

# Energy-efficient Buildings contractual Public-Private Partnership (EeB cPPP) 2018 Progress Monitoring Report

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## 1. Executive summary

The construction sector is crucial to EU environment and energy policies as buildings use 40 % of total EU energy consumption and generate 36% of greenhouse gases in Europe. There is a crucial need of innovation to deploy energy-efficient and low-carbon solutions in the built environment, to avoid facing in long-lived inefficient buildings assets for decades to come.

The Energy-efficient Buildings (EeB) cPPP is a partnership between the European Commission (EC) and the private sector as represented by the private members of the EeB cPPP Partnership Board and supported by the Energy Efficient Buildings Committee (E2B) of the European Construction, built environment and energy efficient building Technology Platform (ECTP).

The EeB cPPP intends to:

- create and integrate innovative technologies and solutions enabling to reduce energy consumption and GHG emissions in line with the 2020 goals as stated by the EC;
- turn the building industry into a knowledge-driven sustainable business, with higher productivity and higher skilled employees;
- develop innovative and smart systemic approaches for green buildings and districts, helping to improve competitiveness of the EU building industry, with an enhanced user-centric approach;

The EC supported **110 projects** through the EeB cPPP initiative under **FP7**. Within **Horizon 2020**, the EC is now supporting **58 new projects** selected under the 2014, 2015, 2016 and 2017 EeB calls. 13 new projects – i.e. 2 Research and Innovation Actions (RIAs), 10 Innovation Actions (IAs) and 1 Coordination and Support Action (CSA) - were selected on the 2017 call under 5 new topics.

In the context of the 2018 progress monitoring survey, the whole set of 168 projects (FP7 + H2020) was contacted in March 2018, with a 82% response rate including an 100% response rate from the H2020 projects.

Key analytics of the overall projects portfolio composition:

- **Average duration per project: 42,5 months for H2020** (43,2 months for both FP7 & H2020);
- **Average EU funding per project: 4 520k€ for H2020** (4 868k€ for both FP7 & H2020);
- **90% of the 58 H2020 projects are still currently being implemented** (while 88% of the 110 FP7 projects are now completed).

The following trends are further observed in relation to cluster allocations of the overall portfolio:

- For both FP7 and H2020, the most important technology clusters are **Technology Building Blocks** (respectively 23% of the projects in FP7 and 27% in H2020) and **Energy performance monitoring & management** (respectively 30% of the projects in FP7 and 24% in H2020).
- The percentage of projects allocated to **BIM, Data and interoperability** has doubled (12% in H2020 compared to FP7 (6%)), while there is the opposite trend for the **ICT** category: 14% of the projects in FP7 versus 7% in H2020.
- **Design** remains the cluster with the lower number of projects (6% in FP7, 4% in H2020).
- A very slight increase of projects dealing with **Advanced materials and nanotechnology** and **Construction processes, end-of-life, cross-cutting information** in H2020 compared to FP7.

ECTP organised the first day of the 2017 Impact Workshop allowing to share success stories of the EeB cPPP. Also, the 6<sup>th</sup> edition of the EeB PPP Project review was released: it is a comprehensive directory of all projects. ECTP and its board members contributed to **more than 30 events** since the last Progress

Monitoring Report (over a period from June 2017 to April 2018). Notable events over the past period include for instance the 1<sup>st</sup> Workshop of the [Digitising European Industry](#) WG on Future Partnerships; participation to [SET Plan](#) Working Group 5; the EC Construction 2020 Thematic Group “*Stimulating investment in building renovation, infrastructure and innovation*”; [Construction 4.0 \(Digital Europe event\)](#); or a contribution to the [EU Sustainable Energy Week](#).

The overall progress of the EeB cPPP is currently in line with the contractual commitments. Current progress on monitored KPIs is promising given the early stage of implementation of a significant part of the H2020 projects.

**2017 progress monitoring results are demonstrating an overall increase compared to the previous PMRs on almost all monitored KPIs, both on those common to all cPPPs and on those specific to the EeB cPPP.**

EeB cPPP projects are mobilising private investment with a **leverage factor close to 4,87**, they enable the creation of new job profiles for the construction industry in relation to innovative technologies, and they generate a substantial impact (job creation and increased turnover) on SMEs that benefit from the EeB cPPP funding. The share of participation of SMEs in EeB cPPP projects has progressed from 28% (FP7 baseline) to 35% in H2020.

The whole set of 58 H2020 projects reported a total of **223 developed new systems and technologies**, as well as **88 non-technological innovations**. A **38,9% reduction of energy use** and a **40,6% reduction of CO2** is expected by the end of the projects. An average of **4,6 submitted scientific publications per project** was reported, and **6 spin-offs** have already been launched to exploit the innovative outcomes of the projects.

The EeB cPPP has a strategic positioning, as it represents the EU focal point of a scattered industry and transforming sector, and it provides a barometer of R&I activities in the EU for the Built Environment sector. It is an **instrument** to embrace the complexity of actors, challenges and innovation needs in a comprehensive and systemic way – being a pan-European ecosystem: it is Inclusive of **all (scattered) stakeholders** (Researchers, industrialists, owners, legislators, financiers, users associations, etc.), in a **multi-disciplinary** and open approach – linking the whole value chain from innovators to users/citizens, integrating different industries; and it transforms construction innovation in products and services, in turn serving European transitions, welfare and job.

## 2. Introduction

### 2.1. What is the challenge?

The construction sector is crucial to EU environment and energy policies as buildings use 40 % of total EU energy consumption and generate 36% of greenhouse gases in Europe. While the replacement rate of existing stock is very small (1-2% per year), the construction sector is on the critical path to decarbonise the European economy by 2050. This is a unique opportunity for sustainable business growth provided that products and related services for both new and refurbished buildings are affordable and of durable quality. Yet, the sector is highly fragmented (over 95% SMEs) and sensitive to economic cycles. As such there is a crucial need of innovation to deploy energy-efficient and low-carbon solutions in the built environment, to avoid facing in long-lived inefficient buildings assets for decades to come.



Figure 1 - EeB Challenge (European Commission, DG Research and Innovation, 2017)

### 2.2. What is the Energy-Efficient Buildings (EeB) cPPP?

The Energy-efficient Buildings (EeB) cPPP is a partnership between the European Commission (EC) and the private sector as represented by the Energy Efficient Buildings Committee (E2B) of the European Construction, built environment and energy efficient building Technology Platform (ECTP).

The multiannual EeB cPPP roadmap<sup>1</sup> is the document containing the research and innovation priorities of the private sector, which are essential inputs for the design of the research work programmes by the EC and the E2B Committee of the ECTP. To improve transparency, this partnership is based on a contractual agreement between the EC and the industry partners.

<sup>1</sup> Energy efficient Building - Multi-annual roadmap for the contractual PPP under Horizon 2020 – December 2013 - ISBN 978-92-79-31239-7 -

[http://e2b.ectp.org/fileadmin/user\\_upload/documents/E2B/0\\_EeB\\_PPP\\_Project-Reviews\\_Roadmaps/Eeb\\_cPPP\\_Roadmap\\_under\\_H2020.pdf](http://e2b.ectp.org/fileadmin/user_upload/documents/E2B/0_EeB_PPP_Project-Reviews_Roadmaps/Eeb_cPPP_Roadmap_under_H2020.pdf)

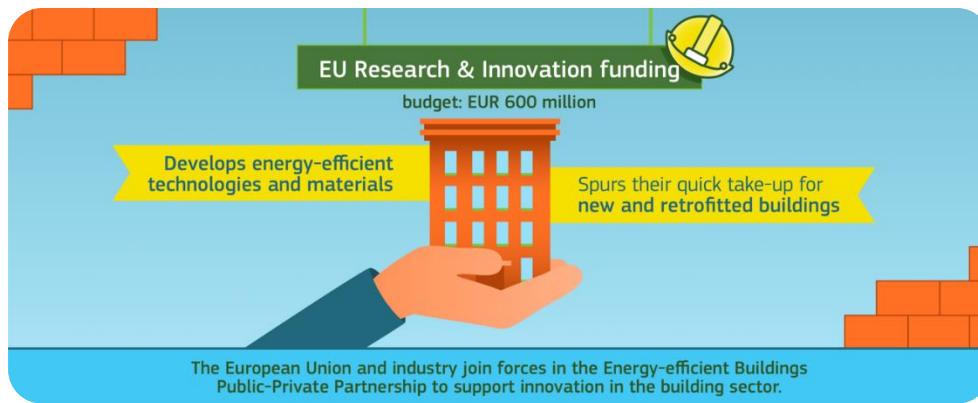


Figure 2 - EeB PPP Partnership ambition and funding (European Commission, DG Research and Innovation, 2017)

### 2.3. What results and benefit can we expect?

The EeB cPPP intends to:

- create and integrate innovative technologies and solutions enabling to reduce energy consumption and GHG emissions in line with the 2020 goals as stated by the EC;
- turn the building industry into a knowledge-driven sustainable business, with higher productivity and higher skilled employees;
- develop innovative and smart systemic approaches for green buildings and districts, helping to improve competitiveness of the EU building industry, with an enhanced user-centric approach;
- to contribute to the challenges as identified through UN Sustainable Development Goals<sup>2</sup>

The principal **key quantitative objectives** of the EeB cPPP are:

- to **increase private investment** in research & innovation **up to 3% of turnover by 2020**;
- to **create 10 new types of high-skilled** jobs implemented through knowledge transfer and training;
- to develop the appropriate set of technologies to **reduce energy and CO2 by 50% and by 80%** respectively compared to 2010 levels;
- to present **at least 100 demonstration buildings and districts**, which are expected to be retrofitted with ICT-based solutions and monitored **to reduce up to 75% energy use**.

### 2.4. Aim of the annual Progress Monitoring Report

The aim of the annual Progress Monitoring Report (PMR) is to provide a critical analysis of the EeB cPPP progress in the implementation of its multiannual roadmap, a summary of progress achieved on KPIs common to all cPPPs and KPIs specific to the EeB cPPP and an overview of the general progress of the PPP since its inception.

Following the mid-term review of the contractual public private partnerships (cPPPs), one of the recommendation has been to enhance the transparency of the management process and readability of the PMR. This edition implements this recommendation with a new simplified structure. The PMR also becomes a public document from 2018 and it is therefore published on the ECTP website<sup>3</sup>.

<sup>2</sup> <https://www.un.org/sustainabledevelopment/sustainable-development-goals/>

<sup>3</sup> European Construction, built environment and energy efficient building Technology Platform (ECTP) website: <http://www.ectp.org>

### 3. Main activities and achievements during 2017

#### 3.1. Implementation of the calls for proposals evaluated in 2017

The EC supported **110 projects** through the EeB cPPP initiative under **FP7**. Within **Horizon 2020**, the EC is now supporting **58 new projects** selected under the 2014, 2015, 2016 and 2017 EeB calls. 13 new projects – i.e. 2 Research and Innovation Actions (RIAs), 10 Innovation Actions (IAs) and 1 Coordination and Support Action (CSA) - were selected on the 2017 call under 5 topics (Table 1 below).

**Table 1- Projects selected under the 2017 EeB cPPP call**

Topic	Topic identifier	Type of action	Projects
Development of near zero energy building renovation	EeB-05-2017	IA	RenoZEB
			HEART
			REZBUILD
			ReCO2ST
Highly efficient hybrid storage solutions for power and heat in residential buildings and districts areas	EeB-6-2017	RIA	Hybuild
			SCORES
Integration of energy harvesting at building and district level	EeB-7-2017	IA	ENVISION
			EnergyMatching
			Plug-N-Harvest
New business models for energy-efficient buildings through adaptable refurbishment solutions	EeB-08-2017	CSA	Stunning
Integration of Demand Response in Energy Management Systems while ensuring interoperability	EE-12-2017	IA	HOLISDER
			RESPOND
			TABEDE

For the 2018 progress monitoring survey, the **whole set of 168 projects (FP7 + H2020)** was contacted in March 2018. A total of 138 questionnaires were completed and validated. This represents an **82% response rate**, which is a significant increase compared to the 2017 progress monitoring survey (66%). Furthermore, when looking only at the **H2020 projects**, all of them (58 projects) completed and validated their 2018 questionnaire, which represents a **100% response rate**. All of the 13 new projects selected on the 2017 call (Table 1) completed their questionnaire. This increase in response rates is the outcome of (offline version of the 2018 questionnaire in appendix):

- The use for the third consecutive year of the dedicated online survey tool<sup>4</sup> which was developed by ECTP in the context of the EeB-CA2<sup>5</sup> Coordination and Support Action. The performance of the tool is improved each year with additional pre-filled data and quality control mechanisms, which makes the overall process easier for project coordinators.
- Frequent and regular reminders sent to project coordinators over a one-month period:
  - Questionnaire sent on March 2<sup>nd</sup> 2018;
  - Reminders on March 11<sup>th</sup>, 22<sup>nd</sup>, 23<sup>rd</sup>, 29<sup>th</sup> and April 3<sup>rd</sup>;
  - Closure of the survey on April 4<sup>th</sup>.

