



---

# The industry roadmap for more energy efficient buildings in Europe

**Stefano Carosio**  
**EeB PPP AIAG Co-ordinator**

**[stefano.carosio@dappolonia.it](mailto:stefano.carosio@dappolonia.it)**

# The industry vision and long term strategy



**Trends and scenarios**  
**Industry objectives and vision**  
**Strategic targets (Recovery Plan, SET plan, ...)**

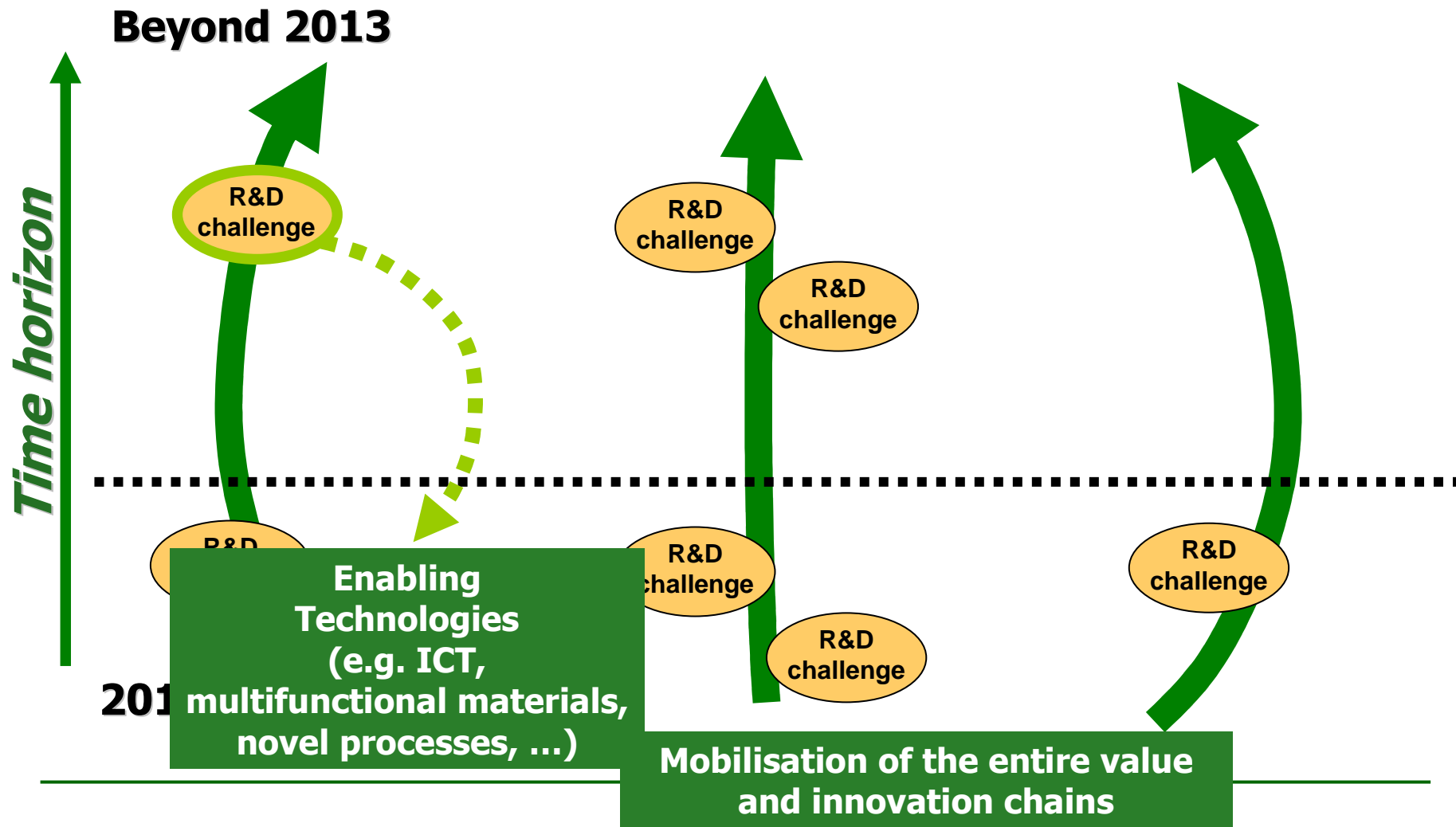
**Key pillars:**

- **Systemic approach (Globally optimised, locally designed)**
- **District potential**
- **Geoclusters**

**STEP 1** Reducing the energy consumption of buildings and its negative impacts on environment (main goal within the PPP EeB 2010-2013)

