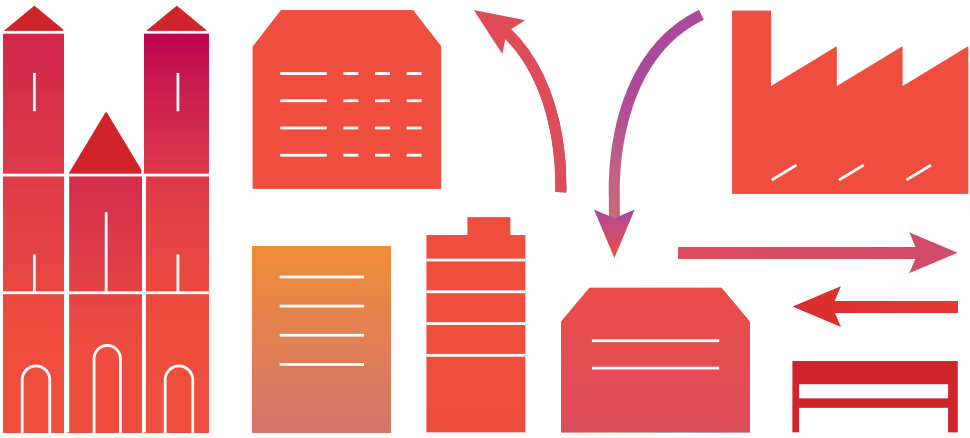
2016

EeB PPP Promising Technologies

Urban & District Scale Solutions



ENERGY EFFICIENT BUILDINGS

AN ECTP COMMITTEE FOR INNOVATIVE BUILT ENVIRONMENT

METHODOLOGY FOR BUILDING EVALUATION AND RESULTS COMPARISON

Standardized comparison of energy performances of complex buildings

The new replicable methodology developed by DIRECTION allows for the evaluation and comparison of the performance of different buildings, each of a considerable size, different construction, installation and boundary characteristics. The methodology uses a novel KPI (Key Performance Index) set, with the simulation model. The innovative approach overcomes the complexity of modeling and comparing the system behavior of large buildings, allowing a sound method to plan, manage and benchmark key energy performances.

The methodology was developed and successfully validated on a set of three new, large buildings located in different European regions. Although developed for use with new buildings, the methodology can also be utilized in the renovation and refurbishment of large existing buildings. The building performances addressed by the KPIs consider a wide variety of aspects regarding the whole building and its components, and are described in terms of energy efficiency and user comfort: building envelope, energy sources (renewables, district heating, etc.) heating and cooling systems, lighting, shading, ventilation, and humidity.

The target user is the planner, facility manager or investor, who needs standardized and quantitative parameters to make correct and reliable decisions. The KPI set can be used in connection with actual building design and simulation systems, and can be integrated in monitoring platforms. In particular, it is compatible with 2 other solutions developed by the DIRECTION project: novel integrated building design and management procedure and novel monitoring platform.

This methodology can therefore be integrated in the planning procedures of one or more buildings, or in a monitoring, benchmarking activity when managing a set of buildings using different systems and located in different climatic regions.

- **Easily regulate multiple buildings of different conditions, construction, internal systems and climatic regions**
- **Innovative calculation method**
- **Methodology open for replication**

- Technical completion: less than 1 year
- Can be used in new constructions
- Can be used in renovation/retrofitting
- Compatible with existing solutions

Project: Direction, Demonstration of very low energy new buildings
www.direction-fp7.eu

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DIRECTION
DEMONSTRATION OF VERY LOW ENERGY NEW BUILDINGS

INTERACTIVE MONITORING PLATFORM FOR COMPLEX ENERGY-EFFICIENT BUILDINGS

URBAN & DISTRICT SCALE SOLUTIONS

This interactive monitoring platform for complex, high performance buildings is a series of sensors installed in various parts of the building (envelope, heating and cooling systems, rooms, etc.), which gathers data and sends it to a central unit. The central unit elaborates the data in real time, according to a numerical model tailored to the building specific design, providing energy and user comfort performance of the building, interaction with BEMS (Building Energy Management Systems) to drive actuators and valves and change the building behavior to achieve optimum performances.

The technology is compatible with existing sensor systems and BEMS, and can be integrated in and interact with the control software of several building components manufacturers. It can be utilized in buildings of a considerable size and complexity, needing a control or monitoring system. The technology was successfully developed in three different climatic regions in Europe and is already being used in two of them. If combined with the other two technologies developed in the DIRECTION project, it gives these additional advantages: The "methodology of building evaluation and comparison" can provide standardized, comparable building performance KPIs and the technology "integrated process for the design and management of very low energy buildings" provides easy integration in the smart integrated design process. Combining these three technologies gives an improved control of the building performances, resulting in better correspondence between designed and real case performances.

