smartEn
Smart Energy Europe

Towards a Quantification of the Demand-side Flexibility of Buildings

smartEn Position Paper

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Executive Summary

A green recovery has broad backing across Europe. Within this the definition of a Renovation Wave is being worked on. However the Wave is defined, one of the big challenges will be working out the order in which to proceed and confirming the progress made.

"If you can't measure it, you can't improve it"[1]

This paper seeks to address an aspect of this statement through the means of quantifying actual building energy performance, and within this context in particular, the demand side flexibility of a building. This is because maximising the energy performance of buildings, given the electrification of heating and transport and the increase in renewables, requires both energy efficiency and flexibility to be optimised, particularly at the grid edge.

The smartEn proposal is innovative for three reasons:

- quantifying first the CO2 contribution rather than providing a measure of KWh allows a combination of the benefits of energy efficiency and flexibility and measure in a simple manner the carbon neutrality trajectory for buildings,
- doing this with live data provides actual rather than theoretical performance. This not only makes use of existing systems such as smart meters, sub-meters, building energy management systems and digital platforms, it also provides a record of actual performance at any point in time,
- it enables an output measure that is not dependent on specific approved technologies. This will accelerate innovation at the same time as simplifying the development and management of the measure.

With this in mind, it is expected that a metric could be developed in time to inform the Renovation Wave, that will identify where priorities should be applied from current building energy performance and demonstrate what has been achieved post renovation.

Whilst there is an emphasis in the paper on flexibility - this is because it is an area that is currently under-represented despite its growing importance – it is a gap in the many current building performance measures.

Finally, the recommended Actual Performance Metric, complements and does not duplicate current certificates and assessments.

smartEn believes that the quantification of a building's energy performance is an important enabling step on the road to climate neutrality, and in supporting the Renovation Wave initiative.

[1] Attributed to Peter Drucker whose writings contributed to the philosophical and practical foundations of the modern business corporation. He has been described as "the founder of modern management".

Introduction & Context

Climate neutrality is becoming one of the greatest foci of attention today and the role buildings play is of high significance. Given the lifespan of buildings this means that a building's CO2 contribution is primarily[2] from its energy performance, and this needs to be improved significantly. But unless the performance is tracked continuously, how do you know if you are improving? Hence the argument for the quantification of building energy performance with demand-side flexibility (DSF) being an important component.

In quantifying building performance as a means for generating improvements the starting point is understanding what you wish to improve. Here it is relatively simple given the context of climate neutrality: it is the energy component of the building's CO2 contribution – or is it wider than this?

A building is part of an energy system. Traditionally it has been a consumer of energy, but increasingly with the energy transition, buildings are part of the energy system itself and can contribute to improving the *system's* efficiency and carbon footprint by unleashing its DSF. Where this is particularly relevant is at the "grid-edge". Here the growth in the electrification of transport and heating could significantly increase the stress on electric distribution networks. But while, for example, charging of electric vehicles can double the electric consumption of the building, it also brings flexibility if the building can use the parked vehicles' batteries to shape its load profile. Indeed, the ability to balance the local, low voltage distribution systems will be a critical capability and is where buildings being part of the energy system is of crucial importance to transform this stress/congestion risk into an opportunity/benefit. Hence the importance of being able to measure the DSF of a building as an important contribution to system efficiency and climate neutrality.

Whilst DSF is important, it is only one component of an efficient, carbon neutral energy system. It is important that the quantification of DSF fits in with and contributes to an overall metric.

Purpose

The purpose of this paper is to set out smartEn's position on the need for the quantification of the DSF of a building as a component of the local energy system's carbon footprint.

Target audience and benefits

Energy Performance Quantification, and specifically the DSF quantification, is expected to be applied to all building types and will be of value to different categories of audience.

