Position Paper on Smart Buildings

Brussels, 12th September 2016

Table of Contents

1. Introduction

1.1. Non-residential buildings

Non-residential buildings serve a specific purpose which requires a predetermined amount of services with a deterministic behaviour and use patterns. All these are in order to fit to the intended business use, productivity requirements and energy and services (e.g. facility management) costs. Since non-residential buildings mostly follow a fixed weekly schedule, automation strategies easily support and continuously optimise their operation.

In the past 10 years, among others, the following requirements appeared in buildings:

- Sustainable buildings (including operation phase), green buildings and energy performance labelling for buildings;
- CO_2 footprint during operation phase;
- The use and management of different water systems in buildings e.g. drinking water, rainwater, grey water, black water;
- Legislative/ building codes/ company internal requirements;
- Technological advances in energy management due to on-site energy generation and energy storage in addition to grid/district connections;
- Technological advances in ”MPC - model predicted controls”;
- Security of energy supply;
- Cost management, energy as service, energy performance contracting;
- New standards e.g. EN ISO 50001 – Energy Management Systems, EN 16247 – Energy Audits;
- Increased share of rented properties (tenant/landlord – split incentives);
- Raised awareness of the energy market about on-site energy production (usually 100% carbon neutral);
- Energy flexibility depending on availability.

Considering the above mentioned bullets the “traditional” image requires extension and strategies for incorporating these new fields need to be explored.

1.2. Residential buildings

Residential buildings, from single family houses to multi-family apartment buildings require usually services like heating, cooling, ventilation, drinking water and domestic hot water, depending on the typical needs (e.g. historical, climate) of a dwelling’s inhabitants. Compared to a non-residential space a pre-programmed

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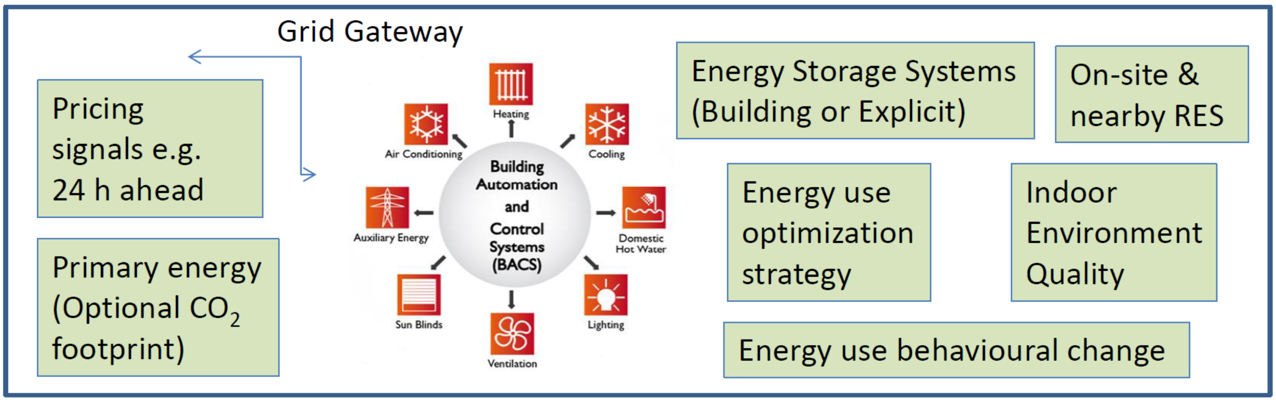
schedule of services would potentially be very complex and likely subject to change on a short notice. Planning ahead with mathematical methods in order to add flexibility on energy use / storage could become very challenging or potentially impossible. This just means that energy flexibility opportunities are less obvious. One could imagine the use of appliances and/or energy storage through advanced mobile devices – ahead planning. Such applications could support adaptive algorithms and thus facilitate energy flexibility.