**The built environment today**

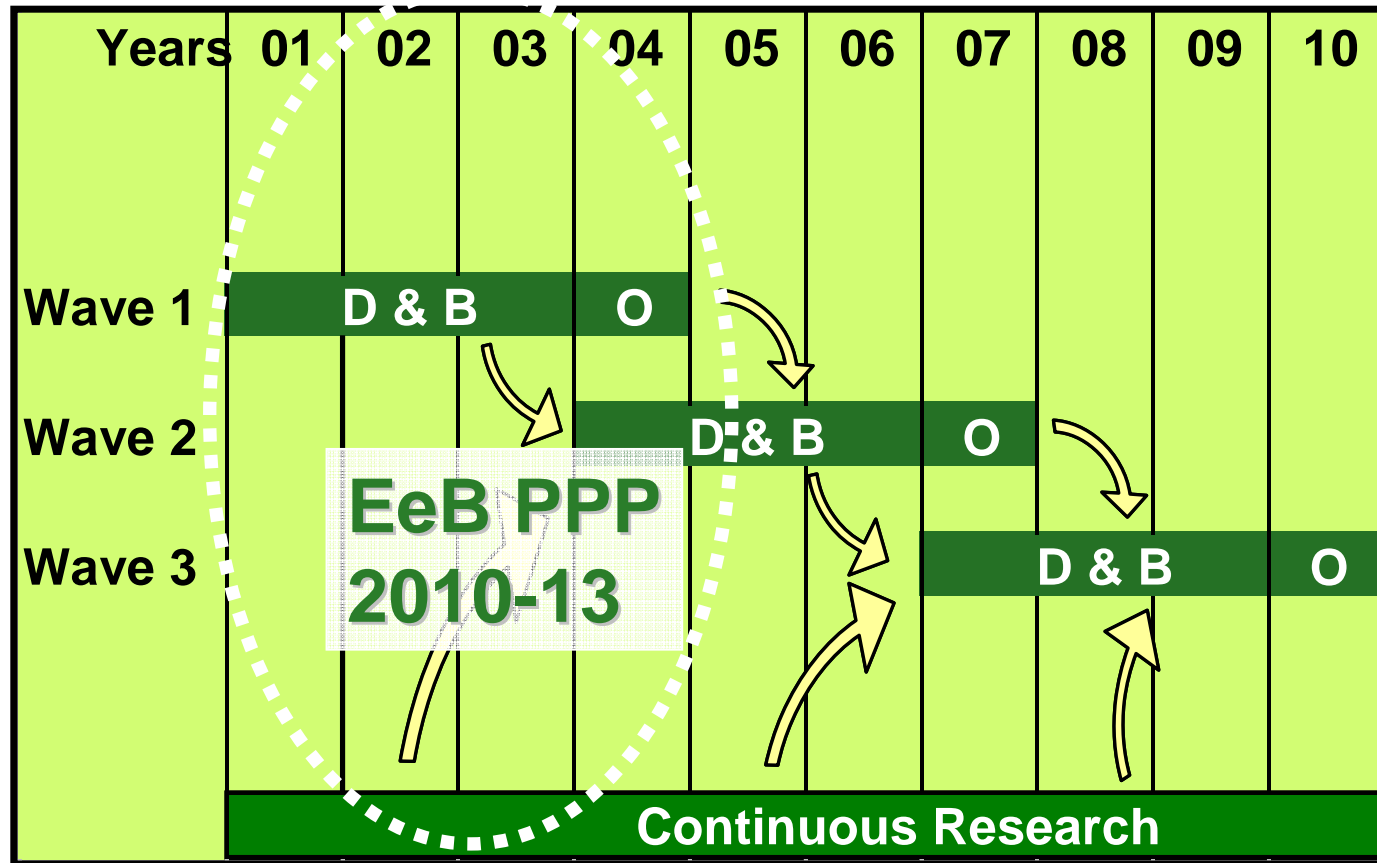
# The industry vision and long term strategy



# The industry vision and long term strategy



## EeB PPP as first wave of a long term industrial strategy



# The roadmapping process

## SRAs Analysis

• SRAs and Implementation Plans from 37 ETPs have been analyzed

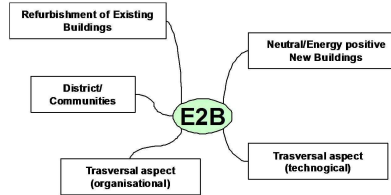


Strategic Research Agendas for the European Research Sector  
 Artemis Strategic Research Agenda  
 EuMaT  
 NEST

## Common targets and multi-disciplinary links have been identified

LEVEL 1 Construction (ECTP)	LEVEL 2 Efficient use of underground city space	LEVEL 3 New materials for waterproof and self-caulking, insulation, fire safety, all being strong enough to withstand ground pressures, flexible enough to absorb ground movements and with high durability in an underground environment
Construction (ECTP)	Efficient use of underground city space	Construction processes for large underground spaces below cities and interurban connections
Construction (ECTP)	Efficient use of underground city space	Special devices for ground conditioning, ventilation, air regeneration and conditioning, exhaust absorption, communications, transport systems, ground water treatment
Construction (ECTP)	Efficient use of underground city space	Air-conditioning
Construction (ECTP)	Efficient use of underground city space	Artificial sun
Construction (ECTP)	Mobility and Supply through Efficient Networks	Multimodal use against monomodal use
Construction (ECTP)	Mobility and Supply through Efficient Networks	New infrastructure system for exchanging information among nodes or erators