The following are the top 5 categories:

1. Building owners, tenants and operators to increase transparency, monitor performance, report on CO2 contributions and to identify how to optimise

[2] There will be an embedded carbon component to building renovations, including energy system assets, that also need to be considered.

building performance, integration of new electricity use (such as EV charging), operating costs and investments,

2. Consumers & consumer associations to more easily understand DSF and translate it into cost savings, revenue streams and contribution to reducing CO2,
3. Developers, real estate sector, building purchasers, financial institutions to improve sales and the value of their properties,
4. Suppliers of decentralised energy resources (distributed generation, energy storage and demand response), aggregators & DSOs to improve system efficiency, reduce their carbon footprint, to easily identify customers with DSF to activate, the amount on offer and where to procure it,
5. Public authorities to monitor the progress of the DSF portion towards decarbonisation of the building stock, in order to further identify opportunities, incentivise investment and steer progress.

Thus, the benefits of a building energy performance quantification metric, that incorporates DSF, fall into three main criteria:

1. Progressing carbon reduction in buildings towards climate neutrality
2. Improving the financial returns and the value of property
3. Building understanding and therefore the demand for flexibility resources

More specifically, smartEn's membership identified the following needs for a quantification metric:

- Raise awareness on DSF, including its benefits for system efficiency
- Promote and facilitate DSF in buildings
- Highlight an important aspect of overall building energy performance
- Contribute to the measurement of the carbon footprint of a building
- Communicate the value that could be earned from participation in DSF schemes
- Value both flexible consumption and generation in buildings
- Make room for further electrification (EV, heating) while limiting its impacts
- Link to tax and other incentives
- Compare the DSF capability/performance of buildings.

In summary, the potential benefits are comprehensive, both in terms of audiences and the types of benefits that could accrue.

The importance of output measures: a comparator

Motor transport and the internal combustion engine is another significant contributor to the global carbon footprint and has been a difficult issue to address effectively. This area is not seen as a great success but never-the-less it does provide a relevant comparator where we can learn from what did and did not work.

In 1998 the car industry agreed a voluntary commitment to reduce new car emissions by 21% by 2008[3]. To do this an output measure of CO2 emissions per mile/kilometre was introduced along with tax incentives tied to the new measure.

[3]https://theicct.org/sites/default/files/publications/ICCT_Post-2020-CO2-stds-EU_briefing_20171026_rev20171129.pdf

In the event, an overall emissions reduction of 17% was achieved[4], short of what was committed to but a significant contribution none-the-less, especially given a 1.4% annual growth in car ownership[5]. The reasons for the shortfall are many and various including an increase in consumer interest in larger polluting cars such as SUVs despite tax incentives for low CO2 emission vehicles and also cheating as demonstrated by "dieselgate".

What the outcome measure did achieve though was to:

- enable innovation by car manufacturers
- provide an easily understandable measure for the public to use
- put in place a straight-forward means for governments to steadily incentivise and set easily comprehended targets for improvement.

Experience from the motor industry can also be used to suggest how the system could be improved if a similar measure was to be applied to buildings:

- Because every building will have a smart meter and / or Energy Management System, dynamic real-time monitoring of energy performance would be much more reliable than factory testing making cheating considerably harder,
- Tax and other incentives, or perhaps more significantly, disincentives on high CO2 usage (taxing the polluters) would need to be made more significant,
- A change from one-off factory tests to a dynamic annual performance measure would enable tracking and thus the ability to reward improvements as well as spot and penalise growing inefficiencies.

In comparison, carbon reductions in buildings have averaged around 1%[6] a year compared to cars' 1.7%. This has been mainly due to product improvements that have tackled the low hanging fruit: e.g. low energy lighting, modulating boilers, better insulation, introducing smart meters, efficient heating and DHW systems, heat pumps etc. The next stage will be considerably harder and will need significant investment plus smart integration and control of technical building systems, local/onsite renewable energy sources, energy storage and grid interaction. It will happen at a time when vehicles in the building's garage or car park switch to electricity, when heating is converted to electricity or as part of the renovation wave. Here we suggest innovation will be important, especially in a more dynamic improvement scenario generated by quantitative measurements. Reliance on more static, retrospective certification systems that recognise established technology rather than innovative solutions may limit progress.

