

Agreed strategic targets for the Energy efficiency solutions for buildings & Renewable heating and cooling:

**Technology oriented targets by 2025:**

Heat Pumps systems:

- Reduction by 50% of the global cost (equipment, sensors and installation) of the next generation for small and large size heat pumps compared to 2015 market prices
- Development of prefabricated, fully integrated cost-effective 'plug in and play' hybrid/multisource heat pump systems and integrated compact heating/cooling plants based on modular heat pumps.

District heating and cooling:

- Increase by 25% the amount of renewable heat or heat recovered from industrial installations in DHC networks, in a cost effective way, without jeopardising the quality of the service provided to the consumers.
- Decrease of the DHC substations reference cost for residential buildings by 20% compared to the 2015 prices.

Micro CHP/CCHP:

- Reduction by 50% of the equipment and installation costs compared to the 2015 market prices.
- Increase of the energy efficiency of Micro CHP/CCHP by 20% compared to the 2015 levels by:
  - increasing operational electrical efficiency close to nominal,
  - maintaining thermal efficiency of the entire operating range of micro and small scale CHP/CCHP.

Thermal Energy Storage:

- Improvement of 25% of performance (energy efficiency, system lifetime, O&M) above ground and underground energy storage compared to 2015 levels.
- Increase of 200% of storage density at the system level (including pumps, valves, pipes, short term buffer) from the current state-of-art of 60 kWh/m<sup>1,2</sup>

**Non-Technology oriented targets by 2025:**

Building on the Integrated Roadmap (IR) of the SET-Plan and some parts and aspects of the multi-annual roadmap prepared by the Energy-efficient Buildings (EeB) PPP<sup>3</sup>, public (e.g. EU, Member States or Regions funds) and private investment must focus on targeted R&I actions to achieve the following goals in terms of developing materials and technologies for energy efficiency solutions for buildings, while striving to reduce GHG emissions:

1. Mastering the renovation of the main existing building typologies in Europe with ambitious, cost-effective and holistic refurbishment packages (for residential and non-residential buildings):

- R&I will lead to the development and demonstration of highly replicable, standardised and holistic refurbishment packages tailored to the main building typologies in Europe (including historical buildings). The objective is to reduce on average the primary energy of buildings by 60% while reducing total cost of ownership and limiting the payback time to 10 years.

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<sup>1</sup> This value is achieved for the zeolite system in the EU-funded research project COMTES at <http://comtes-storage.eu/>

<sup>2</sup> COM(2015) 80 final

<sup>3</sup> EEB roadmap:

[http://www.ectp.org/cws/params/ectp/download\\_files/36D2981v1\\_Eeb\\_cPPP\\_Roadmap\\_under.pdf](http://www.ectp.org/cws/params/ectp/download_files/36D2981v1_Eeb_cPPP_Roadmap_under.pdf)

- These packages should lead to optimal system design and control aiming at maximising energy saving opportunities while covering the remaining energy demand by renewable energy sources to the largest possible extent. They should be based on a holistic approach considering the building and its context (i.e. energy networks, systems and planning at neighbourhood/city level), they should respond to consumers' needs (e.g. comfort, healthy indoor climate), be durable, reusable and recyclable, easy to install, operate and maintain. Based on interoperability among systems, they should combine together existing and emerging sustainable technologies and materials to address energy efficiency throughout the building envelope, technical building systems (including renewable energy technologies and storage) and optimised operation and building performance levels throughout its life time, including with modern ICT-based solutions.

*Monitoring approach: monitoring of R&I activities (number of building typologies addressed, energy and financial performance of the refurbishment packages, etc.), analysis of future building renovation strategies, building stock observatory and market survey. The estimation of the financial performance should take into account the monetisation of the multiple benefits of energy efficiency (e.g. higher property value, higher productivity).*

## 2. Reducing the construction and maintenance costs of new Nearly Zero Energy Buildings (for residential and non-residential buildings)

- Develop and demonstrate market ready solutions to reduce the construction and maintenance costs of Nearly Zero Energy Buildings (NZEB) or positive energy buildings by at least 10% compared to their costs in 2015 with a view to reach a cost reduction of 15%. While reducing cost, these energy-related solutions should lead to optimal holistic system design and control and they should respond to consumers' and societal needs.

*Monitoring approach: monitoring of R&I activities, market survey - costs reduction being calculated without inflation and by offsetting costs related to changes in the market trends for non-energy related works (e.g. interior design).*

## 3. Making energy efficiency works in new and existing buildings less costly and less disruptive for occupants (for residential and non-residential buildings)

- Develop and demonstrate market ready solutions to reduce the average duration of energy-related construction works by more than 20% for renovation and for new buildings compared to current national standard practices. Activities could include solutions capable of being adapted to the final conditions with a lower execution time (e.g. offsite construction) or other solutions to increase the effectiveness of construction processes.

*Monitoring approach: monitoring of R&I activities, market survey.*

## 4. Closing the gap between predicted and measured energy performance for new and refurbished buildings (for residential and non-residential buildings)

- R&I will develop and demonstrate market ready solutions to reduce the difference between the predicted and the measured energy performance to maximum 15% after the commissioning period with the ambition to reach 10%. These solutions should for instance result in more accurate energy performance prediction for new and refurbished buildings (e.g. better baseline, better understanding of occupants' behaviour), optimised control systems or solutions to increase the quality of workmanship.

*Monitoring approach: monitoring of R&I activities, market survey, database of ex-post and ex-ante data on energy performance.*