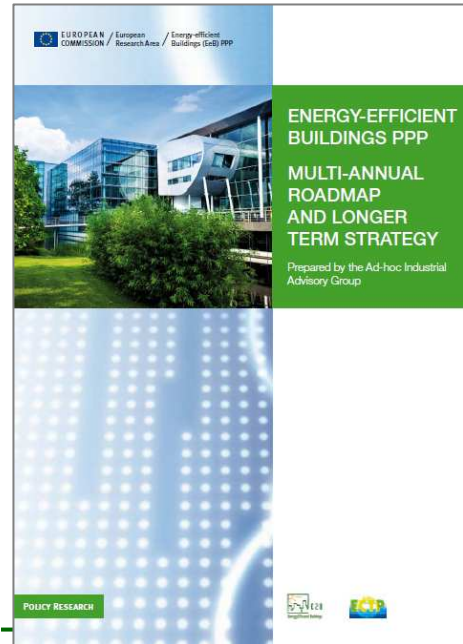
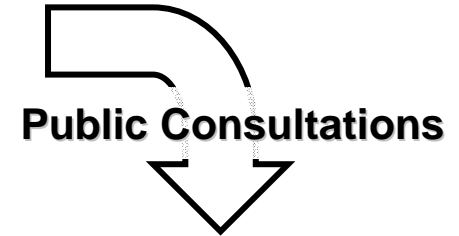
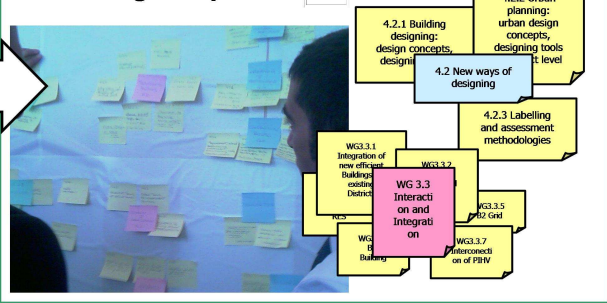
## Cross-check and harmonization



