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Saving Energy in Europe's Public Buildings Using ICT

Policy Background

The EU Heads of State and Government set a series of demanding climate and energy targets to be met by 2020, known as the „20-20-20" targets. These are a reduction in EU greenhouse gas emissions of at least 20% below 1990 levels, 20% of EU energy consumption to come from renewable resources and a 20% reduction in primary energy use compared with projected levels, to be achieved by improving energy efficiency. In January 2008 the European Commission proposed binding legislation to implement the 20-20-20 targets. This 'climate and energy package' was agreed by the European Parliament and Council in December 2008 and became law in June 2009.

Europe's Public Buildings

The buildings sector represents a huge, largely untapped potential for energy savings in the coming years. Due to the low renovation rate of buildings as well as the fact that the buildings sector is slow to adopt new technology – a 20-25-year cycle is typical - swift action is required. Buildings owned and/or managed by the public sector make up more than 10% of the overall EU building stock and around 40% of the construction turnover is public.

One of the main reasons for limited implementation of efficiency measures is limited information regarding both the split of final energy consumption into thermal and electric energy as well as lack of information about the possible measures.

SMARTSPACES Objectives

It is against this background that the SMARTSPACES service will enable public authorities in Europe significantly to improve their management of energy in the buildings they occupy. The implementation of operational services includes 11 pilot sites with more than 550 buildings in 8 countries (United Kingdom, France, Germany, Italy, Spain, Netherlands, Turkey, Serbia) with almost 20,000 professionals and staff users and reaching more than 6,000,000 visitors annually.

SMARTSPACES Pilot Sites

The SMARTSPACES pilot sites where the energy saving services will be implemented and operated are located in large European cities like Milan, Birmingham, Bristol, Istanbul, Belgrade but also mid-size cities like Leicester, Hagen, Lleida, Murcia, Venlo and Moulins.

SMARTSPACES Pilot Sites:

SMARTSPACES Services

The SMARTSPACES energy optimisation service is a comprehensive approach to exploiting the potential of ICT including smart metering for significant energy saving in public buildings. With its aim to reduce energy consumption of the public sector by a very significant amount to meet overall emission reduction targets, the project will build on existing services to develop a comprehensive SMARTSPACES service providing feedback on energy consumption.

SMARTSPACES Public Buildings

The range of public building where the SMARTSPACES service will be implemented and operated is wide and includes city administration buildings, office buildings, museums, university buildings but also schools, nurseries and sports and event centres.

SMARTSPACES Energy Decision Support and Awareness Services

Energy Decision Support and Awareness Services give advice and guidance for optimal energy consumption behaviour to professionals responsible for building operation, to staff building users and to visitors, using feedback on metered current energy consumption and automatic comparison of historic data, norms and simulation together with short-term detection of consumption anomalies and long-term assessment of investment priorities (retrofitting). The components used for all groups (including visitors of buildings) will include visualisation, preparation and interpretation of data on posters, screens, web-portals and social networks or in personnel training.

SMARTSPACES Energy Decision Support and Awareness Services can be further differentiated as follows:

- Energy decision support services providing appropriately visualised up-to-date energy consumption information supporting choice of energy-saving behaviour by building users who are visitors from the general public and staff using the building;
- Analysis, visualisation and alert systems based on up-to-date metering providing energy decision support services to building professionals and energy managers;
- Micro-range and zone-control installations allowing management of at least heating and lighting - energy management services provided primarily locally to a building.

SMARTSPACES Service Users

SMARTSPACES addresses the following user groups:

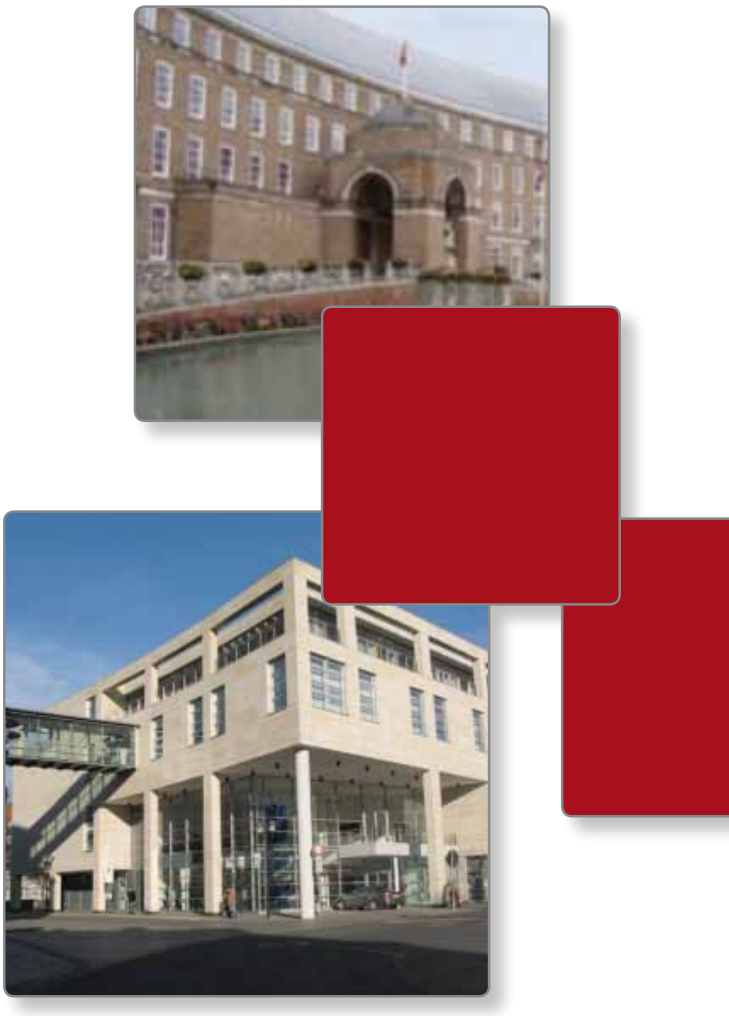
- Building professionals: Service users who have the job of managing energy in the building from city energy managers to caretakers.
- Staff building users: Building users who are employed to work in the building but are not building professionals.
- Visitor building users: Other individuals who are in the building, frequently or rarely, for long or short stays, from museum visitors to school pupils, crèche parents and hospital patients.

