purpose to cover the needs of the building sector that demands more **energy efficient products** (lower λ), in **lower cost** and **better quality** deriving from **cleaner technologies** and more **sustainable resources** (lower EE)
- The new 3i products can be used in several applications as **formed products** (boards, blocks, bricks, facades) but also as **aggregates** that can fill cavity walls or be used as raw materials in **new processes**
- Out of the several products developed some need **additional optimisation** in lab and pilot scale level while others are much **closer to commercialisation**
- Current efforts are targeting **readier products** (LFM for boards and bricks, other applications of LFM) with a special focus on capturing a **wide market share** that could **benefit** from the new products
- Licensing and patenting of the technologies/products are on going while industrial up-scaling is being under study

5. Sum up

CONTACT INFORMATION

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Project website

www.leema.eu

LEEMA Project FP7

@LEEMA FP7

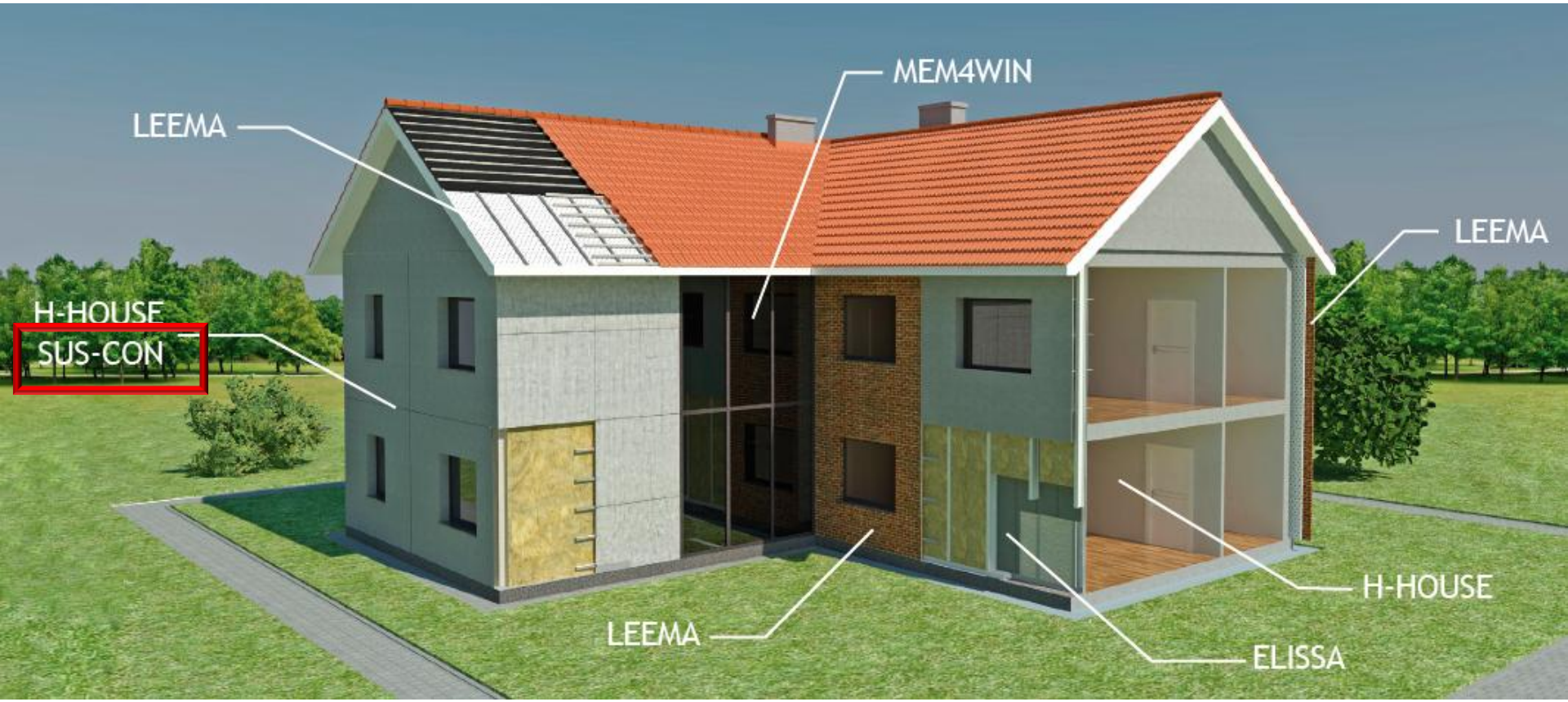
LEEMA Project FP7

LEEMA Project FP7

LEEMA Project FP7

Special thanks to the European Commission for funding our efforts under Grand Agreement #285059

AMANAC Success stories –SUS-CON



SUSTAINABLE ENERGY WEEK
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"Success stories - Advanced materials and solutions for low carbon energy and more sustainable buildings in Europe"

SUS-CON – SUStainable, innovative and energy-efficient CONcrete, based on the integration of all-waste materials

http://www.sus-con.eu/

Ömer Faruk Aydın – ISTON Co., Istanbul

EU Sustainable Energy Week 2016

June 16, 2016 - Brussels

1. Introduction

Project Idea

- Developing novel technologies to integrate wastes in the production cycle of lightweight concrete, producing an all-waste and energy-efficient concrete

Reduction in Embodied Energy

Increase in thermal insulation properties

Reduction in CO2 emissions

Reduction in total cost

Eco-friendly concrete

Partners

10 countries - 16 Partners

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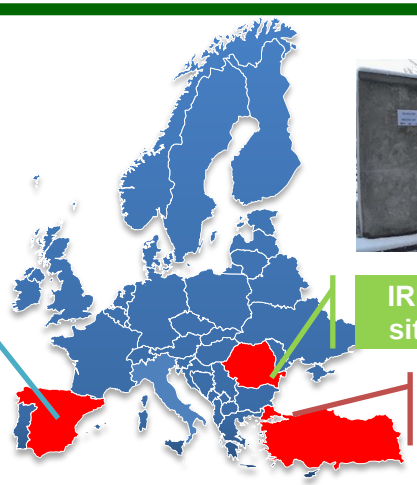
2. Key exploitable results