Thus, it can be seen that whilst imperfect, the auto industry's CO2 output measure does have a number of significant advantages especially with regard consumer understanding

[4]https://theicct.org/sites/default/files/publications/ICCT_Post-2020-CO2-stds-EU_briefing_20171026_rev20171129.pdf
[5] www.eea.europa.eu/data-and-maps/indicators/size-of-the-vehicle-fleet/size-of-the-vehicle-fleet-10
[6] BEIS (2018) 2017 UK Greenhouse Gas Emissions, Provisional Figures; BEIS (2018) 2016 UK Greenhouse Gas Emissions, Final Figures, Table 1

and adoption, something that is perhaps missing from the qualitative measures in use in the building industry.

The argument at the start of this paper was to understand what it is that you wish to improve: i.e. the level of a building's carbon emissions and its contribution to the energy system in general and the local low-voltage system in particular. This suggests an output metric in terms of CO2 emissions that can be related to a building's size and purpose. Thus, a measure similar to the auto industry's CO2/km would be:

CO2 emissions/m^2

Assessing building DSF performance

This topic has been a priority within smartEn for a number of years and in 2019 a White Paper "A vision for Smart and Active Buildings" investigated different metrics to quantify DSF in buildings. The result was a set of three metrics: potential, actual and future flexibility. We have further developed the metrics identified in the 2019 paper and tried to clarify the terminology to reduce confusion between the titles. In particular, we have sought to differentiate between the potential of currently installed energy assets and the potential derived from investing in additional energy assets as might be done as part of the "renovation wave". In addition, we have focused on overall energy performance measures with flexibility as a key component

Three metrics can be identified.

Current Potential. Sub metrics would detail energy efficiency and flexibility potential. This could become a consolidation of the current qualitative measurement systems that apply an audit type of approach, recording the presence of recognised technologies in a building and assessing their potential based on approved expected performance estimates: e.g. Standard Assessment Protocol (SAP) in EPCs. It could also include predictive assessments for the current installed energy assets based on changes to occupancy, weather, regulations, system design, usage etc.

Actual Performance. As above, sub metrics would be applied to specific contexts. It would be based on smart meter data and similar devices supplemented by sub metering, Building Energy Management and Control System data where present. The dynamic nature of such data would lend itself to AI increasing the value and understanding that can be derived, for example by establishing comparators and spotting defects/outliers etc.

Future Potential. This would be focused on development potential: i.e. investing in additional energy assets such as home energy batteries, heat pumps, or putting to use the flexibility of the batteries of the EVs parked in the parking lot. Here a SAP type process may indicate areas for improvement, for example as a gap analysis. In addition, there could be scope for the introduction of innovative measures before they have established market penetration and the performance track record necessary to be incorporated in established assessment systems.

smartEn believes that the Actual Performance Metric is the most important of the three as it is a dynamic output measure. However, it would also be highly beneficial to be able to consider it as a proportion of the building's current and future potential: e.g. actual performance as a percentage of current and future potential.

Actual Performance Metric for DSF

The ideal format of expressing the building energy performance is the $CO2/m^2$ metric, but equally the flexibility element needs to support it by using the practical detailed set of metrics:

- **kWh of despatched volume[7]/time period[8] to the market**
- **kWh of offered volume/time period[9] to the market**
- **Max kW capacity offered**

In this way, this supporting set of measures would easily provide information on:

- Quantity - how much flexible energy and power can be shifted or modulated (actual, measured, real-time, available)
- Duration - how long
- Under which conditions (also expressed as a proportion of the theoretical DSF capacity over the same period)

This quantification metric would be further supported by a "bottom-up" collation of flexibility assets in the building and would cover items such as:

- All DER present in a building:
  - Demand response - capacity to reduce/increase/shift energy consumption upon receiving an external signal (both implicit and explicit)
  - Self-generation
  - Energy Storage
  - EV charging infrastructure (smart or bidirectional)
- interoperability and cybersecurity of all technical building systems
- The presence of an EMS that integrates buildings with the grid to enable automated flexibility

These metrics should consider critical DSF parameters/dimensions such as:

- Number and type of DSF assets, including response time, ramp time, flexibility duration
- Impact of "boundary conditions" (e.g. end-user behaviour)
- The flexible load of both TBS and appliances