Looking at the overall projects portfolio composition (FP7 and H2020), key analytics are observed:

- The **average duration per project** is 43,2 months, slightly lower when considering only H2020 projects (42,5 months);
- The **average EU funding per project** is 4 868 k€, and **4 520 k€** when **considering only H2020**;
- **88% of the 110 FP7 projects** are now **completed**, while 90% of the 58 H2020 projects are currently being implemented.

<sup>4</sup> EeB online progress monitoring tool: <http://eeb-monitoring.ectp.org>

<sup>5</sup> Energy Efficient Buildings Cluster Activities Coordination Action: <http://www.e2b-clusters.eu>

The multiannual EeB cPPP roadmap presents a segmentation of the EeB value chain, which was further adapted and developed in the context of the EeB-CA2 CSA project, resulting in the definition of 7 technology clusters (Figure 3).

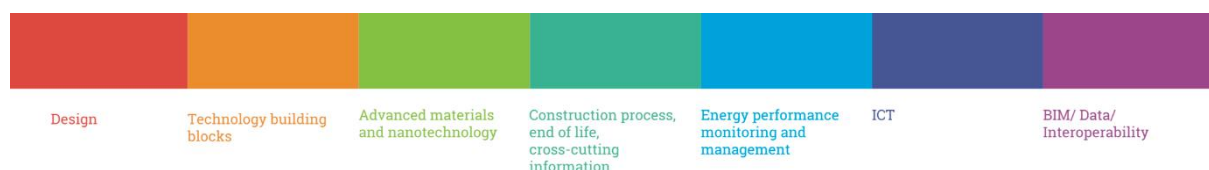


Figure 3: Segmentation of the value chain into technology clusters from the EeB-CA2 CSA project

Based on this segmentation, each project is allocated to a primary technology cluster (mandatory), and a second technology cluster (optional) as illustrated in Table 2. Project coordinators are given the opportunity to select and/or update the most relevant cluster(s) for their project in the context of the annual progress monitoring survey.

Table 2 - Projects allocation per EeB technology cluster

Technology cluster	Design	Technology Building Blocks	Advanced materials and nanotechnology	Construction Processes, end-of life, cross-cutting information	Energy performance monitoring & management	ICT	BIM, Data, and Interoperability	
<b>FP7</b> (110 projects)	1 <sup>st</sup> cluster	12	29	9	13	43	2	2
	2 <sup>nd</sup> cluster	2	21	16	7	22	29	10
	Total	14	50	25	20	65	31	12
	%	6%	23%	12%	9%	30%	14%	6%
<b>H2020</b> (58 projects)	1 <sup>st</sup> cluster	3	24	10	5	10	1	5
	2 <sup>nd</sup> cluster	2	7	5	7	18	7	9
	Total	5	31	15	14	28	8	14
	%	4%	27%	13%	12%	24%	7%	12%

The following trends are further observed in relation to cluster allocations of the overall portfolio:

- For both FP7 and H2020, the most important technology clusters are **Technology Building Blocks** (respectively 23% of the projects in FP7 and 27% in H2020) and **Energy performance monitoring & management** (respectively 30% of the projects in FP7 and 24% in H2020).
- The percentage of projects allocated to **BIM, Data and interoperability** has doubled (12%) in H2020 compared to FP7 (6%), while there is the opposite trend for the **ICT** category: 14% of the projects in FP7 versus 7% in H2020.
- **Design** remains the cluster with the lower number of projects (6% in FP7, 4% in H2020).
- A very slight increase of projects dealing with **Advanced materials and nanotechnology** and **Construction processes, end-of-life, cross-cutting information** in H2020 compared to FP7.

Looking at the latest 13 projects selected on the 2017 call (Table 1), the most represented cluster is **Energy performance monitoring & management** (42%). In addition, 4 of the 13 projects have selected **BIM, Data and interoperability** as one of their cluster, which confirms the above-mentioned growing trend in this category. The original segmentation of the EeB value chain presented in the original



multiannual EeB cPPP roadmap (2013) is now well covered in a holistic way by the EeB PPP projects portfolio, with is a slight shortage on the 'Design' cluster

### 3.2. Mobilisation of stakeholders, outreach, success stories

This section provides a non-comprehensive overview of stakeholders' events organised in 2017.

#### 2017 Impact Workshop on the cPPPs

The yearly Impact Workshop for the three contractual Public-Private Partnerships (cPPPs) took place in Brussels on 16-17 May 2017. For the EeB cPPP, the first day of the Impact Workshop has been organized by the ECTP E2B Committee. 18 EeB cPPP projects "success stories" were presented during the event (see agenda in the appendix ; projects presentations are publicly available on the ECTP website). The event offered the opportunity to share outcomes of projects in similar or close topics of interest, to better identify evidence on the leverage and impact generated by these projects (and the cPPP as a whole), and to discuss potential areas where more RTD is required.

#### Publication: EeB PPP Project Review 2017

The sixth edition of the EeB PPP Project Review was published<sup>6</sup> in May 2017. This yearly publication of the E2B committee highlights current results and achieved or potential impact of the EeB cPPP Projects portfolio. The projects demonstrate scientific and technological excellence, across all levels, from early stage conception to demonstration of almost ready-to-market innovations. They illustrate the diverse innovation approaches and importance of embracing all aspects of the building / construction sector.

#### Events and meetings contributions

ECTP contributed to **more than 30 events** since the last Progress Monitoring Report (over a period from June 2017 to April 2018). Each event represents an opportunity:

- to raise awareness about the EeB cPPP, its objectives and its projects portfolio;
- to gather stakeholder feedback so as to influence and fine-tune the future EeB cPPP roadmap;
- to push forward the EeB cPPP research priorities in interrelated sectors (e.g. ICT, Transport, Smart cities, etc.);
- to convince new stakeholders from interrelated sectors to join ECTP and its EeB committee.

Notable events over the past period include for instance the 1<sup>st</sup> Workshop of the [Digitising European Industry](#) WG on Future Partnerships; participation to [SET Plan](#) Working Group 5; the EC Construction 2020 Thematic Group "*Stimulating investment in building renovation, infrastructure and innovation*"; [Construction 4.0 \(Digital Europe event\)](#); or a contribution to the [EU Sustainable Energy Week](#).

*A comprehensive list of the events is presented in the appendix.*

#### Cooperation and partnerships

- An **EeB cPPP Brokerage session** was organised at the Industrial Innovation Info Days (October 2017).
- A letter of intent was signed by ECTP and the **Polish Regions** to develop energetically positive, sustainable and citizens-friendly cities (November 2017).
- A cooperation with **EffiBUILDING** was established: ECTP selected most promising technologies and prototypes are now referenced within the Effibuilding database.

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<sup>6</sup> 2017 EeB PPP Project Review:

[http://www.ectp.org/fileadmin/user\\_upload/documents/E2B/0\\_EeB\\_PPP\\_Project-Reviews\\_Roadmaps/EeB\\_PPP\\_Project\\_Review\\_2017.pdf](http://www.ectp.org/fileadmin/user_upload/documents/E2B/0_EeB_PPP_Project-Reviews_Roadmaps/EeB_PPP_Project_Review_2017.pdf)

- Support was provided to **CoolingEU**, a forum that brings together stakeholders representing the European cooling sector to promote a more efficient and cleaner cooling supply.
- ECTP became a member of **AIOTI, the Alliance for Internet of Things Innovation**: collaboration for establishing the vision of WG13 focused on Smart Buildings.
- A partnership was established with the International conference and tradeshow **World Sustainable Energy Days 2018**.

Moreover, contacts are ongoing with other initiatives, e.g. the European Steel Technology Platform (**ESTEP**), the Fuel Cells & Hydrogen Joint Undertaking (**FCH JU**), the Big Data Value Association (**BDVA**).

### Outreach

The above-mentioned activities have been further promoted through ECTP communication channels. Their impact and outreach can be measured as follows:

- The ECTP website registered 45k+ page views over 2017;
- its specific EeB committee sub-section registered 21k+ page views over the same period;
- the EeB project database<sup>7</sup> is the 2<sup>nd</sup> most consulted page after the landing page.
- As of April 6<sup>th</sup> 2018, the ECTP Twitter account<sup>8</sup> has 700+ followers.
- As of April 6<sup>th</sup> 2018, the official ECTP E2B Committee LinkedIn group<sup>9</sup> has 900+ members.
- As of April 6<sup>th</sup> 2018, the official ECTP E2B Committee YouTube channel<sup>10</sup> hosts 100+ promotional videos of EeB projects.

### 3.3. Governance

The private side of the EeB cPPP partnership board is formed by 20 members and 10 substitute members. In 2017, the following changes in its composition were as follows:

- For **members**:
  - New organisation name: ACCIONA Construcción (formerly ACCIONA Infraestructuras);
  - New member: *Samir BOUDJABEUR*, TATA STEEL UK;
  - New representative: *Donato ZANGANI* (in replacement of Stefano CAROSIO as of January 2017), RINA Consulting (formerly D'APPOLONIA).
  - Withdrawal: BOSCH
- For **substitute members**:
  - New representative (same organisation):
    - *Imanol AGIRRE*, MONDRAGON CORPORATION;
    - *Ruth KERRIGAN*, IES;
  - New member:
    - *Stefano CAROSIO*, UNIVERSITA DI PADOVA;
    - *Gian Marco REVEL*, UNIVERSITA POLITECNICA DELLE MARCHE;
  - New organisation name:
    - RISE Research Institutes of Sweden (formerly SP);
    - POLE FIBRES-ENERGIVIE (formerly POLE ALSACE ENERGIVIE).
  - Withdrawal:
    - Royal BAM Group;
    - Saint Gobain.

The updated partnership board members list is provided in the appendix.

<sup>7</sup> ECTP EeB projects database: <http://www.ectp.org/index.php?id=29>

<sup>8</sup> ECTP Twitter account: <https://twitter.com/ECTPSecretariat>

<sup>9</sup> ECTP E2B LinkedIn group: <https://www.linkedin.com/groups/3744557>

<sup>10</sup> ECTP E2B YouTube channel: [https://www.youtube.com/channel/UC8LjrepSBN\\_apQNuFNeufig/featured](https://www.youtube.com/channel/UC8LjrepSBN_apQNuFNeufig/featured)

## 4. Monitoring of the overall progress since the launch of the EeB cPPP

### 4.1. Achievement of the goals of the EeB cPPP

A qualitative analysis of the EeB cPPP project portfolio was conducted and delivered in March 2017 in the context of the EeB-CA2 Coordination and Support Action<sup>11</sup>. This included for each of the 7 technology clusters (Table 2) a detailed analysis of the state of the art and current practices, the identification of main challenges, and eventually the definition of future priorities and recommendations and their impact. The analysis was based on the earlier work conducted in the CSA which included an in-depth assessment of the technologies developed by the EeB projects through the involvement of external experts, which resulted in the identification of a selection of most promising innovations<sup>12</sup>. A short summary of the current progress in the implementation of the EeB Multi-annual roadmap is presented below for each technology cluster.

