smartEn
Smart Energy Europe

smartEn White Paper

A vision for Smart and Active Buildings

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About smartEn - Smart Energy Europe

smartEn is the European business association for digital and decentralised energy solutions. Our members include innovators in services and technology for energy and data management, finance and research. By taking an integrated perspective on the interaction of demand and supply, we promote system efficiency, encourage innovation and diversity, empower energy consumers and drive the decarbonisation of the energy sector.

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The positions expressed in this document represent the views of smartEn as an association, but not necessarily the opinion of each specific smartEn member

A vision for Smart and Active Buildings

WHITE PAPER

Introduction

In order to comply with the Paris Agreement, far-reaching changes are needed in society and the economy. The energy sector has a key role to play. Progress is already underway, moving away from a centralised, fossil-fuel-based, high energy consumption system towards a decentralised, renewables-based, efficient and highly interdependent system.

The crucial role of buildings in enabling this energy transition should not be overlooked. The building sector accounts for 36% of Europe's CO2 emissions and 40% of its energy consumption. When it comes to consuming energy, most buildings are currently quite wasteful: 97,5% of the building stock requires updates before it can be considered efficient.[1]This must change.

To achieve climate neutrality by 2050 at the latest, the entire EU building stock must become highly efficient and decarbonised. This target is laid out in the recently adopted Revision of the Energy Performance of Buildings Directive.

The contribution of buildings to achieve EU decarbonisation goals is not limited to their individual performance and characteristics. Buildings are an integral part of energy infrastructure. They are part of a broader system, although for too long they have been considered as stand-alone units, consuming vast amounts of energy.

It is time to change this approach.

Buildings consume energy, but they can also produce and store energy in ways that make the entire energy system more flexible and efficient. Digital and decentralised energy solutions (such as distributed generation, energy storage and demand response) in all types of buildings enable their **demand-side flexibility**, which is **a key feature of smart and active buildings**.

These smart and active buildings will offer an increasing contribution to achieving the EU's decarbonisation goals.

This White Paper outlines key characteristics and an enabling framework for smart and active buildings, following on from an internal consultation with smartEn members on the vision of the building stock in Europe.

With this Paper, smartEn aims to:

- shape the European Commission's portrayal of the sector in the EU Strategic Agenda for 2019-2024;
- encourage the ambitious implementation of building-related legislations under the Clean Energy package by Member States.

[1] BPIE

1. The demand-side flexibility of buildings: key to achieve the EU 2050 net-zero emissions goal

It is a fact that the climate is changing. Science has repeatedly stated that we only have about a decade left to transform our society and economy in order to limit temperature rise to 1.5°C and avoid the consequences of unsustainable climate temperatures.
Growth that is sustainable is a top priority and no longer a voluntary option anymore. To face this challenge, a major package of EU legislations, called Clean Energy for All Europeans, was shaped over the past five years to stimulate investments in energy efficiency and renewables, shape the electricity market design, and drive the uptake of innovative solutions for climate adaptation and mitigation.

Buildings were a major target of climate and energy policies agreed by EU institutions during the 2014-2019 legislature. They were targeted in different policy areas to: a) reduce their energy consumption and increase their energy performance; b) stimulate their digitalisation; c) drive the uptake of decentralised energy resources in buildings; and d) eliminate barriers to their interaction with the surrounding energy system.

Climate and energy concerns were not the only justifications for shaping these EU frameworks for buildings: the human element was also a principal factor. As European citizens spend 90% of their time indoors, they stand to be primary beneficiaries from overall improvements to the EU's building stock if it is transformed into highly efficient and decarbonised structures. The innovative solutions supported by EU energy and climate laws should inherently bring positive consequences, like comfort, convenience, and health to citizens. The opportunity to empower citizens to actively engage with their smart buildings and dynamically participate in the energy system was also a key motivation for these legislations.

Contrary to past legislation, the recently adopted EU legislative files that either directly or indirectly target the building sector, now both acknowledge the demand-side flexibility potential and deliberately aim to stimulate it.
Buildings are not stand-alone entities so their interaction with the system should be fostered because they are integral elements of neighbourhoods and districts. Apart from isolated buildings in rural landscapes, Europe is a predominantly urban continent. Today, approximately 359 million people - 72 % of the total EU population - live in buildings located in cities, towns and suburbs.[2] Buildings in these urban areas should be part of an integrated energy infrastructure network with the ability to connect and interact with the external energy 'ecosystem', ideally delivering (financial and environmentally friendly) benefits to its occupants and to the entire energy system.
This is the so-called "demand-side flexibility" that in principle can be offered by all building types, so crucial to achieve the EU's decarbonisation goals and climate neutrality by 2050.