Exploitable Results (ER)	Key Project Partner	Key Performance Criteria
ER 1: New SUS-CON lightweight aggregates from solid waste	CETMA, ACCIONA, IRIDEX, CRV, TBTC	• Cost effectiveness • Lightness • Thermal insulation
ER 2: Novel SUS-CON geopolymer binders	NTUA, QUB, ACCIONA, BASF	• Cost effectiveness • Low energy consumption • Reduced CO_2 emissions
ER 3: Eco-sustainable lightweight concretes made of 100% secondary raw materials (geopolymer binder and aggregates)	CETMA, MAGNETTI, ACCIONA, QUB, IRIDEX, ISTON, NTUA, S&B	• Reduced Embodied Energy • Improved insulation properties • Reduced CO_2 emissions • Reduced costs • 100% eco-sustainable concrete
ER 4: SUS-CON decision-support tool & design tool http://www.sus-con.eu/suscon-dss/	TRE	

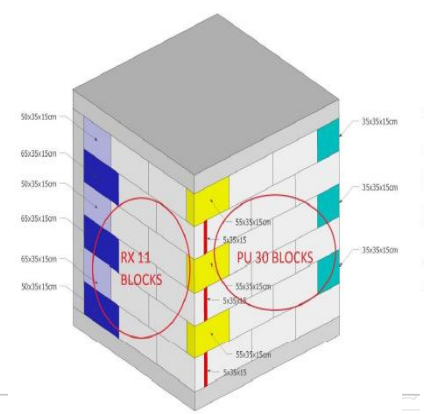
3. Demonstrators



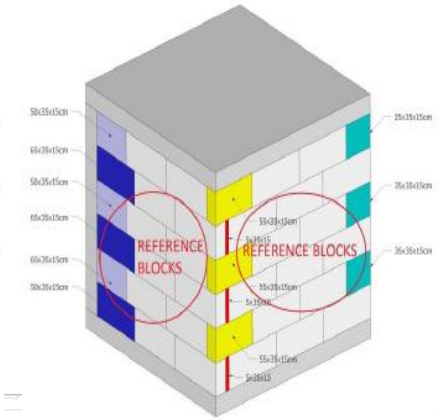
The Iston' s demo site is located in one of its facilities in the Tuzla district at Anatolian side of **Istanbul**.

- **The mock up** was consisting of 2 walls with SCC panels, 2 walls of aerated concrete blocks, SCC roof element and a pvc door and small window.

- **Modified PU 30** recipe was used. 2 panels with 0,2x2,05x2,1 m and 2 panels with 0,2x0,95x2,1 m dimensions were produced for the mock-ups in Turkey.



Sketches of the wall made of SUS-CON blocks



Reference mock-up

3. Demonstrators

SUS-CON panels production

SUS-CON blocks production

3. Demonstrators

Reference mock-up

Temperature tracking in mock-ups

4. Next steps

- SUS-CON products **are highly compatible with existing concrete production processes** (minimized equipment costs) and the industrial production was verified on pilot plants. Some further efforts are needed for full scale industrial production.

- This Project was completed in 2015. The studies for starting **new projects**, focused mostly on improvement and standardization of this products, are going on.

5. Sum up

CONTACT INFORMATION

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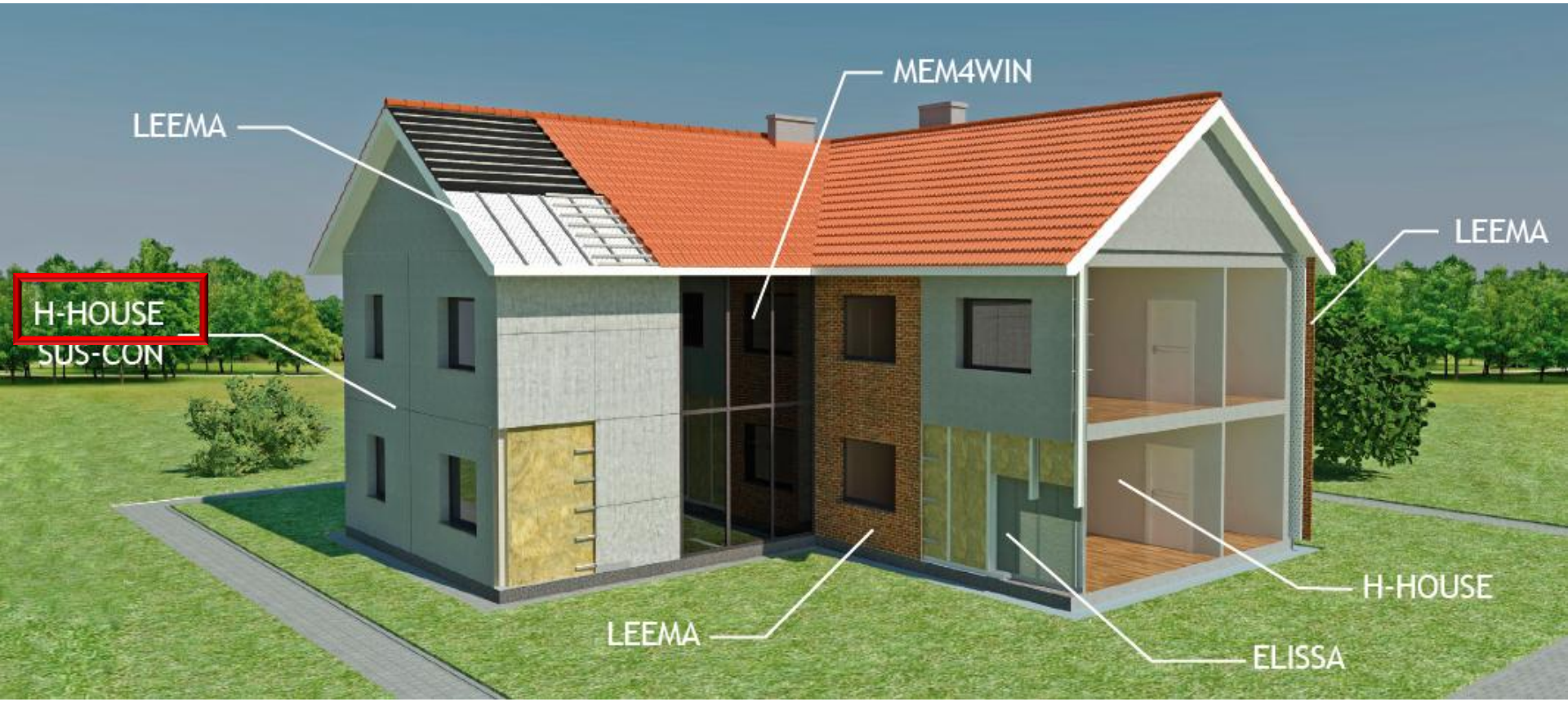
http://www.sus-con.eu/