#### Target areas fully or partially addressed

- **Design:** EeB projects well addressed the development of design tools based on model-based CAD approaches and interoperable interface, improved design accuracy applied with demo districts with the engagement of different stakeholders, and libraries of reference integrated within the tools themselves.
- **Technology Building Blocks:** EeB projects addressed the development and integration of tools and methods to maximize user acceptance of adaptable envelopes, techniques to minimize Volatile Organic Compound (VOC, SVOC), envelopes improving natural light and ventilation in buildings and full scale demonstrations of adaptable envelope integration, smart building envelopes, innovative PV components, building and district level thermal storage, heating systems and storage at building and district levels, heat and power systems at building and district level, low GHG refrigerants, benchmarking and calculation tools, sensors and smart consumption displays for BEMS.
- **Advanced Materials and Nano Technologies:** EeB projects best addressed the development of super insulating materials and components, improved technical properties for organic materials, advanced low CO<sub>2</sub> concrete, modular mass customized envelope solutions and full-scale demonstrations of adaptable envelope integrations.
- **Construction Process, End of Life and Cross Cutting Information:** EeB projects best addressed the development and integration of standardized self-testing sensors/meters and energy performance verification procedures as well as full scale demonstration of deep building refurbishment based on mass customized envelopes.
- **Energy Performance Management and Monitoring:** EeB projects best addressed the development of monitoring tools for envelope and energy equipment performance, legal/societal/environmental performance indicators at EU level, self-diagnosis subsystems for conditional maintenance, virtual reality approaches to diagnosis; energy performance monitoring systems at district level, monitoring tools able to discriminate additional criteria from overall building energy performance, standard protocols for use-value measurements of energy efficiency in buildings.
- **BIM, Data and Interoperability:** EeB projects well covered the development of enhanced BIM models and ontologies to describe interfaces of building and district projects, BIM tools able to merge building models and construction process management and certification methodologies, approaches to enforce long term legal and contractual validity of BIM.

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<sup>11</sup> [http://www.ectp.org/fileadmin/user\\_upload/documents/E2B/EeB-CA2/EeB-CA2\\_D6.2\\_v2.pdf](http://www.ectp.org/fileadmin/user_upload/documents/E2B/EeB-CA2/EeB-CA2_D6.2_v2.pdf)

<sup>12</sup> EeB PPP Promising Technology Brochures:

[http://www.ectp.org/fileadmin/user\\_upload/documents/E2B/0\\_EeB\\_PPP\\_Promising\\_Techno\\_Brochures/EeB\\_PPP\\_Promising\\_Technology\\_Brochures.zip](http://www.ectp.org/fileadmin/user_upload/documents/E2B/0_EeB_PPP_Promising_Techno_Brochures/EeB_PPP_Promising_Technology_Brochures.zip)

- **ICT:** EeB projects well covered key areas which the EEBERS CSA project clustered as integration technologies, energy management & trading, tools for EE design & production management, intelligent and integrated control (at building level) as well as user awareness & decision support.

#### Target areas still to be addressed

- **Design:** this cluster still needs addressing the definition of approaches to enforce the long term legal and contractual validity of building information models, along with the provision of accessible, high quality and trustworthy data, especially in a context of Big Data development. Also related is the fact that planning process improvement implies shared data, practices and tools with proper training and education, along with the development of Integrated Project Delivery (IPD): chosen project delivery methods can compromise the design and integrated planning approach in renovation projects is a success factor for optimization and innovation with limited risks. Eventually, decentralized and circular approaches for building and usage practices need to be considered at early design stage for an effective sustainability, with the engagement of involving all stakeholders within a collaborative and risk share approach, allowing cost-efficient solutions from an LCA perspective.
- **Technology Building Blocks:** while retrofitting of existing buildings to reach nearly zero-energy standards is a key challenge, there is a need to accelerate the introduction of Plus Energy houses within districts (this will be addressed through 4 new projects funded under EeB-05-2017 - see Table 1). This cluster still needs to address areas such as: the development and improvement of storage solutions for thermal energy based on thermo-chemical and phase-change materials (this will be addressed through 2 new projects funded under EeB-6-2017 – see Table 1); the development of strategies to identify economic construction procedures for reuse of structures and procedures to determine the structural load capacity of existing structures accurately, which are easy to use and cost-efficient; technologies and methods to understand and maximise user acceptance, Mass manufactured prefabricated modules, flexible lighting system using LEDs or OLEDs. Demonstration is needed for adaptable envelopes, modelling district energy consumption and building interactions systems and protocols to optimize energy storage and production at district level, new testing procedures to measure material performances, harmonize test procedures and efficiency labelling schemes. Some monitoring aspects such as: standardized functionalities for sensors and actuators, robust, resilient and reconfigurable sensor network: building embedded sensors; Interoperable smart meters.
- **Advanced Materials and Nano-technologies:** this cluster is key in supporting the European leadership in the development of pilot components for buildings retrofitting addressing key challenges as complexity, weight control and overall retrofitting costs. The technology readiness level of promising solutions needs to be scaled up addressing both insulation as well smart functionality and storage. Some key areas include for instance: the development of chemical coupling agents and binders, low-CO<sub>2</sub> advanced concrete, materials for draining, testing procedures to measure material performances, basement insulation, mass manufactured prefabricated modules, the demonstration of photo-catalyst or other de-polluting techniques to minimise the Volatile and Semi-volatile Organic Compound, semi permeable insulation membranes and pigment.
- **Construction Process, End of Life and Cross Cutting Information:** this cluster still needs to address some areas such as: techniques to measure the contribution of each critical component in energy efficient construction; the development of innovative construction processes to provide workers with safer and healthier environment and also systems to control in parallel work done by different experts; prefabricated solutions and mobile factories composed by portable manufacturing facilities, placed near the construction site, including tracking systems; waste collection, separation and reaction techniques in order to increase the reuse of the building waste into recycled composites and optimal re-usability or recyclability

of different types of products; probabilistic tools to model/predict the ageing performance of zero energy building; models and experimental tests capable of assessing the ageing properties of construction materials and components; comparison among member state in relation to energy labelling and its effect, develop an intelligent and well balanced portfolio of mechanisms to raise public awareness, set regulations, codes and practices, fiscal and financial tooling (this will be addressed by the Stunning CSA funded under EeB-08-2017 – see Table 1).

- **Energy Performance Management and Monitoring.** Within this cluster the target areas that still need to be addressed is related to the enlargement of the European network of usage-value measurement and monitoring laboratories. 42% of the projects supported under the EeB-2017 call are further addressing this technology cluster (see Table 1).
- **BIM, Data and Interoperability and ICT:** The target areas which could be linked to the clusters BIM and ICT are horizontal and therefore have been partially addressed. They still deserve efforts to have a proper framework of enabling technologies. The Building Information Modelling tools (BIMs) developed so far are addressing mainly new buildings of all types. There is a need to deploy tool kits for existing buildings which can be easily used by several stakeholders, including construction companies, architects, service providers. 4 of the newly supported projects under the EeB-2017 call are addressing this technology cluster and its challenges. As far as ICT systems are concerned, solutions and user-centric -technologies are crucial for performance monitoring and management of highly energy efficient buildings, enabling guaranteed performance contracts. ICT technologies have also big potential in the manufacturing, construction, operation and end of life phases affecting the overall building lifecycle. ICT are key enablers of future proactive buildings which address customer expectations in terms of comfort and living conditions.

#### 4.2. Progress achieved on KPIs.

This section provides a summary of the progress achieved on KPIs which are common to all cPPPs and on those which are specific to the EeB cPPP. Further details are provided in the appendix.

##### Common cPPPs Key Performance Indicators

###### Mobilised private investment

Despite significant efforts to clarify and further explain the questions related to estimated private investments, the data reported by the projects are sometimes incomplete and inconsistent for few projects, *making it difficult to assess their level of accuracy and to benchmark them properly*. In order to properly assess this indicator, **a parallel approach was conducted by the association similarly to last year. The approach consisted in contacting the Legal Entity Appointed Representatives (LEARs) of a selection of representative organisations (3 Research and Technology Organisations (RTOs), 3 large industrial organisations and 2 SMEs) involved in the EeB cPPP.**

The LEARs were asked to provide for their respective organisation:

- (A) The amount of EC funding corresponding to their ongoing H2020 EeB Projects, from 2014 up to the end of 2017 (i.e. over 4 years).
- (B) Their actual private expenditure mobilised in these EeB cPPP projects, plus the amount of private investment mobilised in other R&I activities related to the main topics sustaining the EeB cPPP, over the same period.

The average leverage factor (B/A) calculated through this approach is approximately **4,87**. Gathered data have been anonymised and are presented in Table 3 below.

**Table 3 - Leverage factor - Data provided by LEARs of selected ECTP members**

	RTO1	RTO2	RTO3	LARGE IND 1	LARGE IND 2	LARGE IND 3	SME 1	SME 2
<b>Number of EeB projects running over the period</b>	4	2	13	10	1	3	3	3
<b>(A) EC funding (€)</b>	919 237	418 470	3 052 074	2 176 748	631 441	1 415 001	917 302	986 055
<b>(B) Private investment (€)</b>	3 994 302	3 500 000	6 593 939	11 609 120	6 133 238	12 000 000	512 500	54 880
<b>Leverage factor (B/A)</b>	4,34	8,36	2,16	5,33	9,71	8,48	0,55	0,05

The above panel of organisations is involved in 39 running projects (most of them being H2020) and is therefore well representative of the overall current portfolio of 58 H2020 projects. The leverage factor observed for RTOs and large industrial organisations is higher than the one of SMEs, *which can be obviously explained by the higher amount of their internal available resources to support internal R&D.* Considering the already evolution since last year, this approach will be further extended in 2019.

### *New skills and/or job profiles*

Number of new skills and/or job profiles created (or forecasted within a reasonable timeframe in the future) in your project

**There is a wide heterogeneity of answers in relation to this indicator** because the question has been interpreted in different ways, similarly to last year and despite the efforts to make it clearer and more explicit. Typically, many projects provided a number of “jobs created” which resulted from their project, instead of the number of new “job profile” creations. Quantitative data are therefore hardly exploitable for this KPI. This year however a new question was introduced in order for projects to provide further details about the new job profiles created within their project. **A selection of relevant answers from 10 H2020 projects is presented in Table 4 below.** It shows that the EeB cPPP is **well on track to achieve its target of 10 new types of high-skilled jobs** creation, especially in relation with innovative technologies for the construction sector (e.g. BIM, CIM, 3D printing, Smart Grids, etc.).

**Table 4 - Nature of new job profiles created in selected H2020 projects**

H2020 Project	Nature of new job profiles created
<b>P2Endure</b>	<ul style="list-style-type: none"> <li>BEM specialist who performs BIM-to-BEM energy simulations to determine most energy efficient renovation strategy.</li> <li>3D printing specialist/assistant who sets up the building site for 3D printing and operates the robot on-site by Guided User Interface (GUI), which is being developed within P2ENDURE</li> </ul>
<b>Stunning</b>	<ul style="list-style-type: none"> <li>Low energy retrofit design consultants.</li> <li>Administrator of the Knowledge Sharing Platform (Renovation Hub: renovation-hub.eu) developed within STUNNING</li> </ul>
<b>INSITER</b>	<ul style="list-style-type: none"> <li>Advisor/Trainer for self-quality assurance in construction</li> <li>Specialist for laser, thermal and acoustic measuring during construction</li> <li>Specialist in re-modelling of BIM for self-instruction for construction workers</li> </ul>
<b>RE4</b>	<ul style="list-style-type: none"> <li>CDW manager</li> <li>CDW-based products designer</li> <li>CDW-based materials developer</li> </ul>
<b>ISOBIO</b>	<ul style="list-style-type: none"> <li>Coating formulation researcher; focused on developing new additives that provide fire retardancy and water repellence to bio-derived material</li> </ul>
<b>MODER</b>	<ul style="list-style-type: none"> <li>Expert on social impacts of district level refurbishment</li> <li>City information modeller</li> <li>Visualisation expert</li> </ul>

	<ul style="list-style-type: none"> <li>• District level simulation expert</li> <li>• Activator: Expert in early phase preparations in a district level project</li> <li>• Project delivery expert</li> </ul>
<b>Rennovates</b>	<ul style="list-style-type: none"> <li>• Jobs related to smart grid control, ICT integration in the built environment and analytics. Smart grid platforms need to be implemented and operated, smart technology needs to be implemented.</li> </ul>
<b>HOLISDER</b>	<ul style="list-style-type: none"> <li>• Software Engineer: Contribution to the development, testing and evaluation of the services developed by HYPERTECH in the project, namely: behavioural profiling, demand flexibility &amp; visual analytics tools</li> </ul>
<b>Plug-N-Harvest</b>	<ul style="list-style-type: none"> <li>• Plug-n-Harvest will promote the creation of interesting, high technology new jobs in the areas of building construction, energy management and the renewable energy sector (...).</li> </ul>
<b>HEART</b>	<ul style="list-style-type: none"> <li>• The relevant new-technology and ICT dimension of the project may promote entry into employment of young and innovatively skilled professionals. (...) The development of systemic solutions that integrate aspects typically treated within different sectors (e.g. envelope and technological systems) greatly facilitates the advent of a new generation of multidisciplinary SME contractors and technicians.</li> </ul>

#### Number of new curricula (university courses)

H2020 projects reported a total of **57 newly created curricula** (28 inputs out of the 58). This makes an average of 2 new curricula per project, higher than the FP7 baseline of 1,3 curricula per project, and also significantly - *6 times* - higher than in the previous PMR (average of 0,3 project), which seems coherent with the fact that H2020 projects having started in 2014 and 2015 are now well advanced.