Flexibility is strongly linked to the variability of the increasing volume of renewable energy sources in the system.
While the electricity system was originally designed under the principle that generation follows demand, the uptake of variable renewable energy sources has changed this. Networks increasingly rely on flexibility in energy production and/or consumption in order to integrate the increasing share of solar and wind in the energy mix.
This is where the demand-side flexibility of buildings comes into play. Buildings' energy demand can be adjusted to offer more flexibility for achieving a smoother integration of renewables in a low carbon energy system. Creating a better match between supply and demand would limit the volumes of renewable electricity that have to otherwise be curtailed, while also reducing dependence on inefficient, carbon-intensive back-up generation.
The combined use of smart solutions in buildings and smart grids can improve the operational efficiency to lower the total global buildings energy demand by as much as 10% over the next 20 years[3].

[2] https://ec.europa.eu/regional_policy/sources/conferences/urban2014/doc/issues_paper_annex.pdf
[3] OECD/IEA, Digitalization and Energy, 2017

2. Digital and decentralised energy solutions: a prerequisite for smart and active buildings

The presence of decentralised energy solutions (distributed generation, energy storage and demand response) and smart solutions in buildings are a precondition to make buildings flexible in response to external signals.

At present, demand-side flexibility is not the main driver for the uptake of smart solutions in buildings. The reduction in energy consumption, the increase in energy performance through the uptake of renewables, and the improvement of comfort and well-being are the most popular motivations for purchasing smart buildings and/or renovating existing buildings with digital and decentralised energy solutions.
Also, investment choices for the acquisition of digital and decentralised energy solutions by both homeowners and energy managers are driven by economic calculations on the Return on Investment (ROI) and payback time.
Some smart solutions, such as rooftop photovoltaics (PV) combined with storage assets, supported by incentive schemes and tariff structures, tend to favour self-consumption and energy independence. The energy and cost savings that could be achieved are a clear stimulus for both homeowners and energy managers making such investments.

However, our vision for the future of the EU building stock does not feature isolated and energy independent buildings as the end goal. smartEn believes that **full integration and interaction of buildings with the energy system is the most cost-effective way to achieve climate neutrality and guarantee system benefits. This is the reason why buildings should not just be digitalised, but also active systems, enabled by the smart solutions present in buildings which have flexible consumption patterns.**

Buildings have flexibility potentials that represent precious decentralised energy resources for the energy sector. These include: electric heating and cooling, mechanical ventilation to maintain indoor air quality, smart meters, smart appliances, smart charging for electric vehicles, energy storage facilities, rooftop PVs and sensors, which together are devices that will become increasingly present in buildings. These resources can be harnessed to use energy when it is most cost-effective, while reducing consumption at moments when the electricity system is under pressure. Short-term reductions in energy demand in response to market-price signals could also be compensated for, by using (available) on-site generation and storage assets.
As a result, buildings are no longer mere passive consumers of energy, they can also produce, store and make their energy consumption more flexible in response to external signals, thanks to digitalisation.
All buildings, when enabled by smart solutions, should be able to deviate from their normal patterns of energy consumption, without negatively impacting comfort and well-being.

Smart solutions in buildings overcome the usual boundaries of the sector. Sector coupling and the electrification of the transport sector will further incentivize the digitalisation and active interaction of buildings with the energy system. In the short to mid-term, about 20% of kWh will be charged at public sites in and between cities, while 80% of kWh will be charged in buildings (residential and commercial)[4]. This presents an opportunity for the flexible use of electric vehicles, as they are stationary (parked) on average 95% of the time, but use only 10% of that time for recharging.[5] Thanks to the deployment of intelligent devices in buildings to allow for smart charging, vehicle-to-grid or vehicle-to-home services, the flexibility potential of electric vehicles can be integrated and unlocked in smart and active buildings.

Interoperability and cybersecurity are key in smart buildings: devices in these buildings must be able to communicate with each other in a safe way, since stand-alone assets will not be able to contribute to the flexibility of the building as a system.
Systems are composed of the aggregation of and interaction among several single devices, and their flexibility performance can greatly vary depending on how they are designed, installed, maintained, operated, and how single devices can communicate with each other.

