Sustainable Places 2016

Paper Proceedings

A CONFERENCE CO-ORGANISED BY THE RESILIENT AND PERFORMER PROJECTS UNDER THE AEGIS OF THE EUROPEAN COMMISSION

(With support of Nobatek and Université de Pau et du Pays de l'Adour)

RESILIENT

www.resilient-project.eu

PERFORMER

Nobatek

UNIVERSITÉ DE PAU ET DES PAYS DE L'ADOUR

SUSTAINABLE PLACES 2016

June 29-July 1, 2016
Anglet, France

Copyright Information

FORWARD

The 4th Sustainable Places International Conference 2016 (SP’16) was hosted by NOBATEK in the historic Basque Country. Special thanks goes to UPPA as well, and the city of Anglet for their gracious hospitality.

The conference program & paper proceedings are intended to stimulate networking linkages in the form of new business and inter-project collaboration opportunities. It was also a deliberate push to bridge the EeB and smart grid sectors, as we know that you can’t have one without the other in the connected cities we all seek to co-create. In fact, one of the SP’16 attendees stated in the post-event survey, “*I was positively surprised how much was about energy...*” SP’16 was proud to be an EU Sustainable Energy Week (EUSEW) official day, and is very much looking forward to continuing to strengthen the SP community objectives and foster the connections between the building & energy sectors in 2017 at the brand new University Teesside facilities in Middlesboro, UK!!

Sincerely,

Zia Lennard & Sylvain Robert

SUSTAINABLE ENERGY WEEK
13-17 June 2016

SP'16 Paper Proceedings Table of Contents

SP'16 IS WARMLY WELCOMED TO THE HISTORIC BASQUE COUNTRY

This year, the SP'16 event included 10 thematic sessions, 13 workshops, 6 scientific posters displayed, 2 special sessions, networking opportunities, and visits of local pilot sites for demonstrating innovative technologies being implemented. About 150 delegates, coming from Europe and other parts of the world attended the event.

SP’16 Event Overview

CONFERENCE TRACKS

Ten conference tracks at SP’16 comprised presentations on various projects & Entrepreneurship & Sustainability Issues journal papers.

WORKSHOPS

Thirteen workshops at SP’16, which brought together experts from more than thirty-five European projects across varying subject matters .

SPECIAL SESSIONS

Two special sessions at SP’16, a final event by the RESILIENT project and a private meeting by the PERFORMER project.

POSTERS

Six scientific posters displayed at SP’16, they are described in the paper proceedings and displayed on the Sustainable Places website.

VISITS

DFour demonstrative pilot site visits on day 3 of SP’16, showcasing local initiatives and interesting novel technologies.

NETWORKING

Several networking opportunities at SP’16, including but not limited to lunches & dinners, and a farewell drink to close the event.

KEYNOTES

The opening ceremony of SP'16 included a group of gentlemen that together are bringing technological R&D advancements to both students and industry simultaneously. Germain's extended introduction is available for download on the SP website, and is summarized on page 12 of the current proceedings. The organization committee is grateful for the warm words delivered at the SP'16 commencement from the following people:

Jac Tortos

CEO, Nobatek

Claude Olive

Mayor of Anglet, FR

Germain Adell

R&D Dir., Nobatek

Christian La Borderie

UPPA

Opening Keynotes

Closing Keynotes

Introductions from the Hosts

Jac Tortos, Centre Technologique

NOBATEK

Christian La Borderie

UPPA

Claude Olive

Ville Anglet

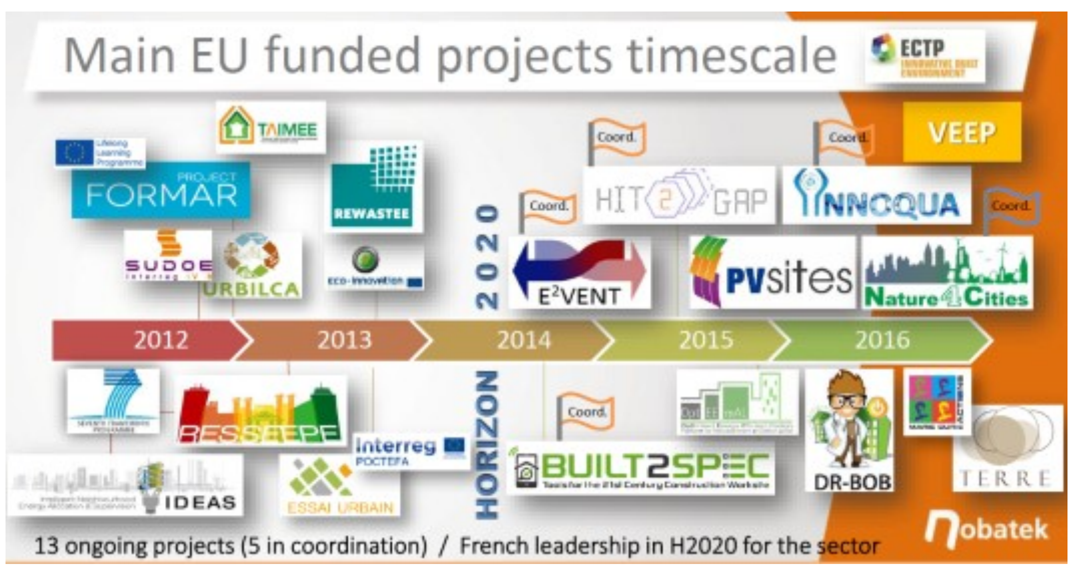

ITACA

Germain Adell, Dir Research, Nobatek

Germain Adell, Nobatek - Germain Adell is the Head of EU funded R&D Programmes and Innovation at NOBATEK-INEF4, a French RTO specialised in sustainable construction, architecture and urban planning. In recent years under his lead, NOBATEK has consistently gained momentum as innovative research performer and open innovation forerunner in the construction sector in France and in the European Energy efficient Buildings Public-Private Partnership.

NOBATEK has been N°1 French player in the EeB PPP in 2014 and 2015 in terms of R&D funding awarded. With an architecture and urban planning background, Germain's former commissions in the last 25 years include R&D and teaching at several international academic institutions in Argentina, France, Spain and the UK and consultancy work for several top EU institutions like the French Built Environment Office, the DPU – University College London and Barcelona School of Architecture, on international architectural and urban planning projects and events.

He is technical and innovation advisor on several regional, national and international collaborative initiatives and coordinates BUILT2SPEC and INNOQUA Horizon 2020 projects. He has recently been elected Member of the Steering Committee of the European Construction Technology Platform (ECTP).



Nobatek

NOBATEK is a certified Technological Resource Centre that certifies the ability to respond professionally to the needs and financial support of SMEs from research through the tax credits. With activities ranging from applied research to innovative services in the fields of sustainable planning and construction, NOBATEK works with companies of the building and public works, materials producers, manufacturers , public or private building owners, developers, architects, engineering firms and communities. NOBATEK has significant presence in Aquitaine and on the whole national French territory, but has also been widely revered in European markets for technology transfer, and occasionally in Latin America, North America or China as well. NOBATEK is also the initiator and national operator of the Institute for Energy Transition INEF4. Pictured below is the Anglet headquarters & façade test-bench.

Etienne Wurtz, Scientific Director, CEA INES

Prof. Etienne Wurtz is Scientific Director at CEA INES and the leader of the Building Energy research program at CEA Tech, the 4500-staff department for Technology Research in CEA, a leading Research and Technology Organisation in Europe. Etienne began his career as lecturer at the university of La Rochelle, with a research focus on building energy simulation tools. He then moved to CNRS (French National research centre) where he became research director and the leader of a department about Near Zero-Energy Buildings, before joining CEA. Etienne has a passion for and an extensive research record in passive solar technologies, innovative industrial construction products, thermal inertia innovative strategies, storage systems and, integrated building concept.

The key role of Large Research Infrastructures in European innovation: Illustration with the CEA INES facilities and Building Energy Efficiency."

