Panel Report

SMART BUILDINGS

24 February 2010 – 09:00-12:40

Session Rapporteur: Stefano Carosio (D'Appolonia)

1.0 INTRODUCTION

Smart buildings are emerging as a lead market onto which new value propositions and business models can be triggered while addressing grand societal challenges. Buildings in fact account for approximately 40% of energy end-use in the EU. The sector has significant untapped potential for cost-effective energy savings which, if realised, would mean an 11% reduction in total energy consumption in the EU by 2020. The EC Recommendation C(2009) 7604 asks for a closer cooperation between the ICT sector and the building and construction sector to improve the environmental and energy performance of new and existing buildings, and to address the existing barriers to the wider use of ICT tools and their relevant applications. In this framework, a political agreement was recently reached on the proposal for a Directive of the European Parliament and of the Council on the energy performance of buildings (recast). The new Directive foresees the obligation for EU Member States to introduce intelligent metering systems, and also recommends that the Member States can encourage the installation of active control systems that aim to save energy.

In this framework, the workshop has been built around two key sessions:

- Session 1: Reinforcing cooperation between the ICT and building and construction sector;
- Session 2: Improving energy performance of buildings.

In the following paragraphs a summary of the aim and thematic discussions in the two sessions is provided, including key recommendations and orientations for future actions as emerging from the panel debate.

This short report is not intended to summarise the detailed presentations but rather the issues which have been discussed, the main messages, the questions raised and orientations that could tentatively be brought forward. More details about the different presentations by the panellists can be found at:
http://webcast.ec.europa.eu/eutv/portal/archive.html?viewConference=8511&catId=8484.

2. Thematic discussions

In the following, key aspects covered by the presentations in the two sessions are provided.

Session 1: Reinforcing cooperation between the ICT and building and construction sector

During the first session (09:00 – 10:30), dealing with “Reinforcing cooperation between the ICT and building and construction sector”, opportunities and issues arising from a closer cooperation between the stakeholders were presented, addressing cooperation islands and touching upon the management of data and privacy related aspects.

Clay Nesler introduced a scenario based on existing technologies or available in the near future, highlighting the opportunity to introduce competition aspects between tenants through for instance sub-metering at tenant level. The challenge is in existing buildings where there is a need for codes and incentives with mandatory labelling showing performances at the time of sale. To deploy the potential he pointed out the need for high profile projects to demonstrate concrete opportunities.

Christian Kornevall pointed out that zero net energy buildings are today not economically viable but they have been kept in the vision. He highlighted the need to mainstream solutions in the entire building sector where problem exist with the complex decision making and delivery processes with functional gaps and operation islands. A number of studies have been performed by leading management consulting firms but they typically address macroeconomics, while builders take decisions on local conditions, on local subsistence and local technology. Based on the EEB Model it appears clearly that subsistence subsidies have very little effect and something else is needed. On the other side, he also stressed that to get transformation we can not fully trust the market. Design of integrated solutions is needed where ICT can help; in particular heating/cooling control is the key. As we can not manage what we don’t know, information and transparency on energy use is a key, knowing prices and working in real time. In this framework it is nevertheless important to consider absolute numbers, not only relative numbers; a house can be in fact very efficient (per square meter) but the total energy used can be very high in case of large surfaces, so we could in principle be more and more energy efficient but use more and more energy in absolute terms. In his closing remarks Mr. Kornevall highlighted that behavioural aspects are extremely important; in fact if people are more efficient they will tend to consume more with a clear bounce back effect that has not to be forgotten.

Claire Roumet gave a clear message, being a priority for ICT to be used in the existing stock, with ICT models that can work in a very diverse housing stock, being easily adaptable. She pointed out the fears that EU is taking out the focus from energy efficiency in use towards energy efficiency in production. Investing in energy efficiency at building level create in fact much more employment, locally. A key aspect is a decentralised EU energy market where smart grids and smart meters as well as management of energy flows will deploy the highest potential for ICT. Key is the coordination of the actors with ICT having a relevant role in its coordination capacity beyond being a component of energy efficient buildings. She stressed the importance of social acceptance and human aspects that have to be taken into account when designing future scenarios, with a clear need for cost-effective solutions. We have the tendency today to match tax opportunities and grants rather then developing holistic approaches that deal with life time homes, that adapt to climate change but also to ageing, taking into account disabled people and easy of use. The cable in the houses should deal with energy flows, information, telephone, etc. She closed by highlighting the fact that energy prices instability is the main obstacle to investments; furthermore, legally speaking, ICT has not to be seen as an over-control of the construction and a control of the user behaviour.