[4] ChargePoint, September 2018
[5] Langton, A., & Crisostomo, N. (2013, October). Vehicle-Grid Integration: A Vision for Zero-Emission Transportation Interconnected throughout California's Electricity System. California Public Utilities Commission, Energy Division

Interoperability and cybersecurity should be key features of smart and active buildings to foster innovation and competition.

smartEn recommends that national policy-makers embrace these comprehensive, future-looking evolutions when transposing the different legislative dossiers of the Clean Energy package into national laws, in particular the Electricity Directive and the revised Energy Performance of Buildings Directive. **The national regulatory frameworks should foster and eliminate existing barriers to unlock the demand-side flexibility of buildings. In this way, homeowners and energy managers would be incentivized to invest in flexible assets and rewarded to participate to flexibility programmes (instead of aiming at energy isolation).**

From a public policy perspective, the entire society benefits from demand-side flexibility, including final consumers that do not participate directly in the flexible management of their loads, because the efficiency of the energy system increases and wholesale electricity costs are reduced compared to projections. The societal benefits created through demand- side flexibility significantly outweigh benefits to the end-users participating in the programmes. In other words, these active final consumers do even more good for society than they do for themselves.
Different estimates have been calculated to demonstrate the macro-benefits of demand-side flexibility:

- By enabling decentralised flexibility resources, including on the demand-side, to participate in the European electricity system, social welfare can be increased by up to €2.8 billion annually[6];
- Increased demand-side flexibility could lead to savings of €5.6bn per year from reduced back-up capacity, network and fuel costs in Europe[7];
- Improved market conditions to ensure access to all flexibility options would directly translate into a reduction of wholesale electricity supply costs by around €50 billion in the year 2030[8].

3. All building types can unlock their demand-side flexibility

The EU building stock is a complex mix of industrial, commercial and residential buildings (both public and private ones). Some of them are large, others small, but all building types can make their energy demand more flexible, provided they have smart solutions.
However, the specific features of commercial and residential buildings have to be addressed separately to unlock their demand-side flexibility, as outlined in the following two sections.

➢ Fostering the demand-side flexibility of commercial buildings

Commercial buildings constitute 25% of the building stock in Europe[9] and they make up 30% of the total energy consumption throughout Europe. For these buildings, heating and cooling are the main sources of consumption (up to 80%), which are flexibility resources[10].

However, **the mere presence of Heating, Ventilation and Air-Conditioning (HVAC) systems or other technical building systems (TBS)[11] that can individually make their energy consumption more flexible is not enough**. Currently, there are a variety of proprietary and open-source communication systems that can either hinder or facilitate the harmonised control and management of TBS and smart devices.

[6] "Mainstreaming RES Flexibility portfolios: Design of flexibility portfolios at Member State level to facilitate a cost-efficient integration of high shares of renewables" (page 70) https://ec.europa.eu/energy/sites/ener/files/mainstreaming_res_-_artelys_-_final_report_-_version_33.pdf
[7] European Commission, "Impact assessment of the revised rules for the electricity market, ACER and risk preparedness," 2016
[8] Commission Impact Assessment accompanying the proposals for the Electricity Directive and Regulation, 30 November 2016
[9] BPIE, "Europe´s buildings under the microscope. A country by country review of the energy performance of buildings", 2011
[10] BPIE, "The active role of buildings in a transforming energy market", October 2015
[11] The revised Energy Performance of Buildings Directive (EPBD) defines TBS as "technical equipment for space heating, space cooling, ventilation, domestic hot water, built-in lighting, building automation and control, on-site electricity generation, or a combination thereof, including those systems using energy from renewable sources, of a building or building unit".

smartEn recommends that in large commercial buildings, the communication protocols of the different devices be interoperable and the overarching management of the flexible energy consumption of a building be attributed to an Energy Management System (EMS).

BACS, and notably EMS, have the potential to support electricity network flexibility objectives by assisting with the remote management of TBS and smart devices installed in commercial buildings. However, presently, BACS are mainly appreciated for providing cost-effective solutions to reduce the energy consumption of a building by improving energy management. Across the EU, BACS generate an average net savings potential of 15% to 22% of all energy consumption of buildings.[12]
smartEn supports the deployment of EMS as enablers of demand-side flexibility in commercial buildings: EMS should be able to optimise local energy consumption in reaction to price signals and/or trade flexibility on electricity markets (directly or indirectly through a service provider, e.g. aggregator).