## Inputs from Stakeholders (channeled through E2BA) more than 200 contributions

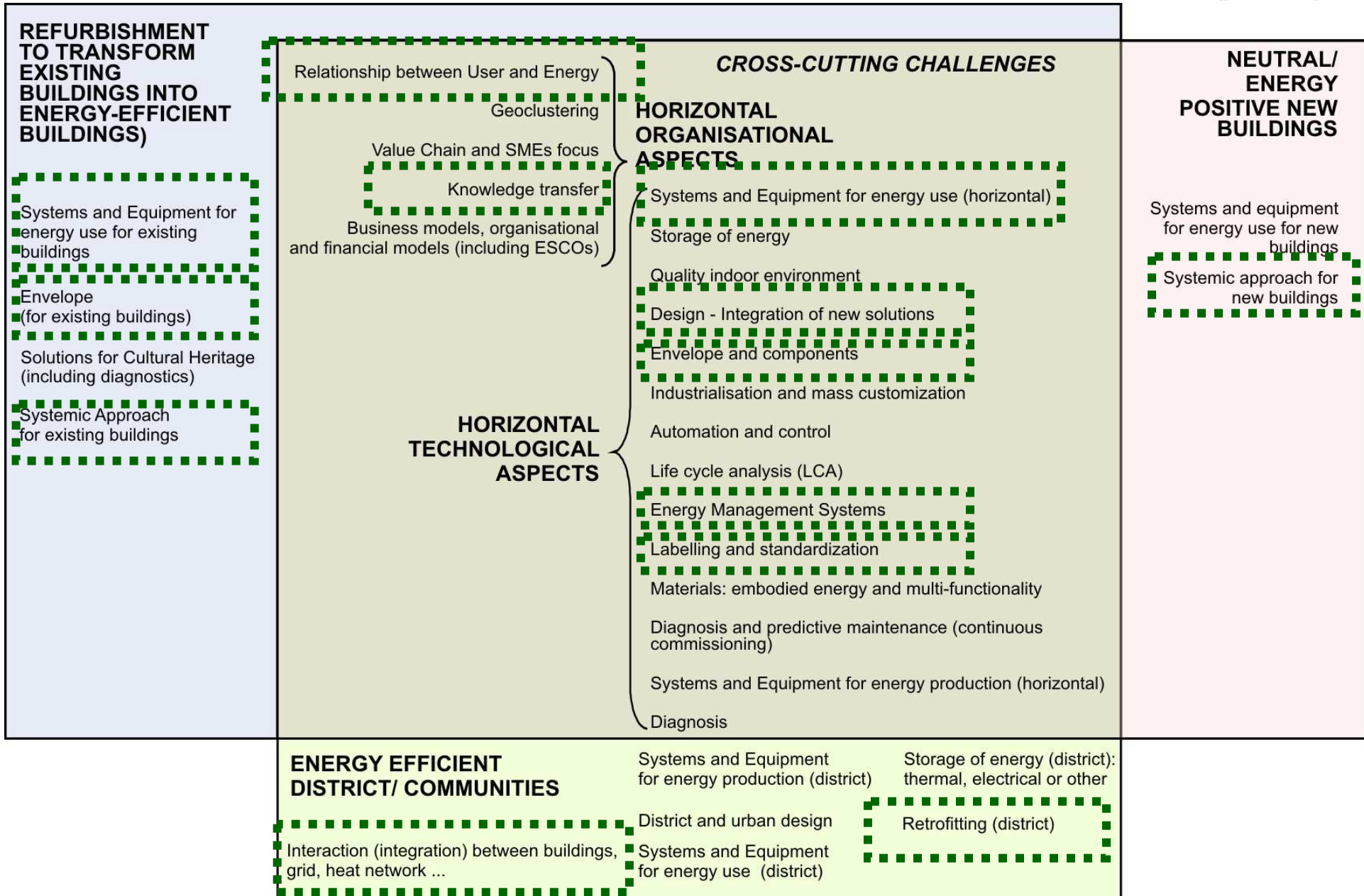
WG1	WG2	WG3	WG4
WG1 - Work at Building Level	WG2 - Work at Building Level	WG3 - Work at Building Level	WG4 - Work at Building Level
<p>Name: Andrew Smith                      Email: andrew.smith@ec.europa.eu</p> <p>Title of the challenge gap (1-4.5 level):                      Innovations in roofing for enhanced energy efficiency</p> <p>Description of the challenge gap (1-4.5 level):                      Today's roofing is mainly based on asphalt or concrete. Innovations in roofing for enhanced energy efficiency include:                      • Barriers (technical): Energy-curable, thick polyurethane, elastomeric, life cycle, water, etc.                      • Descriptive: Description of the knowledge, technologies or tools (including financial or business models) which would be needed to address the technical (research) and not technical (i.e. certification, labelling) challenges gaps.</p>	<p>Name: Andrew Smith                      Email: andrew.smith@ec.europa.eu</p> <p>Title of the challenge gap (1-4.5 level):                      Innovations in roofing for enhanced energy efficiency</p> <p>Description of the challenge gap (1-4.5 level):                      Today's roofing technology is mainly consisting of bitumen based membranes which are applied with trowel, exposing the workers to unhealthy operating conditions.                      • Barriers (technical and/or not technical): Energy efficiency requirements are currently addressed through thick polyurethane or polyurethane layers. Difficulties exist associated with the long life cycle and the exposure to weathering phenomena.                      • Description of the knowledge, technologies or tools (including financial or business models) which would be needed to address the technical (research) and not technical (i.e. certification, labelling) challenges gaps.</p>	<p>Name: Andrew Smith                      Email: andrew.smith@ec.europa.eu</p> <p>Title of the challenge gap (1-4.5 level):                      Innovations in roofing for enhanced energy efficiency</p> <p>Description of the challenge gap (1-4.5 level):                      Today's roofing technology is mainly consisting of bitumen based membranes which are applied with trowel, exposing the workers to unhealthy operating conditions.                      • Barriers (technical and/or not technical): Energy efficiency requirements are currently addressed through thick polyurethane or polyurethane layers. Difficulties exist associated with the long life cycle and the exposure to weathering phenomena.                      • Description of the knowledge, technologies or tools (including financial or business models) which would be needed to address the technical (research) and not technical (i.e. certification, labelling) challenges gaps.</p>	<p>Name: Andrew Smith                      Email: andrew.smith@ec.europa.eu</p> <p>Title of the challenge gap (1-4.5 level):                      Innovations in roofing for enhanced energy efficiency</p> <p>Description of the challenge gap (1-4.5 level):                      Today's roofing technology is mainly consisting of bitumen based membranes which are applied with trowel, exposing the workers to unhealthy operating conditions.                      • Barriers (technical and/or not technical): Energy efficiency requirements are currently addressed through thick polyurethane or polyurethane layers. Difficulties exist associated with the long life cycle and the exposure to weathering phenomena.                      • Description of the knowledge, technologies or tools (including financial or business models) which would be needed to address the technical (research) and not technical (i.e. certification, labelling) challenges gaps.</p>