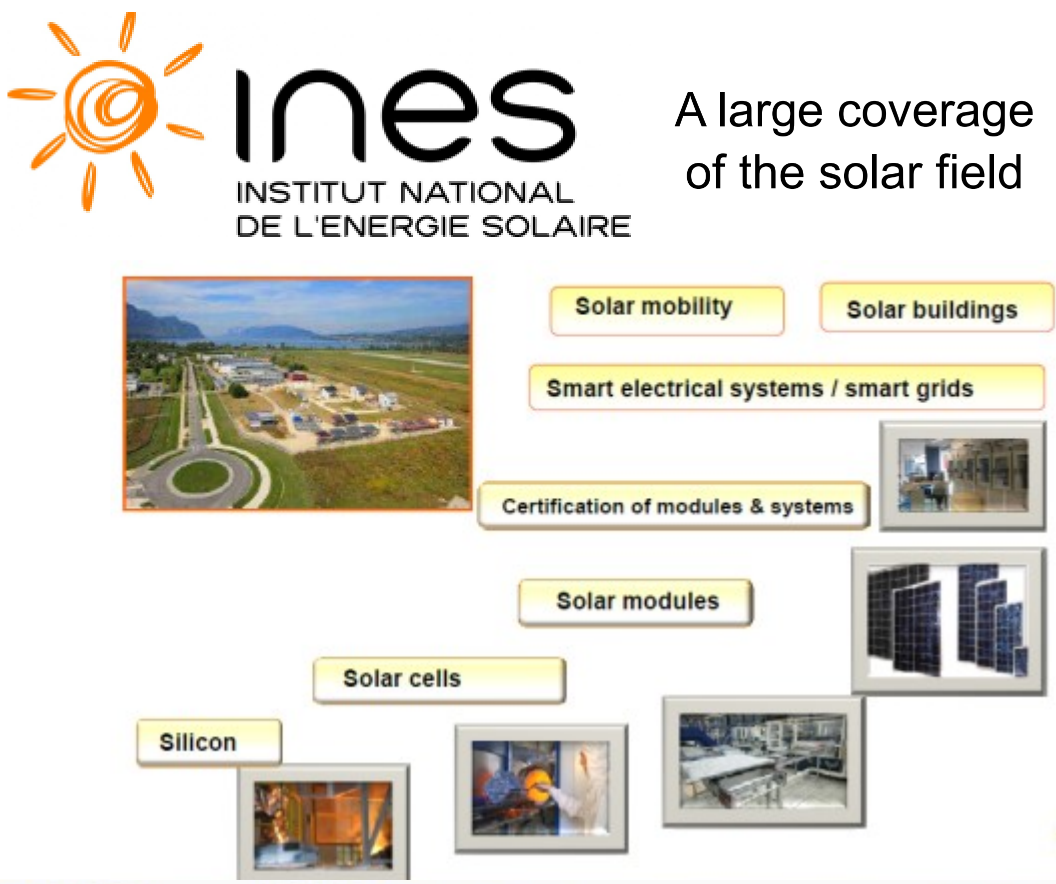
Etienne's keynote at SP'16 illustrated a vision for the medium and long-term strategy for European research on Building Energy Efficiency (and, by extension, on Energy matters) with a particular focus on the role of Large Research Infrastructures (LRI). Large Research Infrastructures are unique tools which provide unique services to researchers in order to deploy, test and validate innovations at a representative scale and at optimal costs.

They are recognized by funding authorities (the EC at first) as essential components of technology innovation and maturation. As technology research leader, CEA has made significant investments in LRI, which translate into the creation of a network of facility-scale experiments, of which INES facilities (located in Chambéry, French Alp mountains) are the main component. Drawing on his extensive background and field experience, Etienne will highlight the key role of LRI in Energy research, emphasizing their contribution to bridging the Technology Readiness Level (TRL) so-called "death valley". For illustration purposes, the presentation will particularly focus on the example of the INES experimental facilities and their unique combination of experimental and demonstration buildings, renewable energy production, storage and distribution. The various way INES facilities have been leveraged for technology innovation assessment, specifically in the building energy area, will be described through targeted examples drawn from past and on-going EU research projects.