More specifically, **smartEn recommends that all EMS in commercial buildings be able to fulfil the following functions to foster their demand-side flexibility**:

- aggregate the flexibility of all smart devices present in buildings that contribute to flexibility;
- manage communication with DSO, energy supplier and aggregator;
- translate price signals into instructions in line with the desired strategy (e.g. lowest carbon footprint, lowest cost) and determine control for integrated equipment – maintaining the desired comfort and productivity;
- control and coordinate the optimal energy consumption of local renewable sources and smart devices in buildings;
- manage prediction of demand and usage of spaces, weather, energy production.

smartEn supports further investigation of these services and encourages the development of harmonized European standards and protocols to support these functions.

➢ Fostering the demand-side flexibility of residential and small buildings

Residential and small buildings are the homes of European citizens, restaurants, shops, small and medium sized enterprises, etc. The complexity of these types of buildings varies enormously and, as is for commercial buildings, depends also on geographical locations and climatic zones.

As 75% of the European building stock is comprised of residential buildings, notably single and multi-dwelling buildings[13], the development of demand-side flexibility will greatly depend on these assets.

Compared to 2016, the number of smart homes in the EU is expected to increase tenfold by 2021: homes which use digitally controlled lighting, heating, ventilation, air conditioning, security and home appliances will increase from 8.5 million in 2016 to 80.6 million in 2021[14]. This is also justified by recent surveys: consumers have shown to be interested in digital energy devices and have a positive attitude towards them – 77% of consumers find the idea of a smart home appealing, very appealing or extremely appealing[15].
This means that a greater uptake of smart solutions in residential buildings is expected. This will create healthier and more comfortable buildings, that can better adjust to both the needs of the user as well as the energy grid, while having a lower overall energy consumption and carbon impact.

[12] Paul Van Tichelen(Vito), Stijn Verbeke (Vito), Paul Waide(Waide) "Ecodesign preparatory study for Building Automation and Control Systems (BACS) implementing the Ecodesign Working Plan 2016 -2019 - Task report on scoping", 20 July 2018
[13] BPIE, "Europe´s buildings under the microscope. A country by country review of the energy performance of buildings", 2011
[14] EPSC, "10 Trends reshaping climate and energy", 2018
[15] Global survey with 7000 participants in seven markets (Brazil, China, Germany, Japan, South Korea, the UK and the US) – Dale (2016): Realizing the future of the smart home with early adopters https://blog.gfk.com/2016/04/realizing-the-future-of-the-smart-home-with-early-adopters/

To unlock this flexibility, **smartEn believes that the presence of two intelligent enablers is crucial: smart meters and energy management systems**.

- when cost-effective[16], smartEn believes that residential and small buildings in Europe should feature smart metering systems that are interoperable with energy management systems and smart grids.
  Smart meters[17] are essential devices that should accurately measure actual electricity consumption (and production)[18], be able to support dynamic demand management through local access to near-real time data and provision of dynamic electricity price contracts from suppliers. This will foster the price-based (implicit) demand-side flexibility.
- intelligent Energy Management Systems (EMS) are key to allow the user to control and automate the use of energy within a household. Similar to BACS in commercial buildings, these systems should not be limited to the mere optimisation of the energy consumption of a building as the result of an energy efficiency measure. EMS should foster the adjustment of energy consumption in response to external signals from the grid (received directly by the EMS or indirectly through the interoperable smart meter installed in the building). These systems should also be the enablers of the incentive-based (explicit) demand-side flexibility of buildings, where the adjustment to energy consumption is driven and compensated by participation in the different electricity markets.
  EMS are already deployed in the market to untap the demand-side flexibility potential of residential buildings.
  For example, an electric heating management system can automatically heat a home, based on consumer preferences (i.e. temperature and time period) while taking into account electricity prices (the system will heat the home when prices are low). In Nordic homes such systems have proven to deliver annual savings of around 25% of the average heating cost.
  Similarly, smart home energy management systems can offer homeowners the possibility to gain transparency and increased comfort through the remote control of their heating systems and then sell the flexible consumption of these residential buildings to electricity markets.