## Clustering of inputs

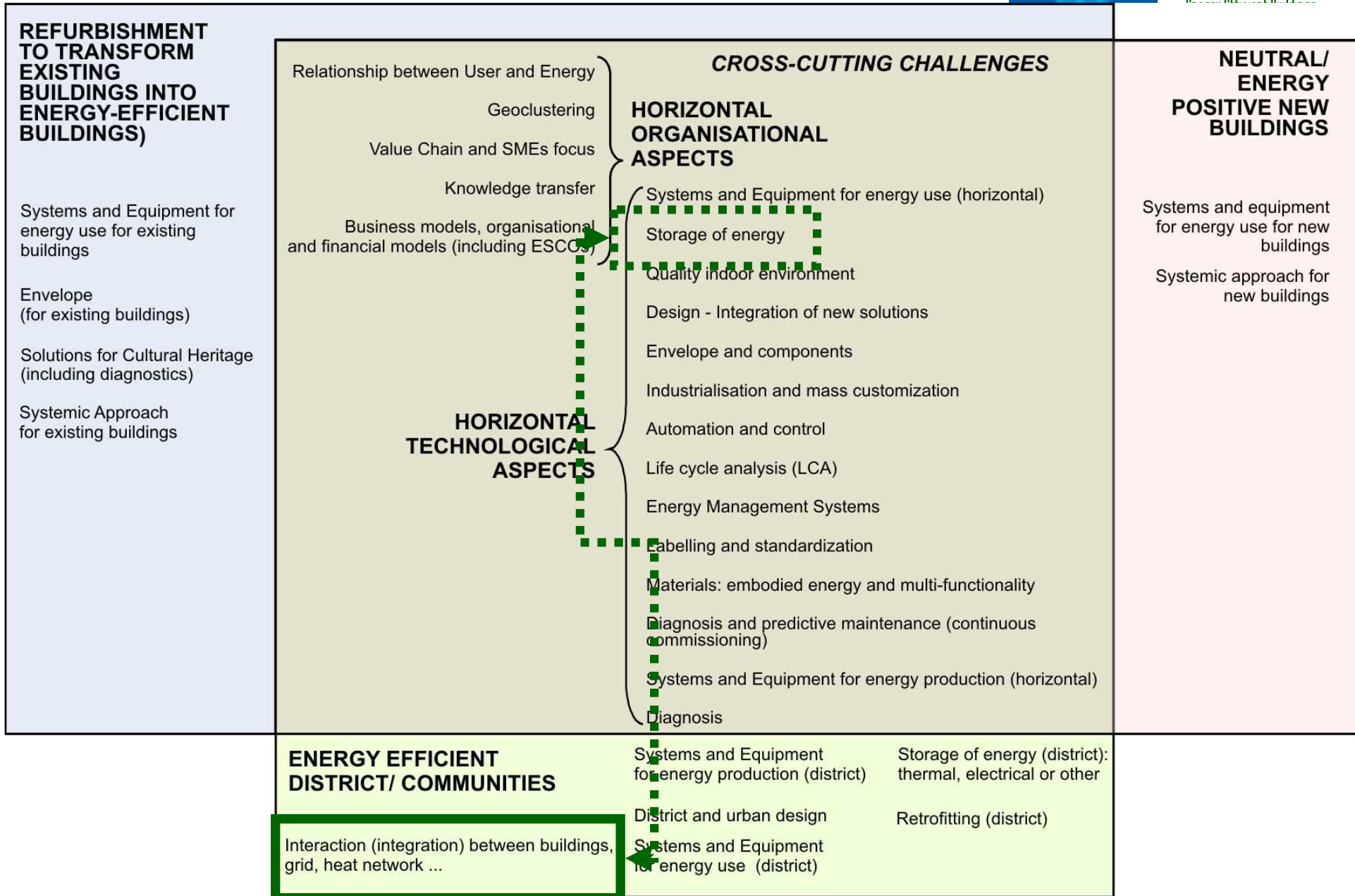


List of Research Priorities

# Research priorities



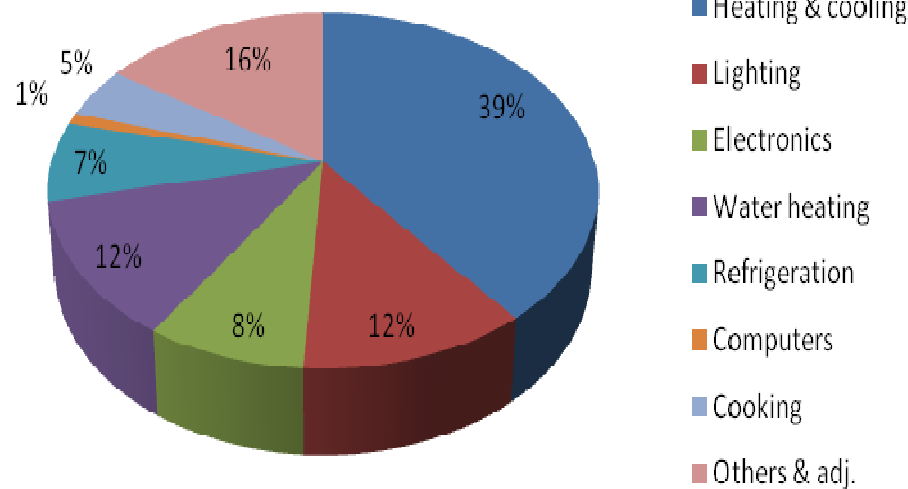
# Logical links with other challenges



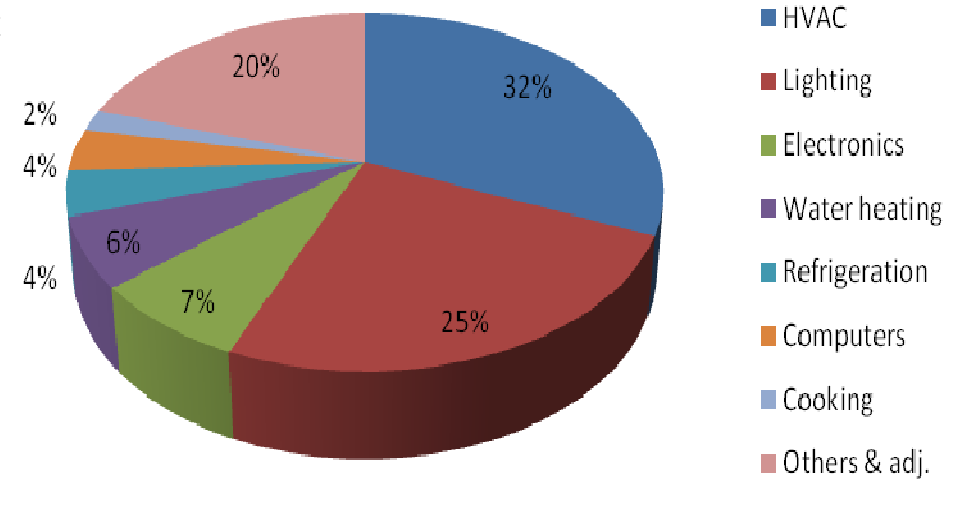
# Addressing (water) heating demand: indeed a priority