#### Impact on SMEs

##### Share of participation of SMEs

The share of participation of SMEs in EeB cPPP projects **has progressed from 28% (FP7 baseline) to 35% in H2020**. There are ten H2020 projects with a share of SMEs higher than 50%. The highest share reported is in the **HEAT4COOL** project with its 9 SMEs within a group of 13 partners.

##### Age of companies

The average age of the companies benefitting from the cPPP funding is **19 years** (inputs from 118 SMEs), the youngest being only 1 year old in **HIT2GAP** and **ReCO2ST**, and the oldest being 104 years old in **EENSULATE** and **RenoZEB**. SMEs participating in FP7 were slightly older with an average of 21,4 years (inputs from 126 SMEs). This question was new in the 2018 progress monitoring survey, so there is no benchmark in relation with the previous PMR.

##### Current size of companies (number of employees)

**The average staff** headcount of participating SMEs in H2020 is **32,1 employees** (inputs from 120 SMEs), slightly lower than in FP7 with 33,5 employees. This question was new in the 2018 progress monitoring survey, so there is no benchmark in relation with the previous PMR.

##### Estimation of the increase in turnover in SMEs participating in your project

H2020 projects reported an **actual average increase in turnover of 2 073 800€** and **49,7%** for their SMEs (30 inputs out of the 58), and an expected increase of **4 747 508€** and **69,2%** (26 inputs out of the 58) by the end of their project. Most important growths are reported by the **EENSULATE** (value of the increase) and **HIT2GAP** (percentage of the increase) projects, both in terms of actual and expected figures. **These figures are significantly higher than in the previous PMR** (actual average increase of 246 626€ and 7,9%, expected increase of 2 707 335€ and 24,3%). *This significant increase could be explained by the strong innovative nature of the participating SMEs and their rapid growth, in particular in Innovation actions that are well suited to valorise SMEs assets.*

Estimation of the increase in number of employees for SMEs participating in your project

H2020 projects reported an actual average increase of **6,6 employees** for the SMEs participating in their project, and an expected increase of **15,2** by the end of their project. **HIT2GAP** and **RenoZEB** reported the higher figures with respectively 35 (actual) and 96 (expected) employees. These values are significantly higher than in the previous PMR (actual increase of 5,5 employees; expected increase of 7,9 employees by the end of the project). *Here as well the significant increase could be explained in a very similar way than the increase in turnover.*

Type of involvement and staff growth by age range

Table 5 below shows the type of actions (RIA, IA or CSA) that SMEs are involved in and their average percentage of staff growth according to their age ranges.

**Table 5 - Impact on SMEs: type of involvement and staff growth**

SMEs – age range		0 to 3 years	4 to 10 years	11 years and more
Type of action	RIA	2	10	22
	IA	5	26	48
	CSA	0	3	2
Increase (%) in the number of employees	Average actual	40%	23%	13%
	Average expected by the end of the project	103%	45%	20%

Case studies

Two practical examples of how EeB PPP projects are generating an impact for their participating SMEs are proposed below:

**R2M Solution (Italy):** Through its participation in the **BUILT2SPEC** project, R2M has hired 3 new staff members and launched Milan-area services related to digital construction. These include drone inspections (external point clouds) and Matterport surveys (internal point clouds). The software platform in the project (the virtual construction management platform from VRM Technology) has been brought into Italy and is being customized to and considered for use as the underlying management platform for one of Italy’s certification programs by which project documentation must be aggregated, managed and stored. If selected, the project would see replication across an initial 200 large-scale commercial projects already under development. Built2Spec has been briefed several times within Green Building Council Italia events and R2M provides company training and seminars to company decision makers on technologies to digitalize construction processes. This is timely as Italy has the “decreto BIM” which mandates the use of BIM for large public projects today and in the future – all public projects. As a next step building upon the work done in BUILT2SPEC, R2M is involved in research related to BIM analytics (BIM Bots) that can be used to mine various information within BIM models such as how a structure maps to various certification protocols.

**Hypertech (Greece):** Through its participation in the **MOEBIUS** project, Hypertech has achieved to launch 2 new product offerings for Energy Efficient Buildings; a light-weight Building Automation System that allows for Human-Centric Automation of lighting and HVAC equipment without compromising indoor comfort levels, along with a unique offering for aggregators, for the analysis and clustering of flexibility offered by buildings, towards optimizing transactions in ancillary services markets. What is most important however, is the fact that Hypertech established a commercial agreement with one of the largest construction and facility management companies in Greece, as part of the go-to-market strategy of the company, which is expected to increase the outreach of the company’s Building Automation solutions and generate significant revenue streams from commercial activities in the next 3 years (circa 20% of the current company turnover).

Significant innovations

New systems and technologies

The whole **set of 58 H2020 projects** reported a total of **223 new systems and technologies developed** (excluding incremental improvements). This represents an average of **3,8 new systems and**



**technologies per project**, which is an increase compared to the previous PMR (average of 3,3). This is also higher than the FP7 baseline (average of 3). **RE4** and **TOPAS** have the most important number with 10 new systems and technologies each.

76% of the developed new systems and technologies both apply to new buildings and for renovation of existing buildings.

The **average current TRL of the new systems and technologies is 5.3**, while the average expected TRL at the end of the projects is **6.9**. This is an increase compared to the previous PMR (current average TRL of 4.7 and expected of 6.8). The FP7 baseline shows an average current TRL of 6.4, and 6.7 expected by the end of the projects.

The **highest observed TRL** (current 6.1 and expected 7.4) corresponds to the innovations which belong to the **“BIM, Data, and Interoperability”** technology cluster. The **lowest observed TRL** (current 4.8) corresponds to the innovations which belong to the **“Advanced materials and nanotechnology”** technology cluster.

A further detailed analysis of the TRLs for each technology cluster is presented in the appendix.

#### Non-technological innovations

In addition to the above new systems and technologies, the 58 H2020 projects also reported a total of **88** non-technological innovations (e.g. innovative methodology, innovative business model, etc.). This represents an average of **1,5 non-technological innovation per project**, which is equal to the average reported in the previous PMR. This is higher than the FP7 baseline of 0,9 non-technological innovation per project.

#### Specific Key Performance Indicators for the EeB cPPP

##### *Contribution to the reduction of energy use*

In terms of reduction of energy use, H2020 projects reported a **18,7% reduction achieved** in their project results (33 inputs out of 58), and a **38,9% reduction expected** by the end of the project (43 inputs out of 58). This is an increase compared to the previous PMR where respectively 12,2% of reduction achieved, and 35,5% of reduction expected had been reported. This is also an increase compared to the FP7 baseline where the projects reported a 31,6% reduction achieved and a 33,5% reduction expected for those which are not completed yet.

The best performing projects in relation to this KPI are **Herb, iNSPIRE, and MORE-CONNECT** which declared an 80% reduction achieved in their project results.

##### *Contribution to the reduction of CO2 emissions*

In terms of reduction of CO2 emissions, H2020 projects reported a **13.1% reduction achieved** in their project results (29 inputs out of 58), and a **40,6% reduction expected** by the end of the project (38 inputs out of 58). This is an increase compared to the previous PMR where respectively 8,5% of reduction achieved, and 37,3% of reduction expected had been reported. This is also an increase compared to the FP7 baseline where the projects reported a 29,7% reduction achieved, and a 32,6% reduction expected for those which are not completed yet.

The best performing project in relation to this KPI is **MORE-CONNECT** which declared an 80% reduction achieved in its project results.

### *Contribution to the reduction of waste*

In terms of reduction of waste, it is worth mentioning that only 36% of the H2020 projects (20 inputs out of the 58) provided a reply to this question. Those projects reported a **10,8% reduction achieved** in their project results, and a **25,8% reduction expected** by the end of the project. This is an increase compared to the previous PMR where respectively 7,9% of reduction achieved, and 23,3% of reduction expected had been reported. This is also a significant increase compared to the FP7 baseline where the projects reported a 7,9% reduction achieved.

The best performing project in relation to this KPI is **RE4** which declared a 65% reduction achieved in its project results.

### *Contribution to the reduction in the use of material resources*

In terms of reduction in the use of material resources, H2020 projects reported a **6,9% reduction achieved** in their project results (21 inputs out of 58), and a **20,6% reduction expected** by the end of the project (24 inputs out of 58). This is an increase compared to the previous PMR where respectively 2,4% of reduction achieved, and 19,2% of reduction expected had been reported. This is also a significant increase compared to the FP7 baseline where the projects reported an 8,6% reduction achieved.

The best performing project in relation to this KPI is **RE4** which declared a 65% reduction achieved in its project results.

### *Demonstration sites*

There is an **average of 3,6 demo sites** per H2020 project, which makes a total of **204 demonstration sites**. This represents a 25% increase compared to the FP7 baseline with 2,8 demo sites per project. This is also a slight increase compared to the last PMR where the average number of demo sites per H2020 project was 3.4.

**P2Endure** and **QUANTUM** reported the highest figures, with 12 demonstration sites each.

### *Patents*

#### *Patent applications*

H2020 projects reported **10 patent applications submitted** (40 inputs out of 58), and **58 expected** by the end of the projects (31 inputs out of the 58). The average expected number of patent applications in H2020 is therefore of **1,9** per project, which is higher than the baseline achieved in FP7 (average of 1 per project). This is also slightly higher than in the previous PMR (average of 1,5).

The best performing project in relation to this KPI is **LAWIN** which declared already 3 patent applications, while **Greeninstruct** and **SCORES** expect both 6 patent applications by the end of their project.

#### *Patents awarded*

In terms of patents awarded, H2020 projects reported **3 patents already awarded** (37 inputs out of 58), and **37 expected** by the end of the projects (28 inputs out of the 58). The average expected number of patent awarded in H2020 is therefore of **1,2** per project, which is higher than the baseline achieved in FP7 (average of 0,5 per project). This is also slightly higher than in the previous PMR (average of 1).

**BUILT2SPEC, OptEEmAL and P2Endure** both declared already 1 patent awarded, while **SCORES** expect 6 patents awarded by the end of its project.

#### *Standardisation activities and contributions to new standards*

##### *Number of activities leading to standardisation*

There is an average number of **1,8** activities leading to standardisation in H2020 projects (39 inputs out of 58). This is significantly higher than the FP7 baseline (average of 0,6 activity per project). This is also higher than in the previous PMR (average of 1,1 activities).

The best performing project in relation to this KPI is **BRESAER** which declared 24 activities leading to standardisation as part of their project.

##### *Number of working items in European Standardisation Bodies*

**5 working items** in European Standardisation Bodies have been declared by the H2020 projects (34 inputs out of 58), 2 of them belong to the **GELCLAD** project. FP7 projects declared 6 working items (based on 64 projects answers), over the whole Framework Project.

##### *Number of pre-normative research files - prEN - under consultation in European Standardisation Bodies – ESBs*

**2 prEN** under consultation in ESBs have been declared by the **HOMESKIN** and **INNOVIP** H2020 projects (33 inputs out of 58). A total of 3 prEN were declared by FP7 projects.

#### *Trainings for a higher quality workforce*

##### *Number of dissemination events, seminars, conferences organised in your project*

**512 dissemination events (seminars, conferences, etc.)** have been reported by the H2020 projects (48 inputs out of 58). The best performing project in relation to this KPI is **ACCEPT** which reported 100 events. The FP7 baseline is 1934 events (inputs from 98 FP7 projects).

##### *Number of participants in dissemination events organised in your project*

The above 512 dissemination events were attended by **21.181 participant** (47 inputs out of 58). The best performing project in relation to this KPI is **HOMESKIN** which declared that it has gathered 3.100 participants through its events.

#### *Promotion of Entrepreneurship - Number of Spin-offs and Start-ups as result of your project*

**6 spin-offs** and Start-ups are resulting from the H2020 projects (inputs from the 58 H2020 projects). They are detailed in the appendix. This represents 4 additional companies compared to the previous PMR. One company (**Robot at work**) is associated to 2 different projects.

A total of 35 Spin-offs and Start-ups are expected to be launched by the end of the H2020 projects (52 inputs out of the 58). **EENSULATE** and **Pro-GET-OnE** declared that they intend to launch 5 Spin-offs each. The FP7 benchmark provides a reference to 16 Spin-offs created (95 inputs from FP7 projects).