As for commercial buildings, **at present, HVAC systems offer the largest flexibility loads in residential and small buildings**. If supported by smart devices, **the uptake of electric vehicles, static energy storage facilities and on-site renewable generation, this will increase the demand-side flexibility potential of residential and small buildings**.
In particular, home energy storage facilities are going to become default assets in smart and active buildings that will offer valuable flexibility resources with a minimum need of behavioural change. It is indeed expected that more than half of the installed electrical energy storage capacity in Europe in 2020 (5.5GWh) will be in residential buildings.[19]

In the future, smart appliances, notably white goods in residential buildings, will also become providers of flexibility.
In a hypothetical scenario in which the current stock of residential buildings is fully electrified, activation of just 1% of the total installed capacity of washing machines, dryers, dishwashers and domestic hot water heat pumps would give the EU a potential of flexibility of about 37 GW upward and 23 GW downward capacity, with more in winter than in summer thanks to electrical heating.[20]
Consumer acceptance and a willingness to engage in the use of energy smart solutions play a crucial role for the actual activation of their demand-side flexibility. Demand-side flexibility for some smart appliances requires behavioural changes, no matter how automated demand response mechanisms are. Users may need to adjust to a delayed start function in certain devices, as outlined in the following examples:

- when a dishwasher has been loaded, the washing can start at any moment until when the dishes are needed for a new use; this means that between dinner and breakfast a dishwasher can run at any moment of the night;

[16] According to EU law, Member States need to carry out a cost-benefit analysis before the deployment of smart meters.
[17] The recently adopted Electricity Directive sets minimum functionalities and requirements for the roll-out of smart meters.
[18] When consumers produce, the distribution network must be tracked in both directions in order to avoid downloads or overloads and thanks to instruments as smart meters it is possible to redirect energy flows according to data provided.
[19] EASE and Delta-ee, European Market Monitor on Energy Storage (EMMES) 3.0, March 2019
[20] EDF calculations, 2018

- the flexibility of a washing machine also depends on the willingness of the user to accept that wet clothes may be inside the washing machine for a certain amount of time when the cycle has ended; this is a constraint to the flexibility of washing machines;
- as in the case of washing machines, the flexibility of dryers depends on how long the user is willing to let wet clothes remain in the machine before drying commences;
- the flexibility of electric radiators or air to water heat pumps must also be used carefully, since the automatic increase or decrease in their energy demand might modify the internal temperature of a building and the comfort of its occupants.

In general terms, more efforts need to be done to support the introduction, acceptance and uptake of smart appliances. smartEn welcomes the preparatory study for the identification of potential Ecodesign/Energy Labelling implementing measures in Lot 33. The focus on demand-side flexibility is particularly appreciated to set criteria on the ability of smart appliances to automatically change and optimise consumption patterns in response to external stimuli (price information, control signals, local measurements).

4. A quantitative value for the demand-side flexibility of buildings

Net-zero greenhouse gas emissions by 2050 is the EU objective currently in discussion at EU level.
The transition to a highly efficient and decarbonised EU building stock would be the contribution of the sector to achieve the EU decarbonisation goal. To measure such evolution and progress in buildings the Energy Performance Certificate was developed, and other tools are currently being shaped (Smart Readiness Indicator, Level(s))[21], looking at energy aspects and also comfort, well-being and sustainability in a broader sense.
smartEn believes that **coherence and complementarity among these certifications and indicators is a top priority to avoid confusion to end-users, property valuers, buildings professionals and service providers**. A serious strategic reflection must occur at EU level.

smartEn is also convinced that **an effective certificate/indicator needs to provide valuable information that can be used to drive the refurbishment of the existing EU building stock**, because it is improving its energy performance too slowly (renovations are well below the necessary annual 3% rate).
Apart from scoring buildings, such tools should guide homeowners and energy managers on how to improve the rating of their buildings, through the uptake of innovative technologies and services that can enable demand-side flexibility, which will ultimately contribute to the EU decarbonisation goal.

It is unlikely that demand-side flexibility will be driven without a specific value expressing the flexibility potential or performance of a building. Making energy consumption flexible due to external signals is a relatively new concept and business model in the building sector. Therefore, **a specific value for the demand-side flexibility of a building is necessary**. The risk is to have extremely well insulated buildings with multiple smart solutions installed that, however, are not flexible or their potential remains untapped.

Currently, there are efforts to give visibility to the demand-side flexibility of a building through a new indicator, the Smart Readiness Indicator (SRI), a common European voluntary scheme to express the "readiness" of a building, i.e. its potential for smartness. In the first version of this indicator, to be deployed across Europe, potentially by mid-2020, qualitative information will be provided to express the potential demand-side flexibility of a building (together with two other functionalities, as set by the revised Energy Performance of Buildings Directive[22]).
Qualitative information on the readiness of a building to be flexible is simple and fit for an early version of the SRI. However, this indicator will not provide any information on either the flexibility potential of a building in kW or the actual flexibility performance of a building in kW/h.