## Residential Sector



## Commercial Sector



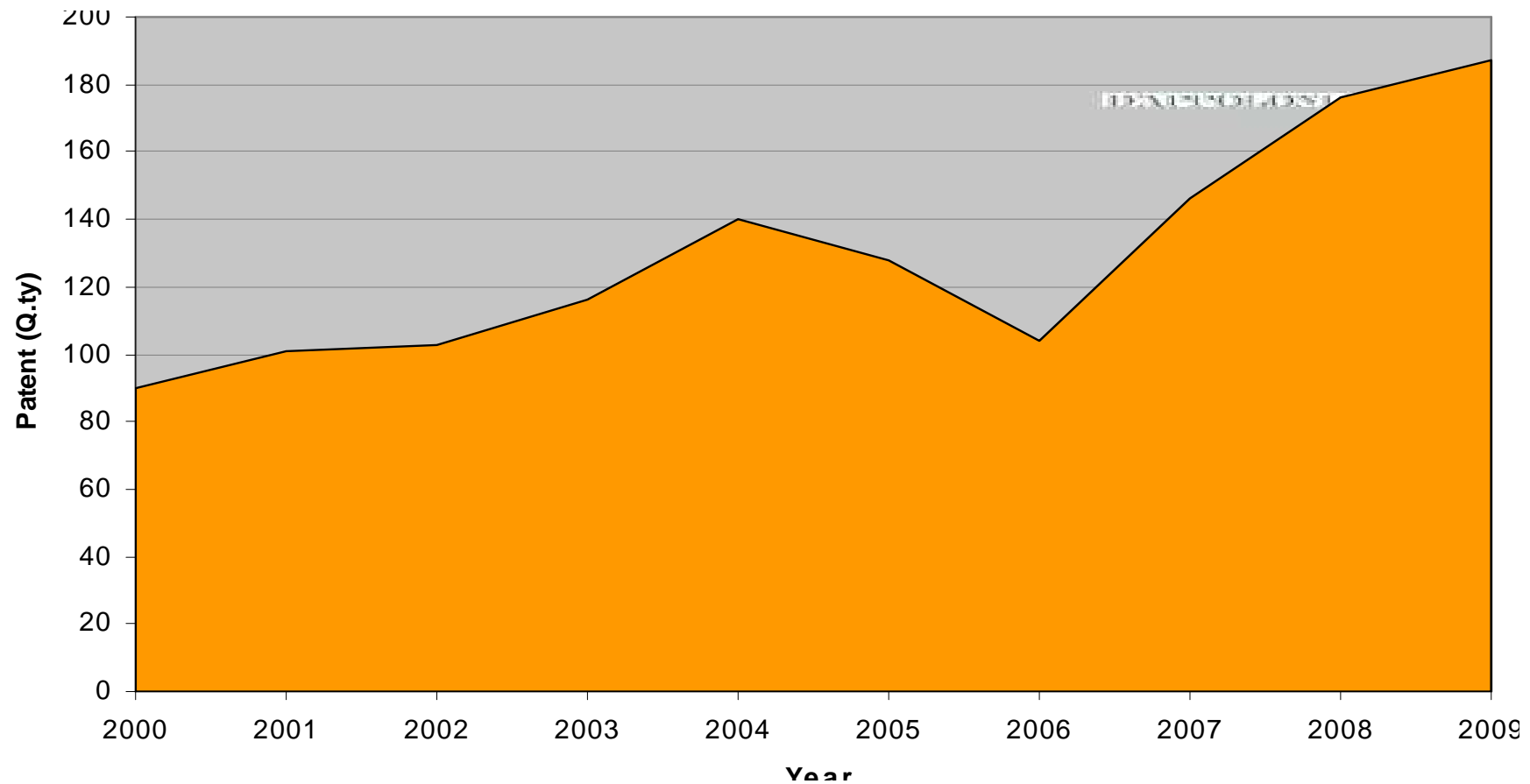
Source: DoE



# Addressing (water) heating demand: indeed a priority



## Patents' trends