Acknowledgements

Co-funded by the 7th framework programme of the European Union under grant agreement 285463

AMANAC Success stories - H-HOUSE



[H]house

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[H]house - Healthier Life with Eco-innovative Components for Housing Constructions

http://h-house-project.eu/

Oliver Kreft - Xella

EU Sustainable Energy Week 2016

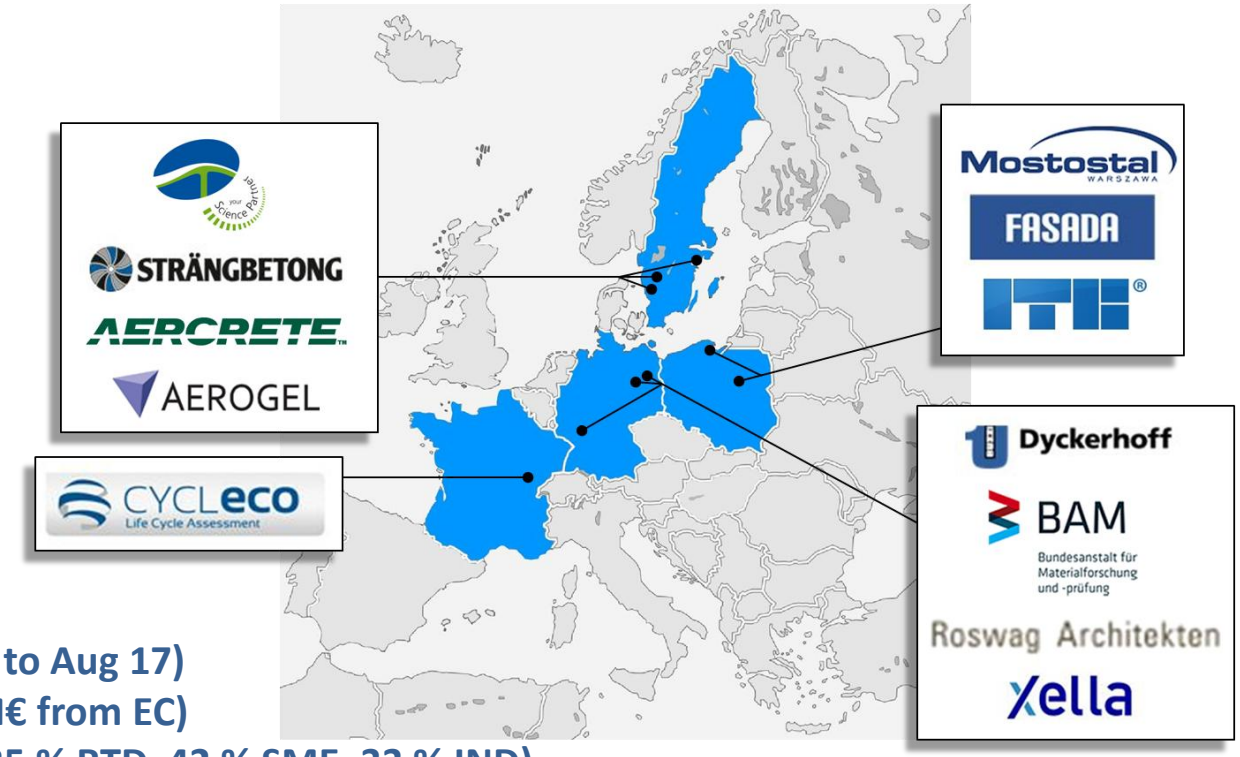
June 16, 2016 - Brussels

1. Introduction

Project goals: Development of building materials and components for external and internal walls, for both new buildings and renovation.

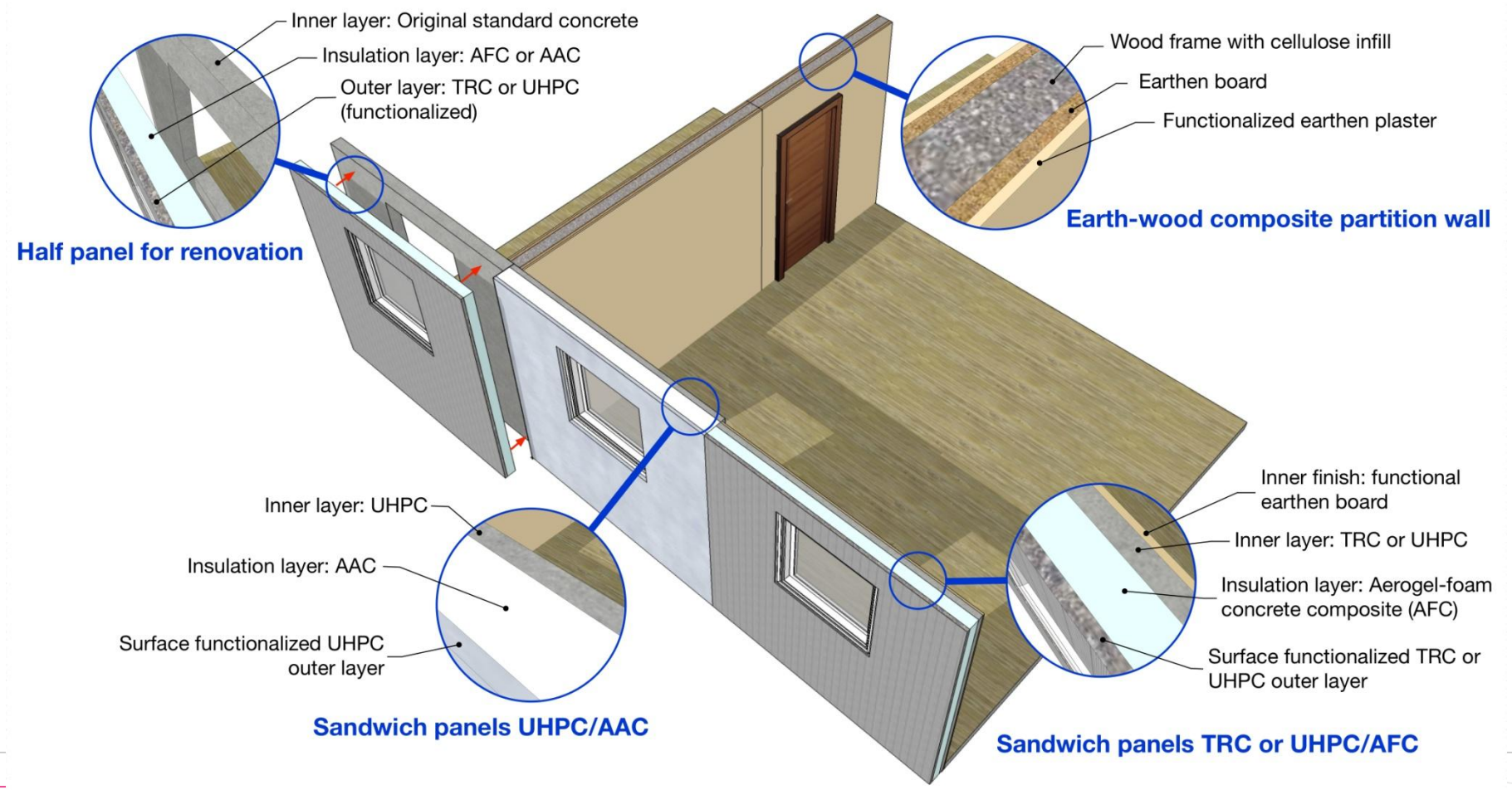
Improvement/tailoring of:

- Physical and chemical properties
- Indoor air quality
- Energy efficiency and sound insulation
- Embodied energy
- Durability, maintenance and service life



- **Duration:** 4 years (Sep 13 to Aug 17)
- **Funding:** 6.55 M€ (4.75 M€ from EC)
- **Consortium:** 9 partners (25 % RTD, 42 % SME, 33 % IND)

2. Conceptual design



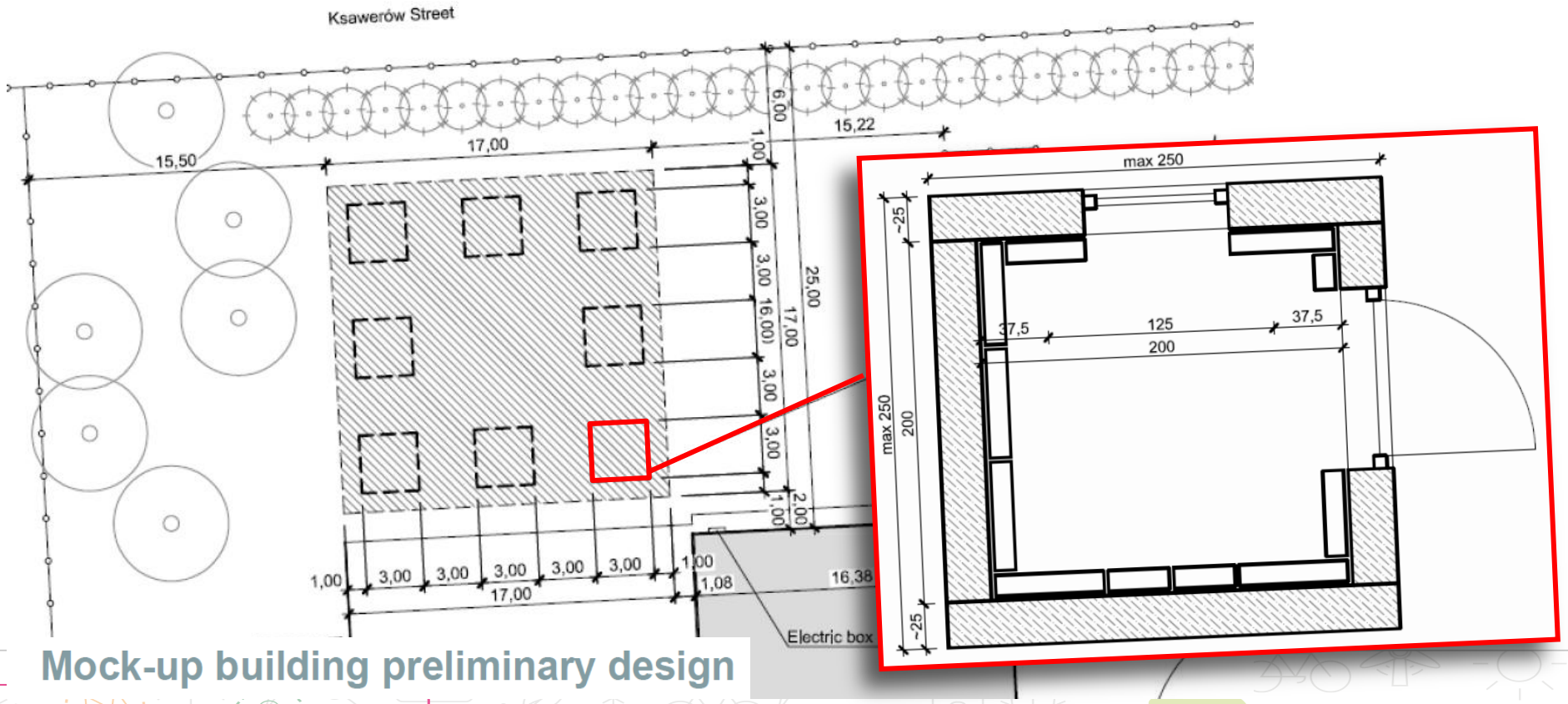
3. Key exploitable results

Exploitable Results (ER)	Key Project Partner	Key Performance Criteria
ER 1: New sandwich elements, thin, light-weight, non-inflammable	STR, CBI, BAM, FAS, DYC, CYC 	• improved durability: No corrosion, frost resistant and easy-to clean surfaces • Reduced embodied energy: No steel reinforcement, low clinker content, reduced thickness, lightweight • Superior thermal performance • Affordability
ER 2: Earthen plaster incl. aerogels with increased moisture buffering and air purification capacity	ROS, CBI, GEL 	Improved indoor environment quality by: • Increase of moisture buffer capacity in the interior • Adsorption of air-borne pollutants • Use of acoustic damping effects of layered composites
ER 3: Very low density Autoclaved Aerated Concrete (AAC) with improved resource- and energy efficiency	XEL, DYC, CYC	• Optimizing the carbon footprint • Minimizing the production costs • Meeting mechanical and (hygro)thermal target-values