[7] This value is in absolute terms (includes both Up and Down volumes)
[8] The periodicity can vary depending on the needs. It can be real-time, daily, weekly, monthly, quarterly or annual
[9] The periodicity can vary depending on the needs. It can be real-time, daily, weekly, monthly, quarterly or annual

Utilisation and seasonal capability

The energy performance of a building will be directly impacted by its utilisation, both in terms of how it is being used and also the level of that usage. For example, the energy consumption of a storage warehouse will be very different to that of a distribution warehouse. Thus, it is likely that a set of usage categories will be required to generate meaningful benchmarks, and that these benchmarks will need to take account of the level of usage.

Beyond utilisation of buildings by occupants, the individual characteristics of TBS/appliances in a building can be impacted by seasons. The overall flexibility of a building might be different depending on the period of the year. A combination of utilisation patterns and seasonal impacts are the most relevant variables in the demand-side flexibility of a building.

Potential Data Sources

There are several potential sources of dynamic data that could support an Actual Performance Metric. Smart meters, sub meters, BEM systems and DSF controllers provide the opportunity to generate both high level, top-down and low level bottom-up quantification of the CO2 energy related emissions from a property.

In broad principles, acknowledging that the devil will always be in the detail, this could take the following form:

- Grid supply would be measured by smart meters on a time related basis. The carbon content of this energy is identified by the supplier depending on the type of supply tariff chosen by the building operator and the CO2 make-up of the energy at the particular time. This will give the base level of CO2 emissions derived from grid consumption.
- Self-generation can also be measured by a sub meter, its carbon content identified and added to the base level where appropriate.
- DSF will be managed by a Building Energy Management System and information from it will identify the despatch of energy either in terms of supply to the grid from generators, EVs or storage systems or in curtailing demand within the building. The carbon content of this functionality will be subtracted from the base level of CO2 emissions.
- Sub meters have the ability to add significant additional granularity. They should be viewed as an investment to enhance flexibility although flexibility can be unlocked in present conditions, without waiting for the deployment of sub-meters

This information can be collated on a daily, weekly, monthly, quarterly or annual basis depending on the purpose it is being used for. Data aggregation and assessment, the application of AI and machine learning will increase the understanding and potential value of the information many-fold. It could be conducted on-site and/or remotely by a range of different service providers depending on the use that is required.

Alignment with other measures

The next consideration is how to align the Actual Performance Metric with existing measures and new initiatives in the pipeline. This is a complex subject as there are a number of specialist measures which some may prefer to retain whilst others may wish to consolidate. Adding a further measure risks complicating the picture. However, smartEn feel that the **Actual Performance Metric**, as a quantitative entity, should neither overlap nor compete with existing qualitative measures; rather it would complement and add value to the evolution of the Energy Performance Certificate (EPC), Smart Readiness Indicator (SRI) and to the new Digital Building Logbook.

Challenges

This proposal is not without its challenges.

- As with all other measures, managing the security and privacy of the data used is an important consideration and in this case the task may be much larger. However, digitisation is having to be addressed in many different spheres and so the respect of GDPR, data privacy, data management and cybersecurity rules is becoming a more of a standard requirement than a challenge.
- There are several building performance metrics in place at the moment and therefore integrating and not duplicating them is an important consideration. However, none measure actual performance or are able to provide a historic record of performance. Thus, this metric fills a gap and will complement existing measures.
- Many buildings within the EU do not yet have the benefit of digitisation which will make quantification of the energy performance and identifying renovation targets more difficult. However, using temporary data loggers as a temporary way of identifying a baseline to short-listed buildings would provide a temporary answer with subsequent digitalisation being one of the key elements of the resulting renovation.
- Extending this challenge, the quantification of the level of interoperability across energy to bring together the demands of mobility, heating, communal and the energy system as well as the normal building electrical loads will be of growing importance but is in its infancy. Again, an outcome of the renovations should be a more integrated quantification system, something that could be tackled manually for target buildings/districts when shortlisting candidates.