[21] A CO2/m3 value to express the carbon footprint of individual buildings could be also set, and targets to reduce emissions for building types could be defined up to 2050.
[22] Readiness to adapt in response to the needs of the occupant, readiness to facilitate maintenance and efficient operation and readiness to adapt in response to the situation of the energy grid.

Quantitative data could provide more specific insights and accurate information on the measured flexibility of buildings. Quantitative data in kW or kW/h on the demand-side flexibility of a building requires the definition of a robust methodology. This requires time and the thorough involvement of engineers, data scientists and buildings professionals.
smartEn has investigated different options to provide more valuable information to quantify the volume of demand-side flexibility of a building:

- Option 1 - Define the **potential flexibility of a building** based on the installed capacity in kW of both TBS and appliances. This information can be provided both for existing and new buildings on the condition that the installed capacity in kW of all flexible devices in the building is provided. This data in kW would be indicative quantitative information, based on the sum of the flexibility potential of individual assets present in a building. However, it will not provide any indication on the actual activation of the flexibility potential;
- Option 2 – Calculate the **historical flexibility performance of a building** based on data from the previous year. The actual activation of flexible loads in buildings over a year could be expressed in kw/h/year. Digitisation is providing considerable amounts of energy data that can be used to measure the actual rather than theoretical flexibility of a building. This data would provide a more accurate quantitative information compared to the potential flexibility of a building: it will express how flexible a building was in a specific timeframe. However, it will not give any indication on the future flexibility of a building, as too many (internal and external) variables might deviate the historical pattern;
- Option 3 – Determine the **future flexibility performance of a building** expressed in kw/h. This value should be based both on historical values provided by Option 2 for existing buildings while taking into account the impact of different variables in the future, e.g. addition of smart devices, structural changes in the building (modification of the architectural layout, deterioration of insulation materials, replacement of some TBS, etc.), expected changes in consumption patterns and consumer behaviour, etc. A solid methodology would be needed to take into account all these dynamics.

Although different, each of these three options offer **political and market visibility to the demand-side flexibility of buildings** and will provide both homeowners and energy managers a **specific, measured information on the active interaction of their buildings with the energy system**.

This specific information should not be a stand-alone figure or a new ranking tool.
smartEn recommends including this specific information into an effective and comprehensive certificate/indicator on buildings, which should be fully integrated into energy and climate policies.
The success of this specific information on demand-side flexibility will manifest through the increase in digitalisation of the EU building stock and activation of flexibility volumes from buildings.

As only what gets measured gets changed[23], **smartEn recommends Member States to shape solid national long-term building renovation roadmaps which also value the flexibility of buildings and set 2030, 2040 and 2050 quantitative targets to foster the demand-side flexibility of buildings**. **This roadmap should be used to define a comprehensive policy framework and financial incentives for the uptake of smart technologies and services to increase the flexibility value of individual buildings,** while contributing to the overall decarbonisation of the EU economy and society.

[23] Experience in the transport sector has showed that progress can be achieved if improvements can be measured: CO2 emissions standards and targets for vehicles have been proven successful to drive the uptake of innovative and clean solutions.

5. Conclusions

The demand-side flexibility of all building types is still untapped. To achieve climate neutrality in 2050 in a cost-effective way, this potential must be unlocked.
While Member States must correctly implement the Clean Energy package in the next years to eliminate existing barriers to demand-side flexibility at large, the specific contribution of smart and active buildings must be targeted and fostered in an integrated way.

To enable the demand-side flexibility of buildings, the deployment of smart solutions and the development of innovative services is key. They can transform the existing passive EU building stock into a smart and active player in the clean and highly electrified system of the future.
smartEn believes that a specific quantification of the demand-side flexibility of buildings would make the difference to increase the demand-side flexibility volumes activated by buildings.
For now, this information is missing in the existing certification and indicator schemes and programs currently in use. Once defined, this value should not be isolated, but integrated into an impactful certificate/indicator, that must be developed in the EU legislature 2019-2024, and ultimately included into a comprehensive framework of long-term plans, policies and incentives to unlock the demand-side flexibility potential of buildings.