Impact category	REFERENCE CEM I 42,5 R(R)	CEM II/A-S 52,5N	CEM II/B-P 42,5N	CEM II/B-M (V-LL) 42,5R	CEM III/A 42,5 N	CEM III/B 42,5 N	CEM V/A(S-P) 42,5 N
Non renewable energy [kwh]	0	3%	-2%	-5%	13%	19%	1%
Climate change [kg CO_2 eq]	0	-3%	-5%	-9%	-3%	-5%	-11%
Acidification [molc H^+ eq]	0	-1%	-5%	-9%	3%	4%	-8%
Terrestrial eutrophication [molc N eq]	0	-3%	-7%	-10%	-5%	-8%	-13%
Freshwater eutrophication [kg P eq]	0	10%	-4%	-6%	19%	29%	5%
Freshwater ecotoxicity [CTUe]	0	3%	-2%	-3%	7%	11%	1%
Land use [kg C deficit]	0	3%	49%	-2%	15%	21%	56%

4. Demonstrators

- Location 1: Warszawa, Poland (Mostostal)
- Location 2: Milano, Italy (Dyckerhoff/Buzzi)



Mock-up building preliminary design

5. Next steps

Protection and commercial realization of [H]house KERs:

- **Facade elements:**
  - Technology for **hydrophobation of concrete surfaces** (BAM) → PATENT
  - Technology for **micro-structuring of UHPC surface** (BAM/DYC) → SECRET KNOW-HOW
  - **New sandwich/new half-sandwich elements** (CBI/BAM) → SECRET KNOW-HOW
  - **Anchorage/connectors** for facade elements (MOS) → SECRET KNOW-HOW

- **New materials:**
  - **Foam concrete with low thermal conductivity** by incl. of aerogel (CNC/GEL) → UTILITY MODEL
  - Very low density **Autoclaved Aerated Concrete (AAC) with improved resource- and energy efficiency** (XEL) → SECRET KNOW-HOW
  - **High-Performance binder or binder compound** with reduced carbon footprint and concrete mix design for hydrothermal curing (DYC) → PATENT/SECRET KNOW-HOW

- **Improved indoor climate:**
  - **Increased moisture buffering by earthen plaster** by incl. of aerogel (Quartzene™) (ROS, GEL) → UTILITY MODEL

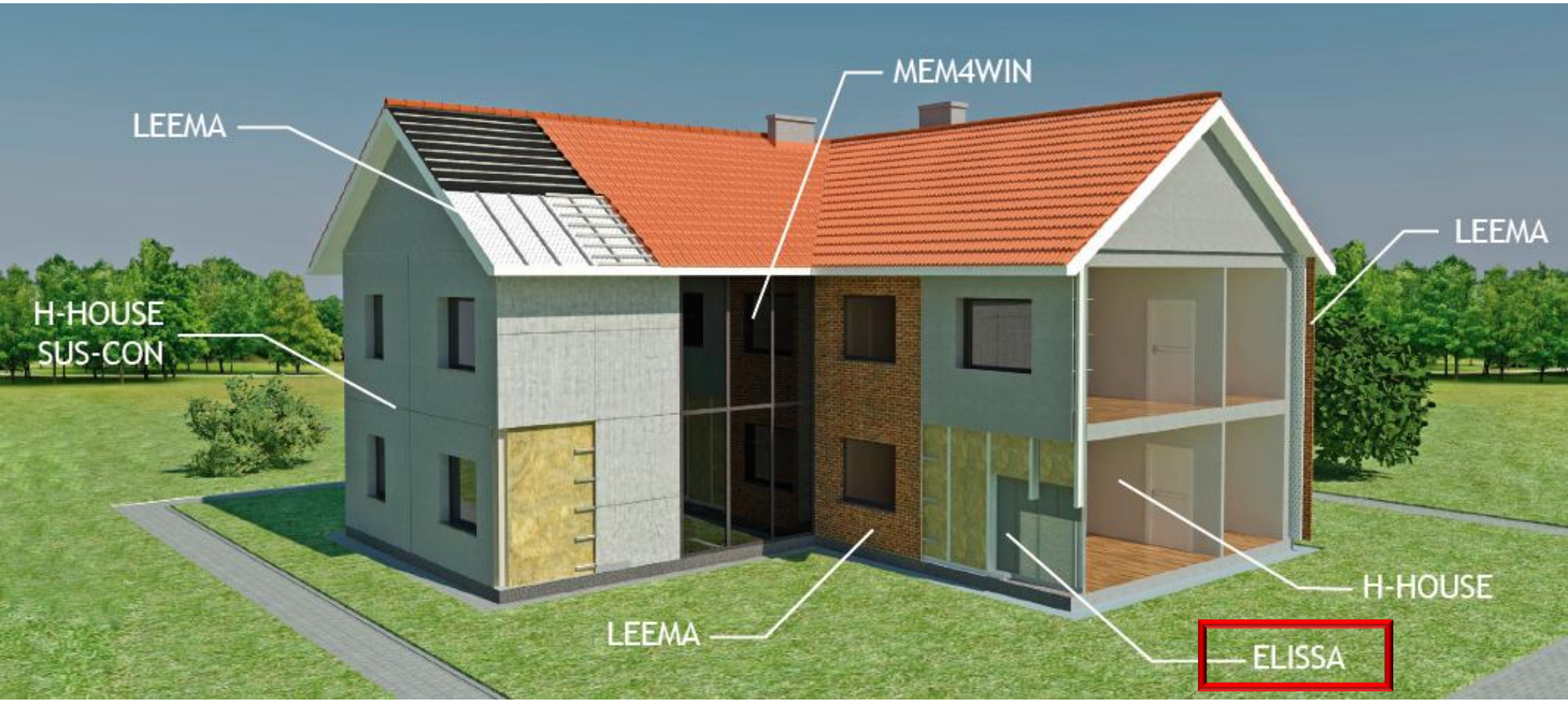
Exploitation will involve direct industrial use by industry partners, license agreements and consulting services.