#### *Scientific (peer-reviewed) publications*

H2020 projects reported an average of **4,6 submitted scientific publications per project** (49 inputs out of 58), representing a total of 224 submitted publications. This is lower than the FP7 baseline of 11 submitted publications per project. However, it is more than the double of the average declared in the previous PMR (2,2 per project).

The best performing project in relation to this KPI is **BUILT2SPEC** which declared a total of 20 submitted / published scientific publications.

### 4.3. Evolution over the years

As outlined in the earlier section, 2017 progress monitoring results are demonstrating an overall increase compared to the previous PMRs on almost all monitored KPIs, both on those common to all cPPPs and on those specific to the EeB cPPP.

This increase is sometimes significant when it comes to the number of new curricula developed by the projects, to the increase in turnover and number of employees for participating SMEs, and also on the reduction of energy use, CO<sub>2</sub>, waste and on the use of material resources.

When compared to the FP7 baseline, all indicators are also showing a global positive trend, sometimes very significant (for instance on the number of activities leading to standardisation). Only the indicator which relates to the number of scientific (peer-reviewed) publications is currently lower than the FP7 baseline (although significantly growing compared to the previous PMR). This can be explained by the greater emphasis that H2020 EeB projects now dedicate to increase their market and commercial exploitation impacts rather than on the dissemination of their scientific excellence, and the higher targeted TRLs.

**As far as the leverage factor estimation is concerned, ECTP would recommend for the upcoming years to adopt the alternative “organisation-based” approach implemented through the LEARs, as presented in Section 3.2.** This approach provides more meaningful and consistent results than the “project-based” approach through the progress monitoring questionnaire.

#### Qualitative view on current strengths of the cPPP

- The overall progress of the EeB cPPP is currently in line with the contractual commitments.
- Current progress on monitored KPIs is promising given the early stage of implementation of a significant part of the H2020 projects.
- There are effective value chains which intimately interconnect large companies and SMEs, with the latter providing a substantial contribution in terms of jobs created and increased turnover with impact on local economies.
- Public entities are participating in the EeB cPPP with a significant role in the demonstration and validation of project results.
- There are well established clustering activities that will increase the visibility of the EeB cPPP results, and that will enable benchmarking across projects and stakeholder engagement whilst optimising the use of the EC funding
- Projects are getting familiar with the fact that they have to contribute every year to the annual progress monitoring effort (significant increase in response rate), thereby leading to more accurate and meaningful overall results.

#### Qualitative view on current weaknesses of the cPPP

- Original estimates in terms of impact and additional investments provided by EeB cPPP proposals should be refined and updated before they get contractual, perhaps as part of a short negotiation stage before signing the Grant Agreement.
- One potential activity that could be promoted to increase the impact of the cPPPs is the establishment of a stable dialogue with technology users, typically building owners and promoters of rehabilitation and construction (private and public). The expected outcome would be to increase technology and new processes adoption and increase the replication of

projects beyond the cPPP. The interaction with potential clients and investors would support the involvement and investment of industrial companies in technology development.

- Explicit link between H2020 and European Innovation funds (ERDF, ESIF, EIB, etc.) should be made, as well as with structural funds so as to ease access to financial support for industrial demonstrations. This phase of solution scale-up definitely presents a high-risk profile while requiring higher investments than lower TRL stages. It corresponds to the so-called “Valley of Death”, responsible for many market failure or un-ability to industrialize. Ensuring a smooth transition from H2020-like to ERDF or Innovation Fund-like support by mutualizing assessment criteria or easing the blending of support mechanism would definitely promote innovation. Support mechanisms are today independently managed, having its own selection criteria and time line, as well as requirements, which makes it very hard, especially for innovative companies to benefit from these.
- cPPPs shouldn't be considered in a stand-alone mode, which can favor a silo approach. Favoring common work between cPPPs is a potential way of progress. As an example, call for proposals should jointly be reviewed across different cPPPs, which would encourage cross-cutting approaches and, finally, the delivery of more innovative products, anticipating final customers' needs. The European Commission has a key-role to play in stimulating this cross cPPPs collaborations.

## 5. Outlook and lessons learnt

The built environment affects the quality of life and work of all EU-citizens. The construction sector is today on a critical path to help decarbonise the European economy by 2050. In the specific case of buildings, one must keep in mind key figures: people spend around 80-90% of their time in buildings, buildings consume about 40% of global energy, 25% of global water, 40% of global resources, and they emit approximately one third of greenhouse gases emissions (36% of greenhouse gases in Europe). Yet, buildings also offer the greatest potential for achieving significant change: energy consumption in buildings can be reduced by 30 to 80% using proven and commercially available technologies.

The Public-Private Partnership (PPP) on Energy-efficient Buildings launched in December 2008 under the European Economic Recovery Plan managed to attract a high industrial participation and helped innovate the building sector. Under Horizon 2020, the contractual PPP (cPPP) on Energy-efficient Buildings aims to develop affordable breakthrough technologies and solutions at building and district scale, facilitating the road towards future smart cities. It also largely supports the increase of large-scale pilots and demonstrators, which is crucial in a context of further exploitation and spread of the Research & Innovation outcomes. The European Commission (EC) supported 110 projects through the EeB cPPP initiative under FP7. Within Horizon 2020, the EC is now supporting 58 new projects selected under the 2014, 2015, 2016 and 2017 EeB calls; 13 new projects were selected on the 2017 call.

This Progress Monitoring Report provided a critical analysis of the EeB cPPP progress in the implementation of its multiannual roadmap, a summary of progress achieved on KPIs common to all cPPPs and KPIs specific to the EeB cPPP, and an overview of the general progress of the PPP since its inception. The response rate to the annual progress monitoring survey was significantly higher than the previous year, reaching 100% for the H2020 projects.

**2017 progress monitoring results are demonstrating an overall increase compared to the previous PMRs on almost all monitored KPIs, both on those common to all cPPPs and on those specific to the EeB cPPP.**

EeB cPPP projects are mobilising private investment with a leverage factor close to 4,87, they enable the creation of new job profiles for the construction industry in relation to innovative technologies, and they generate a substantial impact (job creation and increased turnover) on SMEs that benefit from the EeB cPPP funding. The whole set of 58 H2020 projects reported a total of 223 developed new systems and technologies, as well as 88 non-technological innovations. A 38,9% reduction of energy use and a 40,6% reduction of CO<sub>2</sub> is expected by the end of the projects. 6 spin-offs have already been launched and supported.

The report highlighted that the progress of the work is in line with the contractual KPIs targets.

The private part of the cPPP represented by ECTP – the European Construction, built environment and energy efficient building Technology Platform – is continuously dedicating its resources to raise awareness about the EeB cPPP, its objectives and its projects portfolio. It also facilitates clustering between the projects in order to enhance their impact, mutualise resources and favour synergies. Every year ECTP is publishing its annual EeB PPP Project Review, a publication of its E2B committee which highlights current results and achieved or potential impact of the EeB cPPP Projects portfolio. The next edition will be published in June 2018 and made available on the ECTP website.

## Appendix

- Offline version of the 2018 progress monitoring questionnaire
- Comprehensive list of events
- Updated partnership board members list
- Detailed common cPPP KPIs and specific EeB cPPP KPIs
- Spin-offs and Start-ups resulting from H2020 EeB projects
- Analysis of the TRLs for each technology cluster
- Agenda of the 2017 EeB Impact workshop

## Foreword

Dear Project Coordinator,

The European Commission (EC) supported 110 projects through the EeB PPP initiative under FP7. Within Horizon 2020, the EC is now supporting 58 new projects selected under the 2014, 2015, 2016 and 2017 EeB calls. Your project is part of this portfolio.

One of the commitments in the contractual agreement between the EC and ECTP consists in **monitoring the impacts and exploitable outcomes** generated by the projects supported under this framework. In this respect, **both the European Commission and ECTP ask for and support your commitment to the provision of quality information for this monitoring.**

In addition, please note that the content provided through this questionnaire will **directly support dissemination and communication activities of your project**. Indeed, this content is being exploited to publish the 2018 edition of the annual **EeB PPP Project Review [booklet](#)** but also to feed official ECTP media channels such as the [EeB Committee website](#), the [EeB Committee official YouTube channel](#), etc. Thus, your cooperation is essential and very much appreciated.

**Jurgen TIEDJE**

Head of Unit " Advanced Manufacturing Systems and Biotechnologies"



Co-Chairman of the EeB PPP Partnership Board

**Antoine ASLANIDES**

ECTP Steering Committee Member  
E2B Committee Executive Board Member



Co-Chairman of the EeB PPP Partnership Board



### Guidelines

- This questionnaire has been pre-filled for your project with data previously collected in the context of the EeB PPP Project Review 2017 preparation and/or from the 2017 monitoring questionnaire. **Please check those pre-filled data and amend or update them when necessary.**
- The monitoring questionnaire is divided into 4 parts:
  - 1° Project Key Information
  - 2° the Key Performance Indicators (KPI) common to all cPPP
  - 3° the specific KPIs for the EeB PPP
  - 4° miscellaneous
- If you feel a question is not relevant for your project, please **leave it blank** (do not put '0').
- We ensure you all actions related to guaranteeing the confidentiality of all personal or individual data inserted in the questionnaire will be put in place.
- For any question or concern, please contact:
  - Anne-Claire BRUANT**
  - ECTP Project & Policy Manager
  - [anne-claire.bruant@ectp.org](mailto:anne-claire.bruant@ectp.org)
  - tel: +32 2 400 10 68

## EeB cPPP Progress Monitoring – 2018 Questionnaire

### 1- Project Key Information

#### 1. Project Identification

<b>Project acronym *</b>			
<b>Project name *</b> Maximum number of characters, spaces included : 150			
<b>Start date (e.g. May 2013) *</b>		<b>Status *</b>	<input type="radio"/> Ongoing
<b>Duration (months) *</b>			<input type="radio"/> Completed
<b>Total budget (€)*</b>			
<b>Project website *</b>			

#### 2. Coordinator details

<b>Name</b>	
<b>Organisation</b>	
<b>Country</b>	
<b>E-Mail:</b>	
<b>Phone number:</b>	

#### 3. If you wish, details on another contact point, preferably in charge of exploitation and/or dissemination activities

<b>Name</b>	
<b>Organisation</b>	
<b>Country</b>	
<b>Role in the project</b>	
<b>E-Mail:</b>	
<b>Phone number:</b>	

#### 4. Select the clusters your project should belong to

<b>First Technology Cluster *</b> (1 choice only, mandatory)	<b>Second Technology Cluster</b> (1 choice only, optional)
<input type="radio"/> Design	<input type="radio"/> Design
<input type="radio"/> Technology Building Blocks (envelope, energy equipment, structure)	<input type="radio"/> Technology Building Blocks (envelope, energy equipment, structure)
<input type="radio"/> Advanced Materials & nanotechnology	<input type="radio"/> Advanced Materials & nanotechnology
<input type="radio"/> Construction process, end of life, cross-cutting information	<input type="radio"/> Construction process, end of life, cross-cutting information
<input type="radio"/> Energy performance monitoring & management	<input type="radio"/> Energy performance monitoring & management
<input type="radio"/> ICT	<input type="radio"/> ICT
<input type="radio"/> BIM/Data/Interoperability	<input type="radio"/> BIM/Data/Interoperability

#### 5. Project Description

<p><b>Description *</b> Maximum number of characters, spaces included: 420</p> <ul style="list-style-type: none"> <li>• If the description is pre-filled, please update it to reflect the latest progress of your project.</li> <li>• Focus your description on innovative aspects of your project, expected or achieved impacts and exploitable results.</li> <li>• Do not copy generic project objectives from your proposal.</li> </ul>	
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\* This content will be published in the 2018 EeB PPP Project Review booklet (see [2017 edition](#) for examples)

## 2- Common cPPPs Key Performance Indicators

### 6. Mobilised private investment

	Actual value (March 2018)
<b>Total amount of actual private expenditure mobilised in EeB PPP projects</b> (i.e beneficiary contributions to eligible project costs plus possible additional private expenditures directly linked to project execution)	
<b>Estimation of private investment mobilized in other R&amp;D activities related to the EeB PPP</b> (including investments after end of the project)	

### 7. New skills and/or job profiles developed in the project

<b>Number of new skills and/or job profiles developed in your project</b>	
<b>Number of new curricula (university courses)</b>	
<b>Have you been facing issue to staff your project with adequate job profiles &amp; skilled resources? Please provide details.</b>	