reveal constant industrial interest and innovations



IPC code: F24D

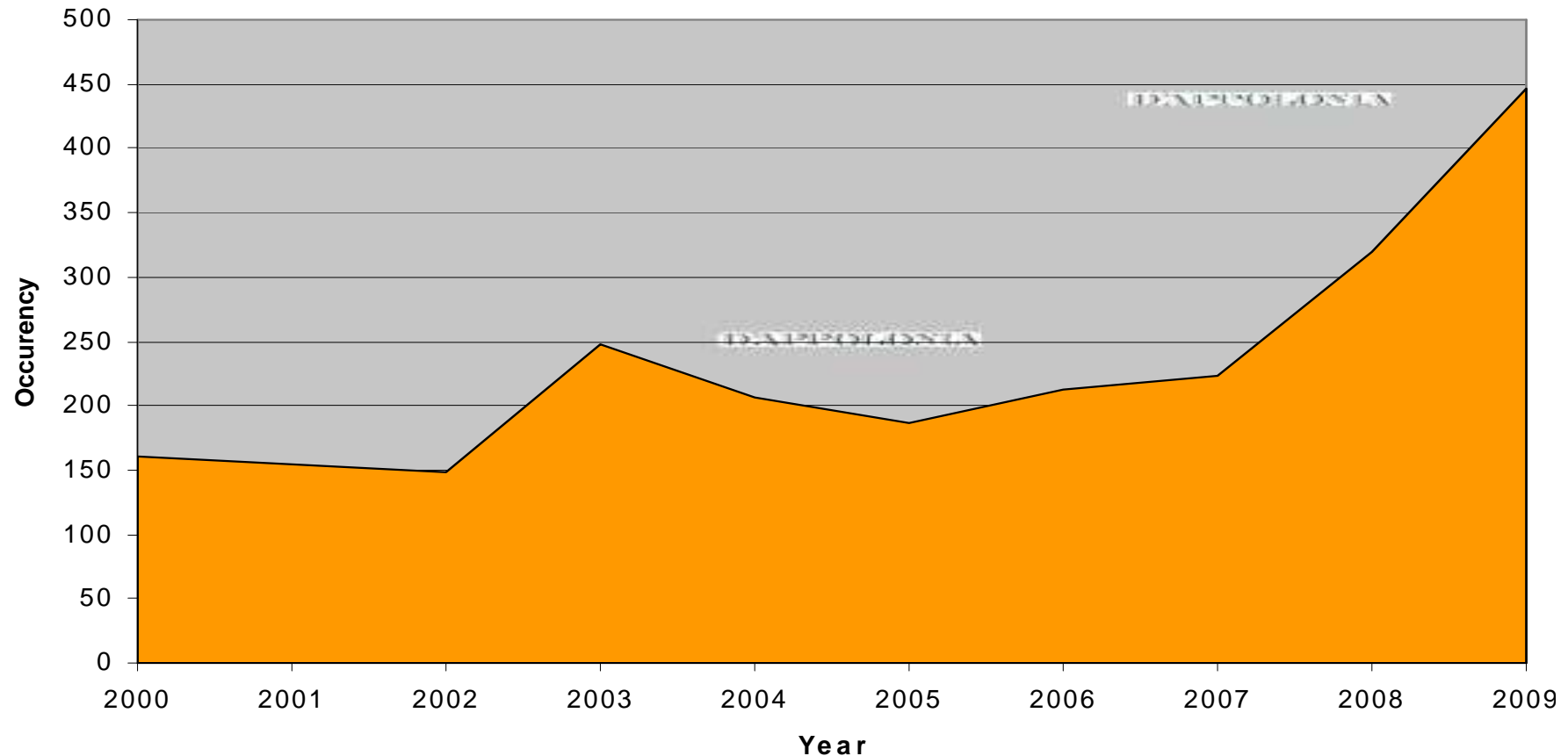
Keywords: "space heating or sanitary or domestic water"