The Renovation Wave

Quantification of the energy performance of a building pre- and post-renovation, with a particular focus on its DSF, would be an important tool in identifying renovation targets, quantifying achievements, ascertaining lessons and supporting funding programmes. It is suggested that the **Actual Performance Metric** could be a relatively simple, early step in such a programme.

As the DSF functionality is already included in the current format of the SRI for buildings, this forms a good starting point for the addition of a quantitative metric. It is recommended that the Actual Performance Metric should be investigated by the SRI Topical Group C to prepare the ground for a rapid development.

In addition, a wholistic Actual Performance Metric should inspire the development of a valuable Digital Building Lookbook, currently in development by DG GROW of the European Commission.
Both these recommendations should be included in the Action Plan supporting the Strategy Communication on the Renovation Wave.

As a primarily digital proposition this should be based on the agile methodology; that is, a "sense and respond" approach starting with a Minimum Viable Proposition (MVP) as opposed to developing and testing a complete methodology from the bottom up before implementation.

Conclusion

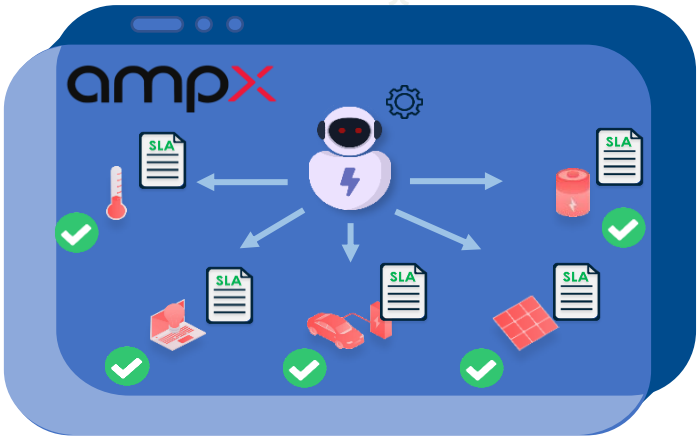
smartEn believes that the quantification of a building's energy performance is an important enabling step on the road to climate neutrality, and in supporting the Renovation Wave initiative. We propose the use of the **Actual Performance Metric** for the quantification of DSF, as a means to measure and improve the carbon emissions of buildings in the EU. Referring it to the Current and Future Potential Quantification Metrics to indicate where the greatest potential for improvement lies would enhance the value of the Actual Performance Metric and the contribution of DSF in decarbonising the energy system. The use of BACS, smart metering, sub metering, DSF controllers and BEM systems provide the data necessary to establish such a measure in a relatively short space of time. It would be a comparatively simple and cost-effective metric to set up thereby reducing risk and shortening the "time to market", both vital factors post-Covid19.

ANNEX

Examples of buildings' demand-side flexibility – benefits for occupants and the system

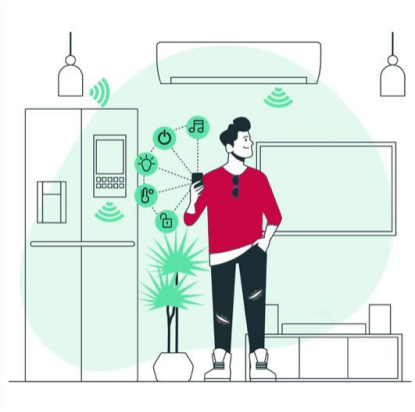
The drive to electrification means that the requirement for (green) electricity will possibly more than double. This will increase the challenge of both providing enough renewable energy and balancing the resulting intermittency. It will also change the consumption profile, potentially increasing peak demand albeit at different periods in the day. Hence the need for flexibility, particularly at the grid edge where local distribution networks may have to be upgraded at great expense to cope with the higher peak capacities required without flexibility.
The following examples illustrate how our members are currently addressing this challenge and the role quantification plays in their products and services.