### 8. Participation of SMEs and impact

<b>Total number of project partners in your project</b>	
<b>Number of SMEs participating in your project</b>	

	SME age
<b>SME 1</b>	
<b>SME 2</b>	
<b>SME 3</b>	
<b>SME 4</b>	

	SME size (number of employees)
<b>SME 1</b>	
<b>SME 2</b>	
<b>SME 3</b>	
<b>SME 4</b>	

		Actual value of the increase (€) (March 2018)	Actual percentage of the increase (%) (March 2018)	Expected value of the increase by the end of your project (€)	Expected percentage of the increase by the end of your project (%)
<b>Estimation of the increase in turnover in SMEs participating in your project</b>	Total amount (€) / Average % for all SMEs				
<b>SME 1</b>	<i>(Name)</i>				
<b>SME 2</b>	<i>(Name)</i>				
<b>SME 3</b>	<i>(Name)</i>				
<b>SME 4</b>	<i>(Name)</i>				

		Actual value of the increase (March 2018)	Expected value of the increase by the end of your project
<b>Estimation of the increase in number of employees for SMEs participating in your project</b>	Total amount for all SMEs		
<b>SME 1</b>	<i>(Name)</i>		
<b>SME 2</b>	<i>(Name)</i>		
<b>SME 3</b>	<i>(Name)</i>		
<b>SME 4</b>	<i>(Name)</i>		

## 9. Significant innovations

*This KPI concerns all developed foreground, tangible and intangible assets that have a marketable or at least an exploitable value, including products, processes, instruments, methods and technologies.*

	Actual value (March 2018)	Expected value by the end of your project
<b>Number of significant innovations developed in the project</b>		

<b>Please provide details about the significant innovations developed in the project</b>	
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**EeB cPPP Progress Monitoring – 2018 Questionnaire**

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**3- Specific Key Performance Indicators for the EeB c PPP**

**4- Contribution to the reduction of energy use and CO2 emissions**

		<b>Actual value (March 2018)</b>	<b>Expected value by the end of your project</b>
<b>Contribution of your project to the reduction of energy use</b>	Average % achieved in your project results		
<b>Contribution of your project to the reduction of CO2 emission</b>	Average % achieved in your project results		

**5- Contribution to the reduction of waste**

		<b>Actual value (March 2018)</b>	<b>Expected value by the end of your project</b>
<b>Contribution of your project to the reduction of waste</b>	Average % achieved in your project results		

**6- Contribution to the reduction in the use of material resources**

		<b>Actual value (March 2018)</b>	<b>Expected value by the end of your project</b>
<b>Contribution of your project to the reduction of material resources</b>	Average % achieved in your project results		

## 10. New systems and technologies

<b>Number of systems and technologies developed by your project (excluding incremental improvements)</b>	
<i>This refers only to the new systems and technologies, developed within the cPPP projects which are clearly beyond the current state of the art and not only new at the level of the beneficiary, nor only at the level of the cPPP project itself. Purely incremental improvements are not to be taken into account.</i>	

	Short description of each new system and technology (description & progress beyond the state of the art & how the innovation contributes to EeB cPPP objectives)	Current TRL (March 2018)	TRL expected by the end of your project	Envisaged exploitation
		<i>See TRL definitions at the end of the document</i>		<i>Public exploitation means open source, open data, and/or results available for free on a public website.</i>
<b>1</b>				<input type="radio"/> Commercial <input type="radio"/> Public <input type="radio"/> Scientific / Academic <input type="radio"/> Still to be defined <input type="radio"/> No exploitation
<b>2</b>				<input type="radio"/> Commercial <input type="radio"/> Public <input type="radio"/> Scientific / Academic <input type="radio"/> Still to be defined <input type="radio"/> No exploitation
<b>3</b>				<input type="radio"/> Commercial <input type="radio"/> Public <input type="radio"/> Scientific / Academic <input type="radio"/> Still to be defined <input type="radio"/> No exploitation
<b>4</b>				<input type="radio"/> Commercial <input type="radio"/> Public <input type="radio"/> Scientific / Academic <input type="radio"/> Still to be defined <input type="radio"/> No exploitation
<b>5</b>				<input type="radio"/> Commercial <input type="radio"/> Public <input type="radio"/> Scientific / Academic <input type="radio"/> Still to be defined <input type="radio"/> No exploitation

## 11. Project results taken-up for further investments (into higher TRLs)

	Actual value (March 2018)	Expected value by the end of your project
<b>Number of project results taken-up for higher TRLs using additional investments</b>		

## 12. Non-technological innovations

Number of non-technological innovations developed by your project		
<p><i>This refers to non-technological innovations developed within the EeB cPPP projects which are clearly beyond the current state of the art. Examples of non-technological innovation include methodologies, business models, services, etc. (technological innovations must be listed in Q10 of this questionnaire).</i></p>		
Short description of each non-technological innovation	Progress beyond state of the art	Envisaged exploitation
		<p><i>Public exploitation means open source, open data, and/or results available for free on a public website</i></p>
		<input type="radio"/> Commercial <input type="radio"/> Public <input type="radio"/> Scientific / Academic <input type="radio"/> Still to be defined <input type="radio"/> No exploitation
		<input type="radio"/> Commercial <input type="radio"/> Public <input type="radio"/> Scientific / Academic <input type="radio"/> Still to be defined <input type="radio"/> No exploitation
		<input type="radio"/> Commercial <input type="radio"/> Public <input type="radio"/> Scientific / Academic <input type="radio"/> Still to be defined <input type="radio"/> No exploitation

## 13. Demonstration sites

Number of demo sites in your project	

## 14. Patents

	Actual value (March 2018)	Expected value by the end of your project
Number of patent applications		
Number of patents awarded		

### 15. Standardisation activities and contributions to new standards

	Actual value (March 2018)	Please provide a short description or reference
Number of activities leading to standardisation		
Number of working items in European Standardisation Bodies		
Number of pre-normative research files – prEN - under consultation in European Standardisation Bodies – ESBs		

### 16. Trainings for a higher quality workforce

	Actual value (March 2018)
Number of dissemination events, seminars, conferences organised in your project	
Number of participants in dissemination events organised in your project	

### 17. Promotion of Entrepreneurship

	Actual value (March 2018)	Expected value by the end of your project
Number of Spin-offs and Start-ups as result of your project		

	Name	Website
Spin-off 1		
Spin-off 2		
Spin-off 3		

### 18. Publications

	Actual value (March 2018)
Number of submitted scientific (peer-reviewed) publications	



<b>Number of published scientific (peer-reviewed) publications</b>	
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### 19. Promotional videos

		<b>Actual value (March 2018)</b>
<b>Number of promotional videos</b>		
<i>Please reference only high quality promotional videos which are shorter than 5 minutes.</i>		
<b>Video 1</b>	<b>http://</b>	
<b>Video 2</b>	<b>http://</b>	
<b>Video 3</b>	<b>http://</b>	

### 20. Success story

<b>At this stage, do you consider your project can be presented as a success story in terms of achieved impact ?</b>	<input type="radio"/> Yes <input type="radio"/> No
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## EeB cPPP Progress Monitoring – 2018 Questionnaire

### 4- Miscellaneous

#### 21. ECTP Conference 2018 (13-14 November 2018)

<b>ECTP Conference 2018 will take place on 13-14 November 2018 in Brussels. Would you be interested in exhibiting your project outcomes on a booth?</b>	<input type="radio"/> Yes <input type="radio"/> No
<b>Would you be interested in exhibiting a poster to present your project outcomes?</b>	<input type="radio"/> Yes <input type="radio"/> No

#### 22. 2018, European Year of Cultural Heritage

2018 is the European Year of Cultural Heritage. For this reason, we would like to know the impact of EeB PPP projects for the European Cultural Heritage.

<b>Does/did your EeB PPP project develop some activities dealing with Cultural Heritage and/or Regeneration issues?</b>	<input type="radio"/> Yes <input type="radio"/> No
<b>Even if your EeB PPP project is not directly dealing with Cultural Heritage and/or Regeneration issues, which project partners are working on these issues and/or would be interested in such activities?</b>	

Thank you! Your questionnaire is now completed. You can come back to this questionnaire to fine-tune and/or amend your answers **until March 23<sup>rd</sup> 2018**.

If you have any question or concern, please contact Anne-Claire Bruant at [anne-claire.bruant@ectp.org](mailto:anne-claire.bruant@ectp.org) or at +32 2 400 10 68

On behalf of ECTP, we thank you for your time and valuable contribution. We kindly invite you to join ECTP – Energy Efficient Buildings Committee official LinkedIn group at <https://www.linkedin.com/groups/3744557>

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## EeB cPPP Progress Monitoring – 2018 Questionnaire

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### Definition of Technology Readiness Levels (TRL)

#### HORIZON 2020 – WORK PROGRAMME 2014-2015 General Annexes

Extract from Part 19 - Commission Decision C(2014)4995

Where a topic description refers to a TRL, the following definitions apply:

- TRL 1 – basic principles observed
- TRL 2 – technology concept formulated
- TRL 3 – experimental proof of concept
- TRL 4 – technology validated in lab
- TRL 5 – technology validated in relevant environment (industrially relevant environment in the case of key enabling technologies)
- TRL 6 – technology demonstrated in relevant environment (industrially relevant environment in the case of key enabling technologies)
- TRL 7 – system prototype demonstration in operational environment
- TRL 8 – system complete and qualified
- TRL 9 – actual system proven in operational environment (competitive manufacturing in the case of key enabling technologies; or in space)

## Comprehensive list of events attended by ECTP-E2B (since the previous PMR)

Name of the Event	Date	Place	Short description	Targeted stakeholders	ECTP contribution (who & what)	Number of attendees
SET Plan Temporary Working Group 3.2.	26/04/2018	Brussels, Belgium	Webinar redaction IP	Member states and cities	Paul Cartuyvels co-chairing and contributing to IP	8
SET Plan Steering Committee	12/04/2018	Brussels, Belgium	Feedback on TWG 5 and 3.2.	Member states	Paul Cartuyvels speaker	60
SET Plan Temporary Working Group 3.2.	16/03/2018	Brussels, Belgium	Meeting DG ENER on IP	Member states	Paul Cartuyvels co-chairing and contributing to IP	14
Innovation deal official launch	12/03/2018	Brussels, Belgium	Signing ceremony with Commissioner Moedas, Ministers and private sector	Members of the ID group	PC for co-writing ID; Servan Lacire of BY ES to sign	36
1 <sup>st</sup> Workshop of the Digitising European Industry WG on Future Partnerships	06/03/2018	Brussels, Belgium	The EeB PPP and national programmes	Representatives from various Platforms and industries	Presentation by Paul Cartuyvels	Around 30
EU Industry Day – LNEC event	21/02/2018	Lisbon, Portugal	Digital industrial platform for construction	Portuguese representatives from Construction Research and industry, and from Portuguese ministries	Presentation by Alain Zarli	Around 150
EU Industry Day	21/02/2018 & 22/02/2018	Brussels, Belgium	High-level stakeholders meeting on the European industrial policy	Representatives from various industries	Antoine Aslanides & Alain Zarli attended the event	Around 500
Follow-up meetings (#2 & #3) on the cPPP mid-term review between the Commission's services and cPPP associations	17/01/2018 & 09/02/2018	Brussels, Belgium	Discussion on the Progress Monitoring Report 2018 between the EC and the cPPP	Associations representing the private sector of the cPPP	Alain Zarli, Antoine Aslanides, Paul Cartuyvels, Anne-Claire Bruant	Around 25
SET Plan Temporary Working Group 3.2. (Smart Cities)	20/02/2018	Brussels, Belgium	Webinar redaction IP for Smart Cities	Member states and cities	Paul Cartuyvels co-chairing and contributing to IP	6
Updating the European strategy on energy efficiency: making better use of energy resources	15/02/2018	Brussels, Belgium	Presentation of the EeB PPP	Stakeholders from the energy sector	Presentation by Anne-Claire Bruant	Around 20
SET Plan Temporary Working Group 5 (Eff Ener)	31/01/2018	Brussels, Belgium	Implementation Plan (IP) for Energy Efficiency in Buildings	Member states	Paul Cartuyvels co-chairing and contributing to IP	19
Innovation Deal on Batteries	25/01/2018	Brussels, Belgium	Set up group on solving bottlenecks to second life and recycling of batteries	Partnership between EC, Member States and private stakeholders	Paul Cartuyvels for Bouygues Energies Services and project ELSA	17