Oliver Guillaumond introduced the importance of cities as far as energy efficiency and GHG emissions reduction are concerned. The success lies in the scalability of the ICT solutions; today the buildings are tied to specific vendors, information management is quite difficult to handle. This is why we should start from existing buildings with existing infrastructures; looking at monitoring and controlling we can reach a lot, making buildings perform at all time according to their original intent. In this framework data management is the key as in 2 years between 20 and 40% of energy reduction can be achieved. ICT will then be enablers to transform a set of buildings in a giant data repository, where optimising energy performance become a data management programme. By accessing data via an open internet based architecture the facility managers can do the work remotely, intervening on demand. In this way, solutions will become scalable, less vendor dependant on the equipment installed, being rather cheap and fast to implement without the need to change the current infrastructure. Based on this, we can use the data to optimise the energy contracts as well as make full use of the incentives available. This will require people to work together; there are a lot of players (i.e. tenants) that need to be integrated and combined. Intelligent buildings are part of the broader picture of smart cities, where smart grids are a very powerful tool together with holistic frameworks to drive changes. In this framework Public Private Partnerships are key if clear targets, KPIs and risks are identified to then share benefits and best practices, with clear criteria on how to prioritise actions along implementation.

Marie Annick Le Bars reported about experiences at Bouygues Immobilier with energy positive buildings, covering both integration of renewables and reduction of energy during use. She highlighted that it is important to engage users in contracts based on energy performance in a truly cooperative approach, fostering networks (IT networks and building operation networks) convergence through pilots, with practical standardisation.

The session concluded with a debate on what roles might be envisaged for the various parties in facilitating progress, in improving cooperation between the ICT sector and building and construction beyond the technological issues. A first question from the audience addressed the viability of managing data from consumption and change behaviour for private houses. Claire Roumet answered that in social housing this is feasible as they normally manage 1000 houses in a given area so this justify the cost of an energy manager; indeed critical mass is key. A second question addressed emerging markets in China and India and whether local actors are innovating with local solutions. The panel replied that in China they are very strict but the enforcement is very weak, with no clear relationship between buildings standards/codes and implementation. Claire Roumet pointed out, based on CECODHAS experience, that in the future China will be delivering affordable solutions for renewables and EU would need to invest in training energy managers as well as need to invest in refurbishment, as this creates qualified employment at local level. The big opportunity with China is to create standards that can be replicated; ICT will indeed have a short term impact through simulation in order to replicate the most cost-effective design across the country. A third question from the audience addressed the existence of policies at EU level like Buildings Carbon Credits to make all the stakeholders cooperate in the same direction. Christian Kornevall replied that in some countries the local authorities force the actors to work together, while some developers have this as a basic model, but this is not widely established. He also stressed the fact that there have not been references so far to passive systems (i.e. day light, natural ventilation, natural cooling) which have a great potential when integrated in the

design stage with technology. The last question addressed the differences between residential and office buildings and where the biggest gain lies. Claire Roumet pointed out that the potential in residential housing is more difficult to achieve as it is a fragmented sector although it is relatively important (2/3 of the stock is residential buildings, of which 2/3 are family houses). The panelists nevertheless pointed out that offices are easier to address because of the fact they have all sorts of HVAC and other systems. Furthermore in residential buildings in most of the case we are addressing existing stocks, with associated difficulties in implementing best available technologies. Furthermore users are not fully aware and they are just starting looking at energy efficiency; this is why we need to give information at first, than install technologies to monitor, and this will contribute to change behaviour.

Session 2: Improving energy performance of buildings

The second session (11:00 – 12:30) "Improving energy performance of buildings" opened with a presentation of two initiatives aiming at supporting the EPBD Directive.

Jean-Yves Blanc highlighted that energy consumption is mainly consumed in Heating, Ventilation, Air Conditioning (HVAC) and lighting systems, therefore we need to decrease energy consumed in this area, working both on the envelope and on the technical equipment for control. Dealing with new buildings is much easier; the challenge is to address existing buildings. The return on investment when dealing with insulation, envelope or equipment and control systems is different, with equipment being the quicker. Indeed all different systems can now work together; monitoring is important to understand where energy is used, to be followed by analysis, diagnosis and recommendations. The last point is the control and after that we need to follow up so that performances remain during the entire life cycle of the buildings. The buildings are in fact changing their use during the life and this leads to continuous commissioning to maintain the performances. With the openness that we have today in every system, it is possible to integrate systems, linking for instance access control with HVAC and lighting control so that we can optimise the energy use in office buildings. International standards already recognise this, by applying EN 15232 we can already save up to 50% in office buildings. BAC is therefore a major enabler to achieve energy savings, encouraging promotion of regulations for energy efficiency like EPBD.