Amp X



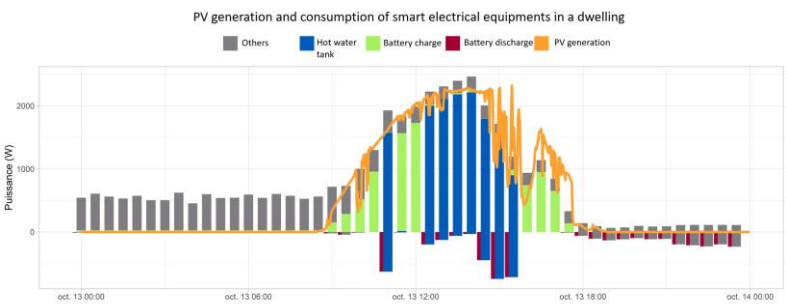
A key challenge is harnessing latent flexibility in buildings. An estimated 20.4 billion devices will be connected to the Internet of Things by the end of 2020. Using the inherent flexibility in just a fraction of these will mean lower energy bills, lower energy system peak demands, and greater network flexibility.
User engagement is essential. A 2019 survey for Ofgem found that 50% of households would adopt a time-of-use (ToU) tariff if annual savings of €144 could be realised. Without an EV, the most engaged customers could save around £91 (€102) a year, which isn't insignificant but requires users to be fiercely focused - every day! - on monitoring tomorrow's tariff to schedule their energy use.
Cutting-edge autonomy in Amp X's demand-side management (DSM) behind-the-meter (BTM) solution relieves consumers of that active engagement burden. It allows technology to work with, rather than for, the user – leveraging artificial intelligence and machine learning to learn user preferences and schedule energy usage accordingly.
Amp X BTM solution is designed to alleviate strains on the grid - like congestion and frequency instabilities – and the strains on the consumer of programming devices such as EV charger, HVAC, and other equipment to be as cost effective and as comfortable as possible.

APPLiA



Smart connected appliances are essential to achieve demand-side flexibility at residential level.
Inside homes, interoperability allows air conditioners, refrigerators, washing machines and heaters to optimise their energy consumption in relation to one another and the grid. This dialogue aims at reducing pressure on the electricity grid and avoiding peak times when the cost of electricity is higher.
As stated in the 2019 JRC report on smart homes and appliances, where users could actively see the energy consumption in real-time and act upon it, there were registered energy savings reaching up to more than 15%.
Only an holistic approach combining building renovation and home appliances will increase the demand-side flexibility performance of the 72 Million smart homes expected in Europe by 2024.

EDF



As it supplies energy to more than 25 million French dwellings, EDF is deploying innovative offers for its residential customers. Built as a showcase, the Low Carbon Smart Home laboratory lets the R&D teams develop and test the new products and services that will be offered by EDF or its partners.
The Low Carbon Smart Home was designed to be comfortable, resilient and carbon neutral:

- comfortable, to help customers feel well at home, while reducing their energy bill;
- resilient, as it brings peace of mind to the customer, for instance with predictive maintenance of heating systems;
- carbon neutral, by using local renewable energy sources, and thanks to energy management systems, that limit the use of fossil fuels.

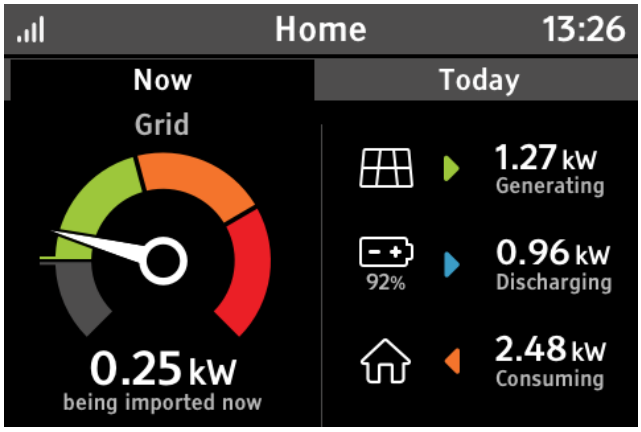
To develop these three areas, the researches performed in the Low Carbon Smart Home are obviously addressing wider questions: the optimal orchestration of systems, based on occupants' needs, the interoperability and communication between devices, the ease of installation and, finally, cyber-security questions.