Another major difference to the operation of non-residential buildings is the interface of operation. Assuming that the "gamification" of the operation of residential buildings continues to increase than an appropriate schedule of use could automatically be determined and services could be prepared thus facilitating energy flexibility, disregarding the level at which energy flexibility is enabled i.e. individual product level or building service level.

2. Terminology and functions



"Smart" implies that the existing energy efficiency functions (e.g. according to EN 15232) get topped with demand side energy flexibility functions – to shift energy use when energy is available, has lower cost than normal or has a minimal or zero carbon footprint.

More and more buildings or groups of buildings generate energy on-site and become "prosumers". Most of this generated energy has a very favourable carbon footprint. Renewable energy is weather dependent which implies that energy generation is not always synchronized with energy use. This fact requires controls and automation that can use / store /re-use such variable energy resources in a flexible manner, while at the same time maintaining energy efficiency.

The upcoming new automation and controls mechanism offer "efficient" and "flexible" energy use which can be called "smart". It should be made clear that the "smart" functions require equipment to be automated.

Efficient and flexible operation requires more information than "just the control sequence". Flexibility means that the system determines from schedules and presence information when services are required and from various forecast models and weather forecast information when the on-site generation is able to produce. Combining that information together with building information leads to "flexibility" while maintaining desired indoor environment conditions e.g. temperature. Another aspect of flexibility is management of availability / cost / carbon footprint of energy from smart grids.

It goes without saying that clarifying the terminology is the 1st necessary step. Although, demand side flexibility (communication with the grid/network) is one function of a smart building, this is more a longer term perspective. When aiming to capture energy and non-energy benefits today two other functions of smart buildings have a greater importance:

- Buildings should react to occupants needs, after all buildings are built for people and we have come a long way from the cave;
- The energy use of the building should be continuously optimized, by ensuring that energy is used only when and where necessary and the proper operation (and integration, when the case) of technical building systems (e.g. fault detection, automatic maintenance alerts).

From the technological point of view, for fully integrating a building's services, a Smart Building requires building automation and controls to necessarily complement metering systems. By applying a single point 'Smart Building – occupant/facility manager' interface, the intelligence of the building shall take, if wanted, automatic decisions, thus unburdening people while at the same time allowing manual override and constituting an evidence base for helping make informed decisions to continuously improve the energy performance of buildings.

3. Policy recommendations

3.1. Policy landscape

- Ecodesign prep study DG ENER Lot 33 'Smart appliances':
  - Draft Task 7 'Policy options' presentation (DSF - demand side flexibility);
- ETSI standard: SAREF (Smart Appliances Reference Ontology) for buildings for the new electricity market (link on Commission's DG CONNECT Digital Single Market , EUSEW 2016 event);
- EPBD review: smart buildings to be possibly included under the form of **Smartness Indicator** within Energy Performance Certificates:
  - Readiness of the building to adapt to the requirements of the occupants e.g. with remote controls;
  - Operation and maintenance of buildings with advanced tools, including fault detection and maintenance notifications;
  - Demand side flexibility.
- Smart Grids Task Force:
  - Smart Grids Task Force (SGTF), Workshop on Smart homes and buildings, Brussels 26 April 2016 (agenda, presentations, conclusions);

3.2. Looking forward

For ensuring an effective implementation there is a need for harmonization of requirements at EU level and differentiation between residential and non-residential buildings, due to different building services installed and different use patterns.

For streamlining the 'making Buildings Smart' process, a standardised approach and visibility (certification) are of most importance for having a sustainable process, for ensuring a transparent value proposition and a level playing field in the buildings sector.

Once with the adoption of this autumn 'Energy Efficiency Package' the European Commission shall set the way forward on this key piece of the energy system puzzle and as a result create added value for citizens and support economic recovery.

When looking only at DG ENER's policy landscape on 'smartness in buildings' the following work-streams need to be coordinated for productively facilitate the energy transition i.e. Smart Grid Task Force, Energy Performance of Buildings Directive and Ecodesign Smart Appliances.

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