6. Sum up

- **CONTACT INFORMATION**
  - Central coordinator: **Dr. Katarina Malaga**, CEO CBI Betonginstitutet, AB, Stockholm, Sweden
  - [H]house website: http://h-house-project.eu/

- **ACKNOWLEDGEMENT**
  - [H]house was made possible with the support of the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement no. 608893.
  - We wish to thank our project officer Monique Levy for her overall great support of the [H]house project

AMANAC Success stories -ELISSA



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ELISSA: Energy efficient-Lightweight-Sustainable-Safe-Steel construction

www.elissa-project.eu

Hans Ulrich Hummel – Knauf Gips KG

EU Sustainable Energy Week 2016

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www.elissaproject.eu

1. Introduction
2. Concept

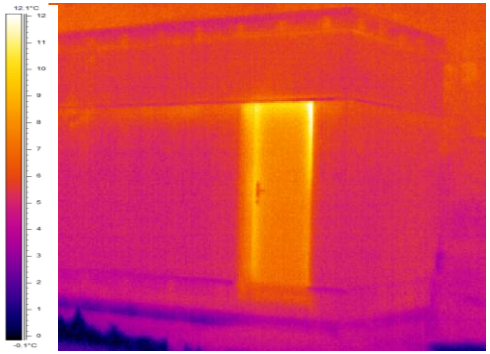
https://youtu.be/hboNkR9NHn0

- Project Duration: 3 years (Sep 13 to Aug 16)
- Consortium: 11 partners (45 % SMEs, 19 % IND,36 % RTD)

www.elissaproject.eu

3. Key Results
4. Demonstrators

- **Quantified improvement in thermal/fire/seismic results:**
  - The ELISSA wall is approximately 45% thinner and at least 75% lighter than a typical masonry wall in North/Central Europe with at least 60% lower U-value.
  - The energy dissipation capacity is 2.0 times higher than for a Central/North Europe brick wall and 1.4 times higher than for South Europe brick wall
  - The ELISSA internal and excternal walls satisfy the most stringent fire design requirements for typical multi-storey buildings. All walls achieved more than 120 minutes resistance to fire.
- **Demonstrators:**
  - Two mock- ups: For thermal and seismic monitoring
  - Excellent thermal performance: Elimination of thermal bridges
  - Large scale facade fire testing



5. Next Steps

- **Mass production** of the ELISSA prefabricated lightweight steel modules
- Development **of logistics for mass production**-transportation-installation
- **Large scale demonstration** of prefabricated elements, VIPs, intumescent paints, Active Damping Device in real conditions in different countries

www.elissaproject.eu

6. Sum up

CONTACT INFORMATION:

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Hummel.Hans-Ulrich@knauf.de

Project Coordinator: Prof. M. Founti - National Technical University of Athens

mfou@central.ntua.gr

LINKS:

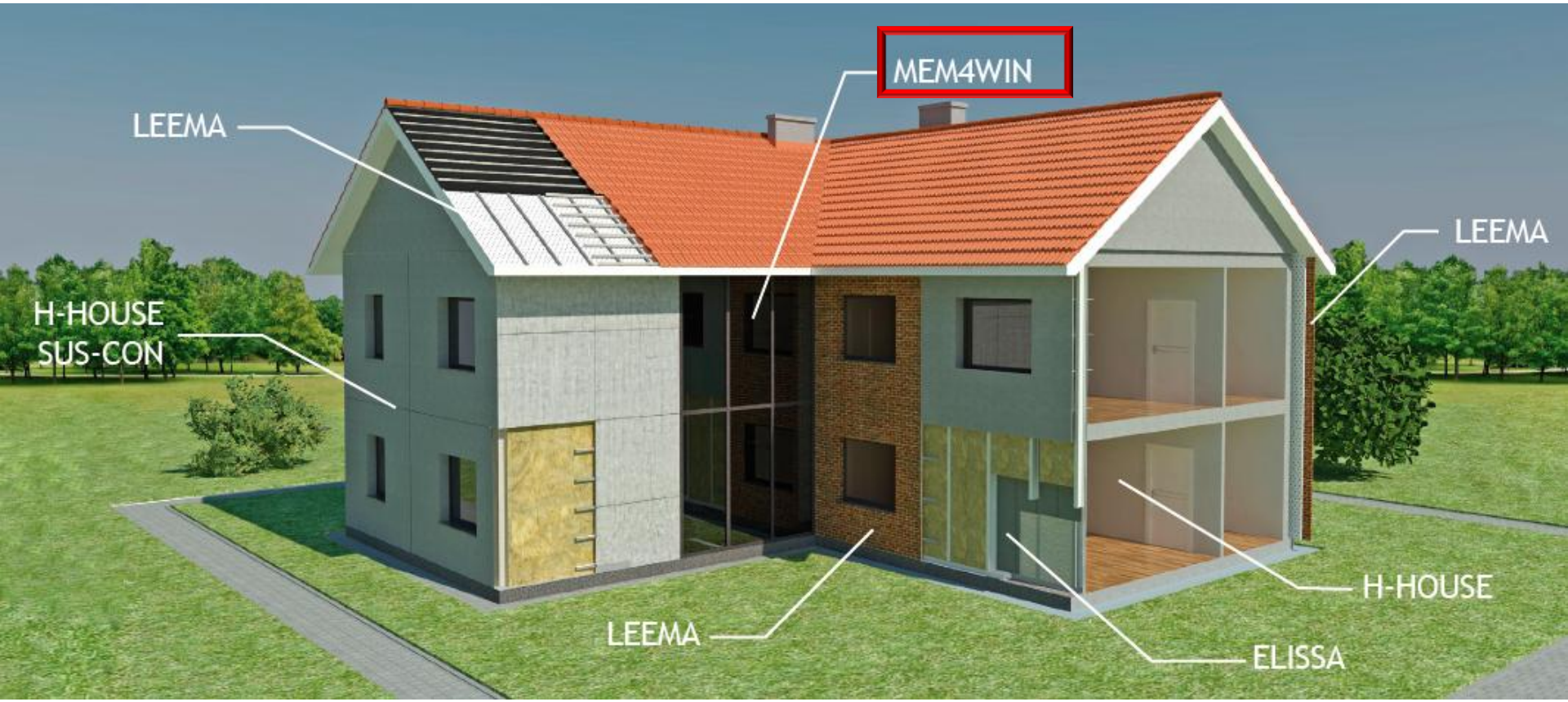
Project website: www.elissaproject.eu

Publications: http://elissaproject.eu/publications

EU web site: http://cordis.europa.eu/project/rcn/108700_en.html

This project has received funding from the European Union Seventh Framework Programme (FP7/2007-2013) under grant agreement nº 609086.