The 2 main contributors for the consumption of electricity are space heating and domestic hot water, which can provide a significant potential in terms of system efficiency.

Millions of dwellings are equipped with electric heating. Their individual contribution to the peak shaving on the capacity market or specific tariff could be at least 1 kW per dwelling, with nearly no impact on comfort for the inhabitants.

Millions of storage electric water heaters, for domestic hot water, are already installed and contribute to balance demand thanks to automatic control by time of use tariff and smart meters.
But these devices are also very efficient, combined with local PV production and an optimal control, to increase self-consumption by up to 25%. Combining PV generation and thermal storage is one of the best solutions to decarbonized the production of domestic hot water and use renewable energy sources.

geo



In developing their "Hybrid Home" proposition geo modelled the possible impact of increased EV ownership on a new building. This showed that if only a third of occupiers charged their EV when they returned home from work it could increase the peak demand by a factor of three. Flexibility in the form of smart charging is a clear solution to this issue, but extend the demand to include electric heating and the problem increases, plus the flexibility to defer the heating load is more constrained. However, the combination of introducing a home battery and maximising building insulation enabled the demand profile to be flattened. The battery is charged at off-peak times and used to supply electricity at peak times thus flattening the peak as well as generating savings: calculations indicated that financial savings of around a third without PV and around a half with PV could be achieved.
Furthermore, the combination of energy efficiency measures, storage of renewable energy and reducing the requirement for peaking generation plant would significantly improve the carbon footprint of the homes.
This solution is currently being trialled in a selection of different homes, including social housing. The expectation is to provide real time data to facilitate operational management of the flexibility.

Siemens

In Sello Espoo, the most visited, green and smart shopping center in Finland, the Siemens' solution delivers a comprehensive optimization program for building systems focused on efficient and flexible energy use, and air quality. The smart power micro-grid represents the first concrete step towards connecting properties to the virtual power plant digital platform.

The shopping center with over 170 shops, a concert hall, a library, hypermarkets and entertainment attractions, utilizes a state-of-the-art cloud solution with 1.68 MW energy storage and 0.5 MW own solar electricity, EVs, building automation and microgrid controls. Sello is the first significant property complex in Finland to be part of the electricity reserve market offered by the national TSO Fingrid.

The gains for the customer are manifold: improved building performance, €118,000 savings/year in energy and maintenance costs, emissions reduction of 281 tonnes CO2 p.a. and €480,000 profit/year on the energy market. The participation in the balancing market contributes to significantly reduce the repayment period for investments in renewable energy production. Additionally, the solution contributes to reducing the need to invest in backup power plants and, at the same time, it helps Fingrid to develop and secure the self-sufficiency of its energy production. It increases the benefits for property owners, energy providers and for society at large.

tiko

The energy supplier EVN has acquired great expertise in consulting and installation of more than 1,700 PV systems for household customers as well as in energy management, which has so far only been accessible to large customers. Together with tiko's solution, EVN implemented "joulie", an integrated solution in the form of an online tool easily accessible to household customers.

With Google Maps, one's own customized energy solution can be planned, optimized, and purchased online with a few simple clicks.

Customers immediately receive a targeted price offer and the appropriate energy contract. joulie enables customers to participate in the energy market through their own electricity production and consumption optimization and to contribute to the energy transition. Surplus electricity from the PV system is either stored in a battery, converted into hot water, flows into the electric car, or is sold.