Meeting with EC / DG R&I, Surface Transport / J.F. Aguinaga	24/01/2018	Brussels, Belgium	Presentation of ECTP & PPP vision and development on FP9	EC officers + ECTP	Alain Zarli, Paul Cartuyvels, Miguel Rodriguez	5
Meeting with EC / DG Research & Innovation I3 / Emanuela de Menna	11/01/2018	Brussels, Belgium	Discussion about EYCH / Fair of innovators	EC officers + ECTP	Alain Zarli, Isabelle Rodriguez	4
Materials EuroRoads - "Materials Innovations Empowering European Industries for Global Challenges"	13/12/2017	Brussels, Belgium	Workshop focused on how research on advanced innovative materials can contribute to providing solutions for clean mobility, for Industry 4.0 and for application in extreme environments.	Stakeholders from the advanced materials sector	Paul Cartuyvels	150
EC Construction 2020 Thematic Group "Stimulating investment in building renovation, infrastructure and innovation" (3 <sup>rd</sup> meeting).	30/11/2017	Brussels, Belgium	Exchange of views on the creation of a European Digital platform for construction, digitalisation for building performance assessment and digitalisation of SMEs.	Stakeholders from the construction sector	Anne-Claire Bruant	Around 40
FEHRL General Assembly	28/11/2017	Porto, Portugal	Presentation of ECTP and the EeB cPPP + REFINET	FERHL members + Board	Presentation by Alain Zarli	Around 18
UEAPME & EBC Construction Forum	23/11/2017	Brussels, Belgium	ECTP and EeB PPP presentation	UEAPME & EBC members	Presentation by Anne-Claire Bruant	Around 15
ePower & Building Summit	22/11/2017	Madrid, Spain	ECTP and EeB PPP presentation	Spanish construction stakeholders	Presentation by Anne-Claire Bruant	Around 200
High Level Group on digitizing EU industry (Participation to the Working-level workshop with Sherpas and Commission Service)	21/11/2017	Brussels, Belgium	Exchanges of views and discussion along the lines of the high-level governance meeting / Digitising the EU Construction industry	EC officers + industry (Sherpas of CEOs-CTOs)	Alain Zarli	
The European Bioeconomy Congress 2017	20/11/2017	Lodz, Poland	Signature of a partnership between ECTP and Polish regions	Polish representatives from Research and industry, and from Polish regions	Emmanuel Forest, Alain Zarli	Around 300
ECCREDI Council meeting	9/11/2017	Brussels, Belgium	ECTP & EeB PPP presentation	ECCREDI members	Presentation by Anne-Claire Bruant	Around 15
Cities of the Future – Turkey in Horizon 2020	26/10/2017	Brussels, Belgium	ECTP & EeB PPP presentation	Turkish & European collaboration within Horizon 2020	Presentation by Paul Cartuyvels	200

Construction 4.0 (Digital Europe event)	17/10/2017	Brussels, Belgium	Discuss digitilisation opportunities for the construction sector	EU stakeholders from construction and digital sectors	Intervention in the panel by Paul Cartuyvels + Anne-Claire Bruant	Around 20
CoolingEU Breakfast at the European Parliament	26/09/2017	Brussels, Belgium	Cooling in buildings	Industry stakeholders interested in cooling issues	Presentation by Anne-Claire Bruant	Around 40
Industrial Innovation Info Day	3-4/10/2017	Brussels, Belgium	Opportunity to promote ECTP and the EeB PPP & meet stakeholders	EU industry stakeholders	Anne-Claire Bruant	Around 200
Field visit to EU-GUGLE project	21/09/2017	Tampere, Finland	Opportunity to promote the EeB PPP	Open to all stakeholders involved in innovation in the Construction sector)	Visit organized by Paul Cartuyvels	Around 15
EeB PPP project CommOnEnergy Final Conference	07/09/2017	Brussels, Belgium	Opportunity to promote the EeB PPP	CommOnEnergy partners	Anne-Claire Bruant	Around 50
Shaping our future in R&I, EC event	03/07/2017	Brussels, Belgium	Discussion about the role of research and innovation for Europe's future	All stakeholders involved in R&I in Europe + policymakers from EU institutions	Emmanuel Forest, Alain Zarli, Paul Cartuyvels, Anne-Claire Bruant	Around 300
Digital skills in construction DG GROW event (Conference "Construction: Let's Build Changes!")	06/07/2017	Brussels, Belgium	Presentation on ICT	Construction & ICT stakeholders	Intervention in the panel by Alain Zarli	Around 100
ECO-SEE project final event	29/06/2017	Brussels, Belgium	Presentation on the EeB PPP and on eco-materials	ECO-SEE partners	Presentation by Anne-Claire Bruant	Around 50
DG RTD Workshop on future technology challenges	16/06/2017	Brussels, Belgium	Opportunity to present challenges for the construction sector/EeB PPP	ETPs, cPPPs and EC	Presentation by Antoine Aslanides	Around 40
EU Sustainable Energy Week	20-22/06/2017	Brussels, Belgium	Opportunity to present ECTP and the EeB PPP	European energy stakeholders	Anne-Claire Bruant	Around 300

## Updated partnership board members list (as of 05<sup>th</sup> February 2018)

EeB cPPP Partnership Board Members proposed by ECTP E2B Committee (on 05/02/2018)

<b>MEMBERS</b>				
<b>NAME</b>	<b>FIRST NAME</b>	<b>ORGANISATION</b>	<b>EMAIL ADDRESS</b>	<b>NATIONALITY</b>
ADAN	Olaf	TNO BUILT ENVIRONMENT	olaf.adan@tno.nl	Dutch
ARTELT	Christian	HEIDELBERGCEMENT	christian.artelt@heidelbergcement.com	German
ASLANIDES (CO-CHAIRMAN)	Antoine	EDF - ELECTRICITÉ DE FRANCE	antoine.aslanides@edf.com	French
BIGNOZZI	Maria	CENTRO CERAMICO	maria.bignozzi@unibo.it	Italian
BONILLA	Javier	ACCIONA Construcción	franciscojavier.bonilla.diaz@acciona.com	Spanish
BOUDJABEUR	Samir	TATA STEEL UK	samir.boudjabeur@tatasteel.com	British
BRUMANA	Raffaella	POLITECNICO DI MILANO (POLIMI)	raffaella.brumana@polimi.it	Italian
CARTUYVELS	Paul	BOUYGUES SA / BOUYGUES CONSTRUCTION	pcartuyvels@bouygues.com	Belgian
DE LARRARD	Francois	LAFARGEHOLCIM	francois.delarrard@lafargeholcim.com	French
GÖTTIG	Roland	FRAUNHOFER IBP	goettig@tum.de	German
JORDAN	Sabina	ZAG	sabina.jordan@zag.si	Slovenian
MIERES	Juan Manuel	SOLINTEL	jmieres@solintel.eu	Spanish
PEREZ	Juan	TECNALIA	juan.perez@tecnalia.com	Spanish
PINTO-SEPPÄ	Isabel	VTT	Isabel.Pinto-Seppa@vtt.fi	Finnish
SEGARRA	Miguel	DRAGADOS	mjsegarra@dragados.com	Spanish
VYNCKE	Johan	ECCREDI	johan.vyncke@bbri.be	Belgian
WURM	Jan	ARUP	jan.wurm@arup.com	German
ZACH	Juliusz	MOSTOSTAL WARSZAWA S.A	J.Zach@mostostal.waw.pl	Polish
ZANGANI	Donato	RINA CONSULTING	donato.zangani@rina.org	Italian
ZARLI	Alain	CSTB	alain.zarli@cstb.fr	French
<b>SUBSTITUTE MEMBERS</b>				
<b>NAME</b>	<b>FIRST NAME</b>	<b>ORGANISATION</b>	<b>EMAIL ADDRESS</b>	<b>NATIONALITY</b>
AHO	Ilari	UPONOR CORPORATION	Ilari.Aho@uponor.com	Finnish
AGIRRE	Imanol	MONDRAGON CORPORATION	iagirre@lksgroup.com	Spanish
BURGUENO MUÑOZ	Antonio	FCC CONSTRUCTION	ABurgueno@fcc.es	Spanish
CAROSIO	Stefano	UNIVERSITA DI PADOVA	stefano.carosio@unismart.it	Italian
KERRIGAN	Ruth	IES	ruth.kerrigan@iesve.com	Irish
MJÖRNELL	Kristina	RISE Research Institutes of Sweden	Kristina.Mjornell@ri.se	Swedish
REVEL	Gian Marco	UNIVERSITA POLITECNICA DELLE MARCHE	gm.revel@staff.univpm.it	Italian
SADORGE	Jean-Luc	POLE FIBRES-ENERGIVIE	jean-luc.sadorge@fibres-energie.eu	French
SCHREUDER	Niels	AGC GLASS EUROPE	Niels.Schreuder@eu.agc.com	Dutch
WURTZ	Etienne	CEA	Etienne.Wurtz@cea.fr	French

## Detailed common cPPP KPIs and specific EeB cPPP KPIs

### Part 1 - Common Priority Key Performance Indicators

	Key Performance Indicator (KPI)	Value in March 2018	Baseline at the start of H2020 (latest available)	Target (for the cPPP) at the end of H2020	Comments
1	Mobilised Private Investments	Leverage factor: <b>4.87</b> (Input by association - based on inputs from the LEARs of 6 organizations – 2 RTOs, 2 Large Ind., 2 SMEs, <i>involved in 39 projects</i> )	n/a	From the CA: Leverage Factor: 4	
2	New skills and/or job profiles <ul style="list-style-type: none"> <li>Number of new skills and/or job profiles created (or forecasted within a reasonable timeframe in the future) in your project</li> </ul>	<b>1064 (cumulative)</b> <b>26,6 per project</b> (Input by Association – Based on inputs from 40 projects)	<i>Reference to FP7 results (Input by Association – Based on inputs from 78 projects)</i>  <i>8,3 per project</i>	From the CA: 10	
	<ul style="list-style-type: none"> <li>Number of new curricula (university courses)</li> </ul>	<b>57 (cumulative)</b> <b>2 per project</b> (Input by Association – Based on inputs from 40 projects)	<i>Reference to FP7 results (Input by Association – Based on inputs from 72 projects)</i>  <i>1,3 per project</i>		
3	Impact of the EeB cPPP on SMEs <ul style="list-style-type: none"> <li>Total number of SMEs participating in your project</li> </ul>	<b>4,6 per project</b> (Input by Association – Based on inputs from 58 projects)	<i>Reference to FP7 results (Input by Association – Based on inputs from 104 projects)</i>  <i>3,8 per project</i>	From the CA	
	<ul style="list-style-type: none"> <li>Share of participation of SMEs in EeB cPPP projects</li> </ul>	<b>35%</b> (Input by Association – Based on inputs from 58 projects)	<i>Reference to FP7 results (Input by Association – Based on inputs from 99 projects)</i>		

			28%		
	<ul style="list-style-type: none"> <li>Age of company</li> </ul>	<b>19</b> (Input by Association – Based on inputs from 118 participating SMEs)	<i>Reference to FP7 results            (Input by Association –            Based on inputs from 126            participating SMEs)</i>		
	<ul style="list-style-type: none"> <li>Current size of company (number of employees)</li> </ul>	<b>32,1</b> (Input by Association – Based on inputs from 120 participating SMEs)	<i>Reference to FP7 results            (Input by Association –            Based on inputs from 119            participating SMEs)</i>	21,4	
	<ul style="list-style-type: none"> <li>Estimation of the increase in turnover in SMEs participating in your project</li> </ul>	Actual increase <b>2 073 800€ per project            49,7%</b> (Input by Association – Based on inputs from 30 projects)  Expected increase by the end of the project <b>4 747 508€ per project            69,2%</b> (Input by Association – Based on inputs from 25 projects)	<i>Reference to FP7 results            (Input by Association –            Based on inputs from 37            projects)</i>	2 248 855 €	
	<ul style="list-style-type: none"> <li>Estimation of the increase in number of employees for SMEs participating in your project</li> </ul>	Actual increase <b>6,6</b> (Input by Association – Based on inputs from 28 projects)  Expected increase by the end of the project	<i>Reference to FP7 results            (Input by Association –            Based on inputs from 52            projects)</i>	9,5	