SMARTSPACES Energy Management Services

Energy Management Services comprise ICT-based systems able to directly switch, control and adjust a range of energy consuming systems and devices. Targets range from complete HVAC systems - heating, cooling and ventilation –, and lighting systems, to individual devices for thermal control and ventilation - vents, blinds, windows – and large individual consumers of electricity – elevators, escalators, servers, PCs and other ICT-infrastructure. Control of water users is included. The services include automatic control of locally generated renewable energy – primarily solar and wind – and facilities to avoid load peaks on electricity networks or adapt to time-of-day tariffs. User access may be extended to non-specialist staff, and EMS for legacy systems are included.

SMARTSPACES Energy Management Services can be further differentiated as follows:

- IP-centric energy management services supporting comprehensive building control using data from newly installed sensors and meters, mainly provided centrally
- Energy management services addressing automatic control of local generation using renewables, and enabling optimising response to peaks in demand by providing "peak shaving".



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SMARTSPACES
Approach and Methodology

To achieve the intended impacts, a toolkit of components must be assembled into effective and accepted Energy Decision Support Services (EDSS) and Energy Management Services (EMS). This is achieved through an appropriate series of steps from requirements analysis, use case definition, service specification, prototyping, functional tests, introduction, field testing and evaluation as detailed in the work plan.

Requirements analysis covers both building user requirements and organisational requirements. Preliminary plans are to use a variety of methods for eliciting building user requirements, to be fed into sets of use cases, taken forward into service modeling using notations which are based on standard notations but streamlined and adopted to the needs and capacity of the project participants in the pilot sites and specification-type descriptions.

The latter will include coherent descriptions against which implementation and test can take place and not strict specifications used in software development. Proceeding like this is regarded as an effective use of project capacity.

Prototypes for service components will be constructed based on these service specifications-type descriptions. These will be subjected to extensive functional testing with potential EDSS and EMS service users to select from open service options and finalise interface and presentation features.

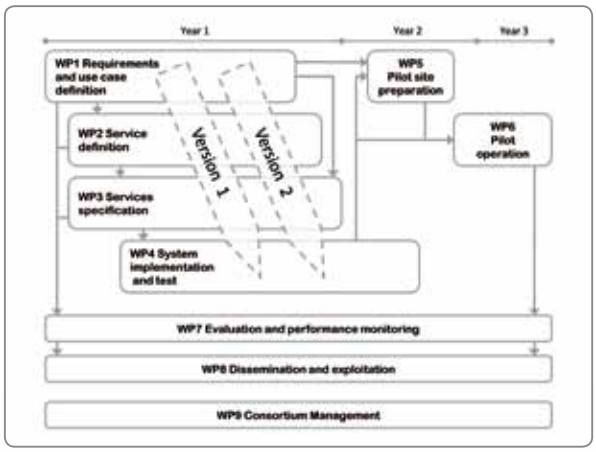
In the introduction phase, building users and building management staff will be instructed in the use of services or components which require their active access.

After introduction, pilot operation takes place under conditions as close as possible to those expected on full deployment. The evaluation programme is an important part of the project, with the goal of both summative and formative evaluation of the success of the various services provided.

The proposed services are fully scalable in that they require no centralised functions above the organisational level of a public authority. Services will be designed to scale up to all buildings of each public authority. Further scaling up is then a process of replication to further authorities.

Costs benefit analysis is addressed in business planning and viability assessment in the dissemination and exploitation work package of the project.

The specification of the new SMARTSPACES Service in the project is being driven primarily by the public authorities in the cities involved in the SMARTSPACES project as they expect to benefit directly and indirectly from these services.



The city authorities expect to benefit directly through reductions in the time they need to manage the heating plants and prepare renovation investment decisions.

The indirect effects are no less important and include the strong improvement of their economic situation through drastic energy consumption and cost reductions resulting from an optimised operation of the heating plants and electricity systems in their buildings which will be achieved through the use of the SMARTSPACES service.

SMARTSPACES Key Figures

The project started on 1 January 2012 and will last for three years. It will set up 11 pilot sites in 11 cities in 8 countries and be operated by 26 partners with an overall budget of almost 7 million Euro.

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SMARTSPACES Partners

The consortium, led by public authorities includes global ICT and service providers and distribution network operators working with local consultants and specialist advisors to carry out all steps in the project service implementation process supported by university partners and research institutes and coordinated by empirica an internationally active research and consulting firm from Bonn, Germany.