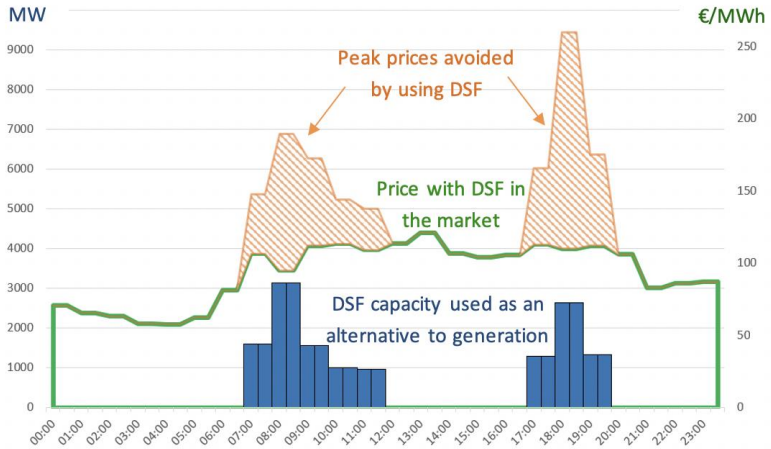
Experience shows that households with joulie can achieve up to 75% of self-consumption and thus achieve significant savings per year thanks to self-consumption optimization.

Voltalis

Optimising consumption in real time, both for the individual consumer and system-wide, is achieved with Voltalis solution: widespread demand control. Voltalis has already equipped 100,000 homes and buildings with its smartbox and was recently backed by the European Investment Bank to roll out another 150,000 by 2022.

In Europe, millions of consumers with flexible loads could participate, totalling a potential of over 160 GW[10] for all kinds of electricity users, most of which among households.

The solution is free for consumers and provides them with energy savings, thus reducing their electricity bill whatever their supply contract. Consumers are happy to engage, and thus participate in the energy transition.



For instance, in an apartment building in Bordeaux, 9 homes achieved 13% reduction on their heating consumption, thus saving each 694 kWh last year and avoiding 295 kg of CO2 in average.

They also helped the system by reducing their load down 20 kW during peak times, on a cold winter day.

Additional energy management services, via a dedicated app, may be used by the consumer, e.g. for scheduling or real time remote control.

Hundreds of thousands of consumers, aggregated together by Voltalis, can provide hundreds of MW of load reduction as an alternative to traditional generation, thus avoiding high system costs and CO2 emissions.

For instance, a couple of million households will be enough to totally shave winter peaks in the French market, thus shaving wholesale peak prices. This will benefit all suppliers, hence all consumers.

[10] By 2030 (source: European Commission, Evaluation report, SWD(2016) 412 Final, part 2/2, p.168)

This impact is simulated here on a typical winter day: with such DSF participation in the French market (Epex), peak prices would have been avoided, so that suppliers would have reduced their sourcing costs during peak hours from 30 M€ down 9 M€, i.e. a 30% cost reduction for all.

Besides, DSF can help avoid grid congestions and ensure a better integration of renewables - hence a more affordable and more climate-friendly use of electricity.

Wattsdat

In developing its platform, Wattsdat is focussing R&D activities on data-driven building energy use models.
The aim is to evaluate which improvements in efficiency and flexibility can be achieved through interventions that increase the smartness of the building.
Wattsdat has demonstrated that releasing the building flexibility potential of smart and active buildings, in particular during heat waves, can reduce their carbon footprint and generate new revenue streams.
By analysing the energy performance of a large commercial building in Italy after the adoption of an advanced HVAC optimization system, Wattsdat identified a valuable demand-side flexibility potential to participate to the balancing market by Terna, using heat pumps as flexible load.
In order to estimate the maximum peak-duration that does not impact the comfort conditions, an assessment was carried out by Wattsdat during a heat wave scenario.
It was observed that the indoor temperature, one hour after the almost complete reduction of the electrical load of the heat pumps, has risen by only one degree beyond the comfort zone on a very warm summer day.
This little discomfort, however, resulted in a potential benefit both for the building, thanks to the profit deriving from the provision of flexibility capacity, and for the system, thanks to the reduced need for production and distribution resources needed to face the heat wave scenario.
Wattsdat platform is currently being trialled in some smart districts to assess the potential of flexibility of a community of users.

About smartEn - Smart Energy Europe

smartEn is the European business association integrating the decentralized solutions of the clean energy transition. We create opportunities for every company, building and car to support an increasingly renewable energy system. Our membership consists of the following companies:

The positions expressed in this document represent the views of smartEn as an association, but not necessarily the opinion of each specific smartEn member.
For further information about smartEn, please visit www.smarten.eu