		<b>15,2</b> (Input by Association – Based on inputs from 26 projects)			
4	Significant Innovations <ul style="list-style-type: none"> <li>Number of systems and technologies developed by your project (excluding incremental improvements)</li> </ul>	<b>223 (cumulative)</b> <b>3,8 per project</b> (Input by Association – Based on inputs from 58 projects)	<i>Reference to FP7 results (Input by Association – Based on inputs from 102 projects)</i>  <i>3 per project</i>	From the CA : 40	
	<ul style="list-style-type: none"> <li>Number of systems and technologies developed by your project (excluding incremental improvements)</li> </ul>	<b>88 (cumulative)</b> <b>1,5 per project</b> (Input by Association – Based on inputs from 58 projects)	<i>Reference to FP7 results (Input by Association – Based on inputs from 98 projects)</i>  <i>0,9 per project</i>		

## Part 2 - Specific Key Performance Indicators for the cPPP

	KPI domain	Key Performance Indicator (KPI)	Value in March 2018	Baseline at the start of H2020 (latest available)	Target (for the cPPP) at the end of H2020	Comments
1	Contribution to the reduction of energy use and CO <sub>2</sub> emissions	Contribution of the PPP projects to the reduction of energy use in the area of the PPP	Actual value <b>18,7%</b> (Input by Association – Based on inputs from 33 projects)  Expected value by the end of the project <b>38,9%</b> (Input by Association – Based on inputs from 43 projects)	<i>Reference to FP7 results (Input by Association – Based on inputs from 79 projects)</i>  <i>31,6%</i>	From the CA : 50%	

		Contribution of the PPP projects to the reduction of CO <sub>2</sub> emission in the area of the PPP	Actual value <b>13,1%</b> (Input by Association – Based on inputs from 29 projects)  Expected value by the end of the project <b>40,6%</b> (Input by Association – Based on inputs from 38 projects)	<i>Reference to FP7 results (Input by Association – Based on inputs from 70 projects)</i>  <i>29,7%</i>	80%	
2	Contribution to the reduction of waste	Contribution of the PPP projects to the reduction of waste in the area of the PPP	Actual value <b>10,8%</b> (Input by Association – Based on inputs from 20 projects)  Expected value by the end of the project <b>25,8%</b> (Input by Association – Based on inputs from 21 projects)	<i>Reference to FP7 results (Input by Association – Based on inputs from 40 projects)</i>  <i>7,9%</i>	From the CA	
3	Contribution to the reduction in the use of material resources	Contribution of the PPP projects to the reduction of material resources in the area of the PPP	Actual value <b>6,9%</b> (Input by Association – Based on inputs from 21 projects)  Expected value by the end of the project <b>20,6%</b> (Input by Association – Based on inputs from 24 projects)	<i>Reference to FP7 results (Input by Association – Based on inputs from 38 projects)</i>  <i>8,6%</i>	From the CA	

4	Demonstration sites	Number of demo sites in the projects	<b>204 (cumulative)</b> <b>3,6 per project</b> (Input by Association – Based on inputs from 57 projects)	<i>Reference to FP7 results</i> <i>(Input by Association – Based on inputs from 92 projects)</i>  <i>2,8 per project</i>	100 demo sites  10.000 dwellings	
5	Trainings for a higher quality workforce	Number of dissemination events, seminars, conferences organised in your project	<b>512 (cumulative)</b> <b>10,7 per project</b> (Input by Association – Based on inputs from 48 projects)	<i>Reference to FP7 results</i> <i>(Input by Association – Based on inputs from 98 projects)</i>  <i>19,7 per project</i>		
		Number of participants in dissemination events organised in your project	<b>21 181 (cumulative)</b> <b>450,7 per project</b> (Input by Association – Based on inputs from 57 projects)	<i>Reference to FP7 results</i> <i>(Input by Association – Based on inputs from 99 projects)</i>  <i>899,6 per project</i>		
6	Promotion of Entrepreneurship	Number of Spin-offs and Start-ups as result of your project	Actual value <b>7</b> (Input by Association – Based on inputs from 58 projects)  Expected value by the end of the project <b>35</b> (Input by Association – Based on inputs from 52 projects)	<i>Reference to FP7 results</i> <i>(Input by Association – Based on inputs from 95 projects)</i>  16		

7	Publications	Number of submitted scientific (peer-reviewed) publications	<b>224 (cumulative) 4,6 per project</b> (Input by Association – Based on inputs from 49 projects)	<i>Reference to FP7 results (Input by Association – Based on inputs from 85 projects)  11 per project</i>		
		Number of published scientific (peer-reviewed) publications	<b>192 (cumulative) 4 per project</b> (Input by Association – Based on inputs from 48 projects)	<i>Reference to FP7 results (Input by Association – Based on inputs from 85 projects)  10,5 per project</i>		

### Part 3 - Contribution to Programme-Level KPI's

	Key Performance Indicator	Definition/Responding to question	Type of data required	Value in March 2018	Baseline at the start of H2020 (latest available)	Target (for the cPPP) at the end of H2020	Comments
1	Patents		Number of patent applications.	Actual value: <b>10 (cumulative) 0,2 per project</b> (Input by Association – Based on inputs from 40 projects)  Expected value by the end of the project: <b>58 (cumulative) 1,9 per project</b>	<i>Reference to FP7 results (Input by Association – Based on inputs from 100 projects)  1 per project</i>	<b>H2020:</b> 3 patent applications per €10 million funding	

				(Input by Association – Based on inputs from 31 projects)			
			Number of patents awarded	Actual value: <b>3 (cumulative)</b> <b>0,1 per project</b> (Input by Association – Based on inputs from 37 projects)  Expected value by the end of the project: <b>37 (cumulative)</b> <b>1,3 per project</b> (Input by Association – Based on inputs from 28 projects)	<i>Reference to FP7 results (Input by Association – Based on inputs from 89 projects)</i>  <i>0,5 per project</i>		
2	Standardisation activities (project level)		Number of activities leading to standardisation	<b>72 (cumulative)</b> <b>1,8 per project</b> (Input by Association – Based on inputs from 39 projects)	<i>Reference to FP7 results (Input by Association – Based on inputs from 73 projects)</i>  <i>0,6 per project</i>	No target	
	Contributions to new standards (PPP level)		Number of working items in European Standardisation Bodies.	<b>5 (cumulative)</b> <b>0,1 per project</b> (Input by Association – Based on inputs from 34 projects)	<i>Reference to FP7 results (Input by Association – Based on inputs from 64 projects)</i>		

					<i>0,1 per project</i>		
			Number of pre-normative research files – prEN - under consultation in ESBs	<b>2 (cumulative) 0,1 per project</b> (Input by Association – Based on inputs from 33 projects)	<i>Reference to FP7 results (Input by Association – Based on inputs from 65 projects)</i>		
					<i>0,05 per project</i>		
3	Operational performance	Time-to-grant		<b>Data from the EC</b>			

## Spin-offs and Start-ups resulting from H2020 EeB projects

H2020 Project	Number of Spin-offs and Starts-ups as a result of the project	Spin-off name	Activity	Exploited result from the EeB project
<b>MORE-CONNECT</b>	2	Recreate <sup>13</sup>	AR/VR technology	n/a
<b>P2Endure</b>	1	Robot at work <sup>14</sup>	Robotic technology for 3D printing of façade layers	n/a
<b>EENSULATE</b>	1	Solace <sup>15</sup> – Housing Affordable and Accessible for all	Use of the system for the insulation of buildings walls	Development of 3D printing robotics and its Guided User Interface (GUI) demonstrated on Korsløkken demo case in Denmark High-efficiency insulation system
<b>Pro-GET-OnE</b>	1	n/a		
<b>LAWIN</b>	1	n/a		
<b>BUILT2SPEC</b>	1	Build Test Solutions <sup>16</sup>	Testing and performance verification solutions in the built environment sector	The PULSE product is based on IP licensed from University of Nottingham, linked to their participation to Built2Spec. Air pulse airtightness technology and test for buildings (innovative, fast, lower cost, low skill, for quick quality assurance and compliance checks)

<sup>13</sup> [www.recreate.nl](http://www.recreate.nl)

<sup>14</sup> [www.robotatwork.com](http://www.robotatwork.com)

<sup>15</sup> [www.solace.house](http://www.solace.house)

<sup>16</sup> <http://buildtestsolutions.com/pulse>

## Analysis of the TRLs for each technology cluster

		AVG value for all WGs		AVG value for each of the 7 WGs	Min value for each of the 7 WGs	Min project(s) acronym(s) for each of the 7 WGs	Max value for each of the 7 WGs	Max project(s) acronym(s) for each of the 7 WGs
Current TRL (March 2018)	WG1	5,3		5,7	5	BuildHEAT – OptEEemAL	7	Pro-GET-OnE
	WG2			5,2	4	CREATE – DREAM – Greeninstruct – Hybuild – INNOVIP – InnoWEE	7,2	ZERO-Plus (EE)
	WG3			4,8	4	INNOVIP – RE4 – TESS2b – VEEP	7	HOMESKIN
	WG4			5,2	4	Greeninstruct – RE4 – VEEP	7	EeB-CA2
	WG5			5,3	3,8	HIT2GAP	7,2	ZERO-Plus (EE)
	WG6			5,3	3,8	HIT2GAP	6,1	BUILT2SPEC
	WG7			6,1	4,8	REZBUILD	7	Pro-GET-OnE
TRL expected by the end of the project	WG1	6,9		7,2	6	BuildHEAT	9	Pro-GET-OnE
	WG2			6,9	5,5	LAWIN	9	WALL-ACE
	WG3			6,7	5,2	TESS2b	9	WALL-ACE
	WG4			6,3	6	ACCEPT – Greeninstruct – INSITER – VEEP	7	EeB-CA2
	WG5			7	5,2	TESS2b	8,7	REZBUILD
	WG6			6,5	6	ACCEPT	7	MOEBBIUS
	WG7			7,4	6	INSITER	9	Pro-GET-OnE



## Agenda of the 2017 EeB cPPP Impact workshop



### Agenda Workshop Impact of the Energy-efficient Buildings cPPP 16 May 2017, Brussels, Belgium

#### **16 May 2017, Tuesday**

Venue: [BEDFORD Hotel](#), 135-137 Rue du Midi, 1000 Brussels

**13:30-13:45 Welcome coffee** (Lobby next to Room Galileo on the 8<sup>th</sup> floor)

**13:45-14:30 Plenary Session** (Room Galileo)

- Welcome address: ECTP (Emmanuel Forest, Ignacio Calvo) and EC (Jurgen Tiedje)
- Introduction to the day: ECTP General Secretariat;
- EC address (1): **Energy Efficient Buildings through H2020 – Public Private Partnership-Achievements and Challenges from the Commission's point of view** – Jurgen Tiedje, European Commission, DG Research & Innovation, Head of Unit *Advanced Manufacturing Systems and Biotechnologies*.
- EC address (2): **Introduction to the proposal for amending the Energy Performance of Buildings Directive** – Sylvain Robert, European Commission, DG Energy, Unit *Energy Efficiency*.

**14:30-16:15 First round of Parallel Sessions (1 + 2)**

Session 1 (Room Galileo): Advanced materials and nanotechnology

Projects: ADAPTIWall, ECO-BINDER, HOMESKIN, ISOBIO, MF-Retrofit

Chairs: Christian Artelt (HeidelbergCement)

Olga Rio Suarez (EC – DG RTD D3)

Rapporteur: Maria Founti (NTUA) – Gian-Marco Revel (UnivPM)

Session 2 (Room Da Gama): Design, Construction process, end of life, cross-cutting information

Projects: ACCEPT, BRIMEE, BUILT2SPEC, NEXT-Buildings, R2Cities

Chairs: Juan-Manuel Mieres (Solintel)

Dominique Planchon (EC – DG RTD D2)

Rapporteur: Sabina Jordan (ZAG) – Stefano Carosio

**16:15-16:30 Coffee Break** (Lobby next to Room Galileo on the 8<sup>th</sup> floor)

**16:30-18:15 Second round of Parallel Sessions (3 + 4)**

Session 3 (Room Galileo): Technology building blocks, Energy performance monitoring and management

Projects: CommOnEnergy, EASEE, EPIC-HUB, P2ENDURE, READY

Chairs: Antoine Aslanides (EDF)

Carlos Saraiva Martins (EC – DG RTD D2)

Rapporteur: Juan Perez (Tecnalia) – Stefano Carosio

Session 4 (Room Da Gama): ICT, BIM/ Data & Interoperability

Projects: INSITER, OptEEmAL, Pro-GET-One, STREAMER

Chairs: Ilari Aho (Uponor)

José Riesgo Villanueva (EC – DG RTD D2)

Rapporteur: Isabel Pinto-Seppa (VTT)

**18:15-18:30 Rapporteurs synthesis + Conclusion** (Room Galileo)