AMANAC Success stories – MeM4WIN



MEM4WIN
ADVANCED TECHNOLOGIES FOR SMART WINDOWS

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MEM4WIN

www.mem4win.eu

Andreas Mader – LiSEC Austria GmbH

EU Sustainable Energy Week 2016

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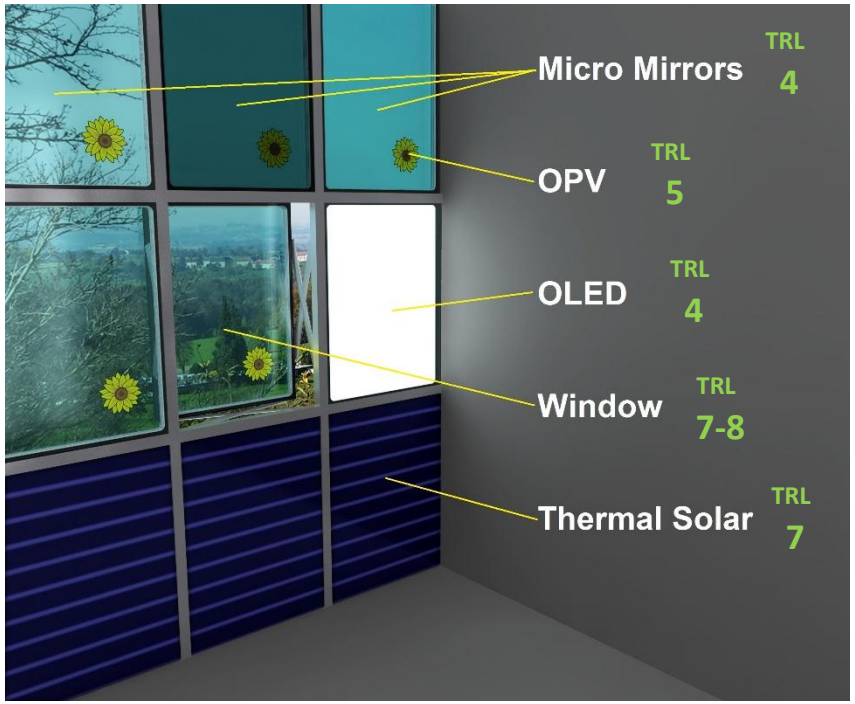
1. Introduction

Targets:

- Intelligent shading and light control
- Power generation (electrical, thermal)
- Integrating lighting
- Reducing weight (-50%) and costs (-15%)
- Appearance ("frameless sash")
- Lowering the U value further (down to 0.3 W/m²K)



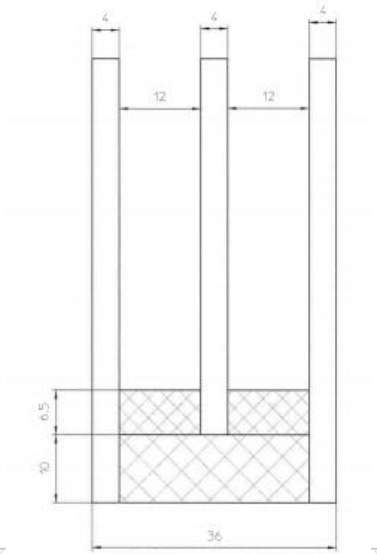
2. Key exploitable results

1 of 12 Exploitable Results:

Market Standard:

Triple

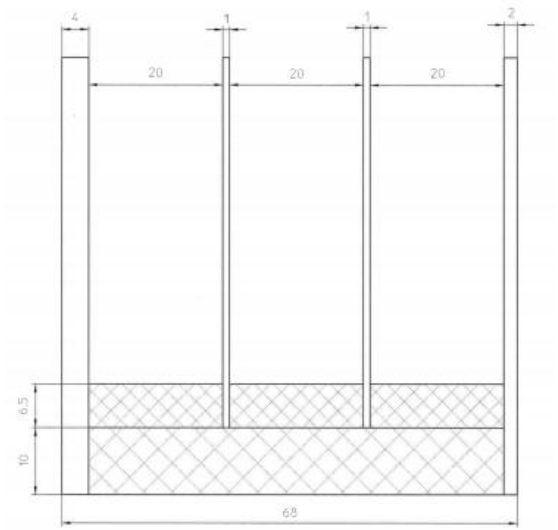
4x12x4x12x4



New Smart Design:

Quadruple ultra light

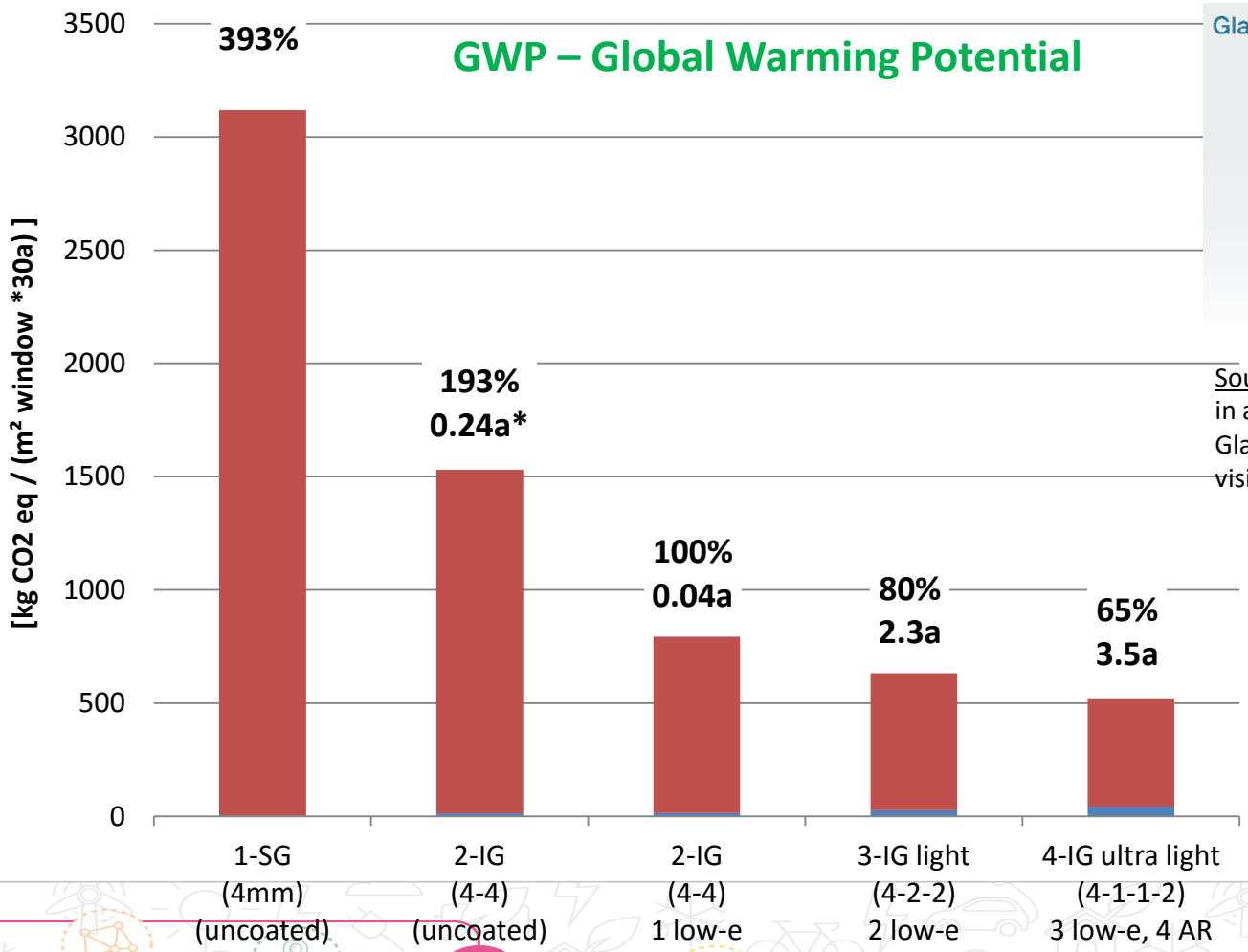
4x20x1x20x1x20x2

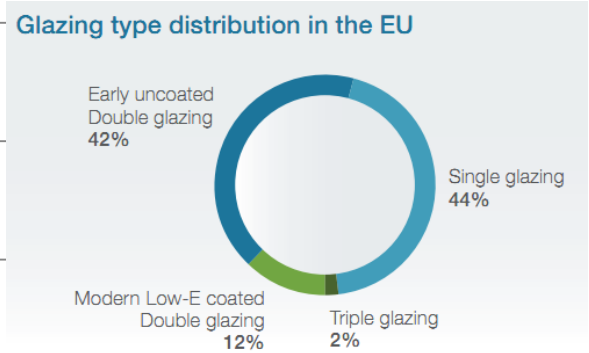


With a Smart Design you get:

- U-Value of 0,3 W/m²K
- Transmission higher than Triple Glass
- High Durability
  (because of low Isochore Preasure)
- Low Weight (less than Triple Glass)
- Low Carbon Footprint
  (because of Top Performance and Low Energy Consumption in Production)
- Higher Optical Quality of the façade
  (Excellent façade appearance)

2. Key exploitable results



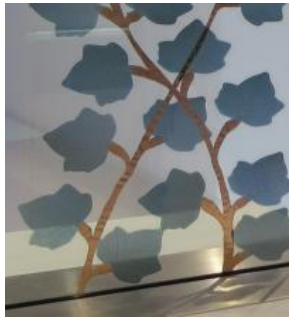


Source: Report „Europe´s flat glass industry in a competitive low carbon economy", Glass for Europe, www.glassforeurope.com, visited in June 2016

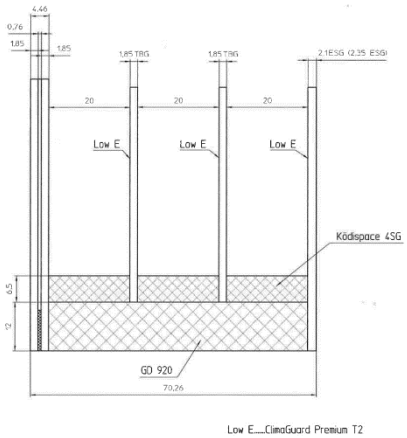
* amortization time (ecological) of additional manufacturing effort (related to preliminary stage)

3. Demonstrators

Update Façade Demonstrator



OPV



Solar Thermal Collector

- Optical Efficiency: >80%
- Functional (including piping system)

Quadruple IG-Unit

- U-Value: 0.3 W/m²K
- G-Value: 0.52
- Transmission: > 75 %
- Gas loss rate: < 0.6 %/a

3 of 32 Demonstrators

4. Next steps

- **If we commit to lowering Carbon Footprint, triple light and quadruple glazing become a must!**

- **Be a Front Runner and use quadruple IG-Units for Public Buildings (EU, National, Convent of Mayors, . . .)**

- **Demo Projects will be a good driver to get a high market acceptance (TRL9)**

- **Quadruple light (4/2/2/2)**
  - TRL 8 → ready to prepare for market launch

- **Prepare for additional 15% lowering of GWP: Quadruple ultra light (4/1/1/2)**
  - Certification
  - Standardization (Limit EN 12150 is now > 2mm +-0,2mm)

5. Contacts

Exploitable Result	Contact
tempered ultra-thin glass membranes	LiSEC, Markus Jandl markus.jandl@lisec.com
novel lamination technology (encapsulation of functional layers in glass-glass modules)	LiSEC, Markus Jandl markus.jandl@lisec.com
quadruple insulated glass unit	LiSEC, Andreas Mader andreas.mader@lisec.com
frame-less, openable window for application in facades	LiSEC, Andreas Mader andreas.mader@lisec.com
solar-thermal collector (fully integrated in IG-unit)	Energy Glas, Mirco Franke mirco.franke@energy-glas.de
doped CVD Graphene (direct transferred transparent contacts)	CNR, Giovanni Bruno giovanni.bruno@cnr.it
CVD Graphene growth equipment	Aixtron, Dr. Alex Jouvray a.jouvray@aixtron.com
LPE Graphene ink	University of Cambridge, Andrea .C. Ferrari acf26@hermes.cam.ac.uk
graphite ink	TIGER, Iurii Gnatiuk iurii.gnatiuk@tiger-coatings.com
micro mirror arrays	University of Kassel, Prof. Dr. Hartmut Hillmer hillmer@ina.uni-kassel.de
OPV glass-glass module (direct inkjet printed organic PV cells)	Belectric OPV, Tobias Sauermann tobias.sauermann@belectric.com
industrial large-format OPV inkjet printer	DURST, Eugen Maier e.maier@durst-online.at

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