[www.e2b-ei.eu](http://www.e2b-ei.eu)

# Addressing (water) heating demand: indeed a priority



## Scientific Publications' trends reveal increasing S&T activity



Engineering Village DB code: 643

Keywords: "space heating or sanitary or domestic hot water"

# Multiannual Roadmap

	2011	2012	2013
<b>Research</b>	<p>Envelope (components) for existing buildings, with a link to materials (multifunctionality and embodied energy)</p> <p>Systems and Equipments for energy use for existing buildings (focus on space heating and hot domestic water)</p> <p>Envelope and retrofiting</p> <p>Systemic approach (link to Quality of the Indoor Environment)</p>	<p>Interaction (Integration) between buildings, grid, heat network...</p> <p>Systems and Equipments for energy use (including production and storage)</p> <p>Relationship between User and Energy, leveraging on ICT tools</p> <p>Systemic Approach, for existing buildings (including integration of ICTs...)</p> <p>Energy Management Systems</p>	<p>Systems and Equipments for energy use</p> <p>Retrofitting (at district level) (including cost effective integration of emerging technologies)</p> <p>Envelope and components, enabled by latest advances in multifunctional materials and nanotechnology</p> <p>Design – Integration of new solutions, focus on assessment, simulation and visualization techniques to support decision making, removing gaps between prediction and reality.</p> <p>High efficiency retrofiting of buildings (including systems and equipment, ICTs...)</p> <p>Control approaches (automated control)</p> <p>Envelope (components) for existing buildings, with links to cultural heritage</p> <p>Labelling and standardisation</p>
<b>Demonstration</b>	<p>Envelope and Systems and Equipment for energy use</p>	<p>Cost effective zero energy new buildings in districts</p> <p>Envelope, Systems and Equipments for energy use for existing buildings</p>	<p>Retrofitting (at district level)</p> <p>Interaction (Integration) between buildings, grid, heat network...</p> <p>Large scale demonstration including new technologies (Envelope components, Systems and Equipments, ICTs...) and new business models</p>
<b>Coordination and Support Actions</b>	<p>Coordinated actions for systemic approaches in Europe (Geo-clustering)</p> <p>Relationship between User and Energy</p> <p>Labelling and standardization (focus on LCA)</p>	<p>Labelling and standardization (including business models, impact assessment, ...)</p> <p>Knowledge transfer (including value chain and SMEs)</p>	

*Dynamic plan/Living document*

## A key aspect: user behaviour!!



Source: [www.flickr.com](http://www.flickr.com)

# Acknowledgements

## CONTRIBUTORS TO THIS DOCUMENT

In the following list the members of the Ad-hoc Industrial Advisory Group who have contributed to the preparation and editing of the document are reported, but many other contributors have provided their views during an open consultation process.

*Acciona (ES):* Javier Grávalos, José Javier de las Heras  
*ACE/CAE (B):* Adrian Joyce  
*Apintech (GR):* Nikos Sakkas  
*Arup (UK):* Rupert Blackstone, Marta Fernández, Jeremy Watson  
*Afos Origin (ES):* Ignacio Soler Jubert  
*BIC (SE):* Åke Skarendahl  
*Bouygues Construction (FR):* Paul Cartuywels, Frédéric Gal, Alain Vassal  
*BSRIA (UK):* Andrew Eastwell  
*Centro Ceramico Bologna (IT):* Arturo Salomoni  
*ClimateWell (SE):* Mats Fällman  
*CSTB (FR):* Luc Bourdeau, Alain Zarli  
*D'Appolonia (IT):* Stefano Carosio (Coordinator), Guido Chiappa, Raimondo De Laurentiis, Mattia Fabbri, Nicolò Olivieri, Sergio Segreto  
*ECN (NL):* Ivo Oostelten



***In close cooperation with the EC interservice Group  
under the coordination of the NMP Theme***

*Fimpro (NL):* Bruno Smets  
*Saint-Gobain (FR):* Roger De Block, Jean-Marie Thouvenin  
*SAP (DE):* Silvio Semprini  
*Schneider Electric (GR):* Polydefkis Loukopoulos  
*Solintel (ES):* J. Antonio Barona  
*Stiebel Eltron (DE):* Holger Thamm  
*Telefonica (ES):* Enrique Fernando Menduïña  
*TNO Built Environment and Geosciences (NL):* Olaf Adan  
*VTT (FI):* Matti Hannus, Markku Virtanen  
*ZRMK (SL):* Marjana Sijanec  
*Züblin AG (DE):* Rainer Bareiß, Norbert Pralle



---

# Thank you for your attention!!

**stefano.carosio@dappolonia.it**  
**secretariat@e2b-ei.eu**