Peter Palensky, representing CEN TC 247, introduced the current scenario with standards for BACs, with three main approaches available, fostering multi-vendor installations. He addressed 3 main phases, from design where decisions to have energy demand at minimum are taken, through operation where energy use is minimised and the next step, where sophisticated controls are needed, easy to use and to maintain. Dr. Palensky highlighted that a building in operation should be accompanied by a digital model like it is used in manufacturing, allowing to compare reality with what it should be and to look at the future to schedule things. He also pointed out in his closing remarks that all the smart grids developments in EU will not be possible without smart buildings, the buildings need to be active in the grid and this will require sophisticated controls.

Sabrina Soussan highlighted once more the two main energy uses in buildings, namely insulation and HVAC/Lighting. The main difference is that payback is much lower in case of HVAC/Lighting. Saving between 20 and 40% is feasible, fostering the introduction of energy saving performance contracting where investments are paid by energy savings

themselves. Stakeholders have indeed conflicting interests, for instance tenants are not motivated to go for energy efficient buildings without any clear return. Climate change needs therefore joint efforts between legislation and industry, technology is available, legislation and regulations needs to create a market pull approach, and only if the two works together things can change. Again, Sabrina Soussan, pointed out that one of the most important topics are today cities; the technology is in fact available to make cities energy efficient. What is missing are innovative business models with interesting pay back time.

Juliusz Żach gave the point of view of a construction company, stressing the importance for ICT to address user behaviour. Users understanding of the importance of their behaviour are fundamental to exploit fully ICT solutions, key enabling technologies already exist.

Georg Brodach pointed out the importance of considering that what ever we save at the consumer end has a factor five in saving at energy generation level, with a clear leverage effect. We need to avoid redundancy; smart grids and buildings are part of the new paradigm, where smart metering is key. As far as the value chain is concerned, we are about to experience convergence as it occurred 15 years ago in media and communication, with many new players coming into the picture as IBM, SAP, Google, ebay, etc. This will shift from traditional grids to smart grids including smart buildings. Smart buildings will be a building block for smart grids, where power an information are exchanged, huge amount of information will be processed and this is where the real challenge lies.

The session ended with a debate to identify whether the potential of ICT tools in bringing about energy performance improvements in buildings is widely exploited today, and if not, why not. A first question addressed obstacles for the roll-out of smart metering and possible problems with privacy of data. Georg Brodach made the case of smart phones and the behavioural hesitation from consumers which wait for the new generation to come; in the case of smart buildings there is a need for a clear political framework. As far as privacy is concerned, if you consider internet, nobody is bothered if others know which websites have been visited, why the problem should exist when it comes to energy use? The panel highlighted that privacy is dealt with differently across EU; in the case of smart buildings there will be a lot of information more than in other cases and this is a challenge for EC and national legislator, establishing who owns which information. Another question addressed the importance of design and new design processes. Peter Palensky highlighted that introducing new technologies is difficult, therefore trying to break barriers through simulation is key. This allows for instance to specify the building according to the bid but also varying performances through options, and this is the right ammunition to foster this approach. The audience followed by raising the question whether there is an objective to capture the outcomes from simulation into a BAC system, educating the construction sector to prove intangible benefits when converging BACs and ICT. The panel replied that we need to come to a point where the control maintain themselves, designing predictive controls that use building models to check if they are at the optimal level, with facility managers in charge. Jean-Yves Blanc pointed out that the key issue is that in smart buildings many actors are involved and if one actor is missing in using the model is a problem. When all the people are sitting at the same table we can use this model, if it is not the case then it is difficult. The market is not ready for that, it is a long way. Georg Brodach pointed out that the 20% of the buildings are in public ownership; if

there was only one large initiative in this area, there will be a huge progress. The public owners can play a key role, the others will follow. The chairman asked whether incentives can accelerate and increase innovation in construction. Mostostal said that incentives are important but should be market driven. A question from the live chat was raised about privacy concerns. Sabrina Soussan replied that privacy is a false issue as today with internet we know when people is at home etc. The US is more advanced in smart grids and they do not have problems at all. Jean-Yves Blanc highlighted that privacy in the building market arise for instance when we integrate access control etc. Depending on the country we face aspects with the Human Resources Department and Unions. It is important that there is an external body that works with these data and it is transparent to trade unions and the stakeholders. Indeed there will be a growing concern on these issues in the future.