- Adaptable to standard BEMS solutions
- Can be integrated in the control system/ software of the different system providers
- Allows performance comparison between buildings with different characteristics and climatic regions
- Technology open for replication

- Technical completion: less than 1 year
- Can be used in new constructions
- Can be used in renovation/retrofitting
- Compatible with existing solutions

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DIRECTION
DEMONSTRATION OF VERY LOW ENERGY NEW BUILDINGS

DEMS DISTRICT ENERGY MANAGEMENT SYSTEM

Urban & District Scale Solutions

The EPIC-HUB Demand Side Energy Management System (DEMS) is a middleware-enabled instrument to manage complex utility resources available in distributed and embedded energy schemes within a neighbourhood, campus or industrial complex. It is comprised of new software to enable the optimal generation and delivery of energy (electricity and heat) within a multivalent supply and multiple end-use district energy scheme. The product has been built using state-of-the-art open source components, semantic-based information models and open standard communication technologies. Key features include a user-friendly interface, scalable control functionality, and cross-platform operability. The middleware enables a strong communication capability between the field hardware (sensors and actuators) and the management layer (tools and cockpit). Its seamless integration into different types of hardware ensures the native communication protocols can be immediately made available to the higher levels in the system.

The target customers include district asset and energy managers and operators, dealing with multi-carrier energy assets, both in the public and private sector, requiring consultancy support services for environmental measures planning. The tool is intended to be used as a support for engineering services to provide major reductions in operating costs and environmental emissions. It has additional benefits via training of system operatives and designers in optimal configuration and running of such assets.

The DEMS will empower customers in deciding the most effective energy mix and operating strategies, while facilitating higher quality and effective consultancy and engineering services for the client. It will be able to provide better informed scheme designs for energy generation and storage both in terms of technology used and plant size, on the basis of energy and technology price and demand curves. Furthermore, due to the specific features of the energy cockpit, it will provide energy managers with additional assets to support the monitoring and informed decisions for real-time energy management.

- **Fully automated management of multiple and complex energy flows**
- **Monitoring capability for operational decision support**
- **Easy and scalable deployment into real systems**
- **Up to 30% reduction on overall energy bills can be achieved**

- Technical completion: less than 1 year
- Can be used in new constructions
- Can be used in renovation/retrofitting
- Compatible with existing solutions

Project: EPIC-HUB, Energy positive neighborhoods' infrastructure middleware based on the energy-hub concept
www.epichub.eu

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DECISION SUPPORT TOOL FOR RETROFITTING A DISTRICT

Towards the District as a Service

URB-Grade has developed an online Decision Support Platform that enables data collection, management, analysis and visualization. The aim is to enable decision making processes with respect to energy aspects in retrofit scenarios. The platform provides "District as a Service" (DaaS) features that enable the district to improve its actions towards energy efficiency, cost effectiveness and citizen comfort.

The platform features:

- **DaaS Profiling Module:** allows the end user to input particular characteristics of a district into a common data base. Characteristics include the consumer, type of consumer and installations – as a district profile based on a District Ontology. This also includes the measurable KPIs to monitor the district's energy efficiency.
- **DaaS Quantification Module:** enables the data acquisition from statistical, survey and real-time data; the processing of the data using CEP and structuring & storage of the data in a common format based on the District Ontology.
- **DaaS Analysis Module and Decision Support Dashboard** – allows the end user to analyse data from the quantification module and to visualise KPIs, as well as access the Prediction Module.
- **Prediction Module:** the module jointly with the Decision Support Dashboard enables the end user to define and forecast upgrade scenarios for the district and evaluate different scenarios to identify the most cost effective and beneficial solutions towards citizens.

Target users are city authorities planning and managing the energy footprint of districts and small towns, utilities as well as third parties considering energy footprint aspects. Demonstrations have been successfully carried out in:

- Eibar, Spain: Assessment of the Current Street Lighting Systems deployed in Eibar, support for deciding which actions in which city areas should be taken to reduce the consumption without compromising the quality of the service.
- Kalundborg, Denmark: Assessment of the use of consumption profiles of residential homes in Kalundborg, support for policy decisions to improve the energy efficiency and use of renewable energies for residents.
- Barcelona: Assessment of the street shops consuming profile in Barcelona, support for deciding which actions in which street shops should be taken to reduce the consumption without compromising the comfort.

- District data capturing, analysis, visualisation and assessment
- Transformation of district data into actionable knowledge
- Enable retrofitting scenarios and enhance energy footprint

Technical completion: less than 1 year
Can be used in renovation/retrofitting

Project: URB-GRADE, URB-grade decision support tool: towards the district as a service
www.urb-grade.eu

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URBGRADE

This technology brochure highlights the highly promising innovations from selected co-funded European projects under the 7th Framework Program (FP7).

The Energy-Efficient Buildings (EeB) Public Private Partnership (PPP) is a joint initiative of the European Commission (EC) and the Energy Efficient Buildings Committee of the European Construction Technology Platform (ECTP).

This initiative aims at promoting research on new methods and technologies to reduce the energy footprint and CO2 emissions related to new and retrofitted buildings across Europe.

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ECTP
INNOVATIVE BUILT ENVIRONMENT

European Commission