3. Conclusions and Orientations

Across the two sessions, a number of specific issues and topics were touched upon. These can be summarised as follows:

- many examples of Energy-efficient buildings exist today, but little coordination across the different actors and stakeholders in the value chain is in place. This is reflected in the complexity of decision making due to the different wishes and objectives of the different actors - owners, managers, architects, engineers, etc. - and consequent need to force partnerships. Christian Kornevall pointed out indeed that in some countries the local authorities force the actors to work together, while some developers have this as a basic model, but this is not widely established.
- the need to address existing buildings is indeed the challenge, with HVAC/lighting system control having the highest potential for energy use reduction. Mr Kornevall highlighted that subsistence subsidies have however very little effect and something else is needed. On the other side, he also stressed that to get transformation we can not fully trust the market. We need better regulatory structures, labelling and standards. Other panelists pointed out that there is a need for codes and incentives with mandatory labelling showing performances at the time of sale. In this framework, and addressing global opportunities in emerging markets in Asia, the panelists highlighted the need for standardised solutions which can locally be replicated, generating job opportunities and growth;
- the panelists highlighted the need to make buildings operating according to their design goals, keeping performances to their optimal value during building life. In this framework, the need to keep performance and therefore introducing continuous commissioning was pointed out by different speakers. Furthermore modelling and simulation can support in the design and operation of BACs. However, as Mr Blanc pointed out, the key issue here is that in smart buildings many actors are involved and if one actor is missing in using the model is a problem;
- based on this continuous monitoring, there is the need to foster the introduction of energy saving performance contracting where investments are paid by energy savings themselves. Stakeholders have indeed conflicting interests, for instance tenants are not motivated to go for energy efficient buildings without any clear return. New value propositions are needed, which are user centric (user awareness & user behaviour) – the concept “prosumers” was introduced – with seamless integration of the players in the value chain from modelling/design to building & maintenance, against current operational islands. This will result in win-win

approaches and will enable cooperation across stakeholders, as highlighted above. Climate change needs therefore joint efforts between legislation and industry, technology is available, legislation and regulations needs to create a market pull approach, and only if the two works together things can change.

- Mrs Roumet highlighted that user behaviour need to be addressed covering both user education and training as well as providing effective but simple to use ICT tools with simplified infrastructures where power, information and communication flows are handled by same cables and interfaces are user friendly. Users are in fact not fully aware and they are just starting looking at energy efficiency; this is why we need to give information at first, than install technologies to monitor, and this will contribute to change behaviour. Nevertheless, as highlighted by Mr. Kornevall, if people are more efficient they will tend to consume more with a clear bounce back effect that has not to be forgotten. In this framework the absolute amount of energy at stake is key, this leads more generally to the need to consider energy efficiency in buildings in synergy with sustainable and responsible consumption.
- the need for solutions that are aggregated or integrated together in order to take advantage of a whole building approach was a common theme across the presentations, encompassing the building dimension through neighbourhoods up to cities. In this framework and in particular considering existing buildings, the exploitation of smart grids and decentralised energy systems is key for effective and quick transformation, with smart buildings having a central role in power and information flows. A relevant observation was that a lot of efforts are addressed to active systems but not much attention is given to passive systems, which could offer affordable solutions and reduce complexity when properly integrated in the buildings;
- the need to accelerate the application of available and emerging ICT solutions both as key technology to increase energy efficiency as well as to address coordination aspects in the value chain, avoiding cooperation islands, was highlighted by all speakers. This will generate the fastest and more affordable contribution which will result in savings up to 40%, by simply exploiting the current infrastructures and transforming buildings in giant data repository which will enable scalable solutions and vendor independency, fostering the entrance of new players from ICT;
- managing data is therefore the key; buildings as data management infrastructures are a new paradigm to come. This requires that transparency and confidentiality in the use of the data are ensured, with clear social and political implications. Privacy aspects and security in handling data gathered and managed to operate Energy-efficient buildings were indeed raised during the debate and a comparison with similar issues when using and providing internet based services was made. Jean-Yves Blanc highlighted that privacy in the building market arise for instance when we integrate access control etc. Depending on the country we face aspects with the Human Resources Department and Unions. It is important that there is an external body that works with these data and it is transparent to trade unions and the stakeholders. Indeed there will be a growing concern on these issues in the future. The panel highlighted that privacy is dealt with differently across EU; in the case of smart buildings there will be a lot of information more than in other cases and this is a challenge for EC and national legislator, establishing who owns which information;
- when it comes to EU strategies and its political agenda, Mrs Roumet pointed out the fears that EU is taking out the focus from energy efficiency to energy production towards energy efficiency in energy production. Investing in energy efficiency at building level is at the end create in fact much more employment, locally;

- to deploy the potential the need for high profile projects to demonstrate concrete opportunities was pointed out during the discussion. In this framework, public buildings can play a role in demonstrating the potential (20% of the stock as it has been reported) and accelerating take up;
- in this framework there is a clear need for Public Private Partnerships where targets, KPIs and risks are identified to then share benefits and best practices, with sound criteria on how to prioritise actions along implementation.

During the session a number of messages and possible orientations emerged for future work and efforts to be jointly tackled at European and local level. In addition, points below should also be taken into account in the design of future EU funding and co-financing programmes:

- The European Commission should support further energy efficiency in use, with a special focus on smart buildings and their implementation in the existing stock, being smart buildings key elements in future smart energy grids, districts and smart cities;
- The European Commission should foster Public-Private Partnerships (PPPs) in the field of energy efficient and smart buildings due to the high risk nature of the projects, not only technically. In this framework, national and regional authorities have a key role to align PPP roadmaps to their agendas and viceversa. This will raise local opportunities and challenges concerning education, training and highly skilled new employment, essential to achieve market penetration and transformation. The combination of European and national regional efforts will support in the definition of globally optimised and standardised solutions which will be fully compliant with local design practices.
- The European Commission should foster the launch of demonstration projects where public buildings could be a target as well as proper standards and incentives could be conceived to engage the end-users and the actors in the value chain;
- The European Commission and European policy should encourage the use of open architectures to favour the exchange of data across multi-vendor systems, while taking into account transparency and privacy in the management of the data. This should be reflected in standards and procurement practices.
- Further EU funding should be made available in areas, such as:
    - Design, modelling and simulation tools, to better understand and value options as well as translate them into effective BAC systems along life cycle;
    - Research on user behaviour and its effects on energy efficiency, including user integration in the value chain;
    - Research on standardised and systemic solutions which can be easily adapted to local conditions;
    - Refurbishment and renovation of existing housing stock, integrating available and emerging ICT solutions to transform buildings in large data repositories with clear integration with BACs and real time control strategies. Opportunities to create links with building digital models should be considered to adapt control strategies across life cycle and change of use.
    - Research on ICT solutions for more effective cooperation and coordination across the value chain, including user involvement.

Coordination between the different stakeholders from industry, the public side and the users must be structured on a European level with clear local benefits and returns; here ICT will play a vital role.

Annex 1

LIST OF SPEAKERS WITH THEIR AFFILIATIONS

Session 1:

Session Chairman:
Alain Zarli
Head of Division
Centre Scientifique et Technique du Batiment

Session Speakers:
Clay G. Nesler
Vice President
Global Energy and Sustainability, Johnson Controls - Building Efficiency
Representative of EuroACE

Christian Kornevall
Director
Energy Efficiency in Buildings (EEB) and Urban Infrastructure Initiative (UII)
World Business Council for Sustainable Development (WBCSD)

Claire Roumet
General Secretary
CECODHAS

Oliver Guillaumond
Senior Manager
Accenture Sustainability Services

Marie Annick Le Bars
Director
Innovation et Développement Durable Immobilier d'Entreprise
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Session 2:

Session Chairman:
Alain Zarli
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Centre Scientifique et Technique du Batiment

Session Speakers:
Jean-Yves Blanc
President, eu.bac
Senior Vice President, Building Automation Strategy
Schneider Electric

Peter Palensky
Head of Business Unit "Sustainable Building Technologies"
Austrian Institute of Technology

Sabrina Soussan
Global Head of Marketing for Building Automation
Siemens Schweiz AG

Juliusz Żach
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Georg Brodach
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