CEA INES

The idea of a National Institute of Solar Energy was formed in 1998 from the will of elected officials, including Michel Barnier and Jean-Pierre Vial, create a reference center in the solar field. The initiation of INES since 2005 resulted from the convergence of four key factors: the unwavering will of the elected (Savoy and the Rhône-Alpes Region), the expertise of associations with the past twenty years, the ASDER unique work, the historical presence of industrial pioneers in the industry (Clipsol, Photowatt …), and the investment of large research laboratories, the first of which the CEA, CNRS and the University of Savoie. All INES partners are today united in its Steering Committee which is responsible for governance and is co-chaired the two communities.

The INES Training & Evaluation Platform provides a complete range of training Inter and Intra -company, on solar thermal, photovoltaics and energy of the building in relation to the industrial sector and research.The platform also performs followed by performance of solar installations and buildings , and offers its expertise to industry professionals . Since July 2012, the Companions of the Solar merged with the INES to expand its training offer and consolidate its educational and technological means.



Nashwan Daewood, Dir. Technology Futures Institute, Teesside University

Nashan Daewood is currently the Director of Technology Futures Institute with the responsibility of strategically developing and promoting research and enterprise at the School of Science Engineering. Nash has more than 200 papers publications and has generated more than 6 million UK pounds to funding.

Nashwan's research topics research include engineering sustainability, Building Information Modeling, Information Technologies and Systems (4D,VR,Integrated databases), planning and management of off-site production, risk management, intelligent decision support systems, cost forecasting and control and business processes.

Nashwan's Recent Publications

Real-time visualisation applications for energy awareness and demand response in built environment, 15th International Conference on Construction Applications of Virtual Reality, Banff, Alberta, Canada, Oct 5 - 7Dawood, M. (Muneeb); Short, M. (Michael); Dawood, N. (Nashwan)

Digitizing the construction sector: The role of ICT in prompting construction effi ciency and effectiveness, 15th International Conference on Construction Applications of Virtual Reality, Banff, Alberta, Canada, Oct 5 - 7Dawood, N. (Nashwan)

A framework to support owner's asset information requirements throughout the life cycle of buildings, 15th International Conference on Construction Applications of Virtual Re ality, Banff, Alberta, Canada, Oct 5 - 7, Patacas, J. (João); Dawood, N. (Nashwan); Kassem, M. (Mohamad)

Technology Futures Institute, Teesside University

Research themes

Research within TFI is organised into three main interrelated themes:

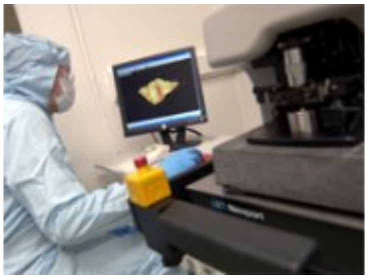
- Engineering sustainability - focuses on the sustainability of the built environment with particular emphasis on the use of information and communication technology for building information management and modelling and for visualisation of construction processes.
- Manufacturing and process engineering there are two key elements - firstly, development of bespoke, advanced and functional materials for specific industrial applications and secondly, the use of micro and nanomanufacturing to create devices that have high density and enhanced functionality.

- Measurement and control systems - activity centres on the applications of intelligent algorithms in systems control, advanced chemical analysis technologies, and process flow measurement in challenging environments.

The Technology Futures Institute is an international leader in key areas of research and innovation related to engineering sustainability, manufacturing and process engineering and analytical instrumentation, measurement and control engineering. In REF 2014, 59% of our research in general engineering was recognised as world-leading and internationally excellent with 90% of the impact submission rated as outstanding/very considerable.

Collaboration

The Institute's vision and strategy is to develop internationally leading applications focused research. We have a long tradition of applied, collaborative research working with industrial partners. The Tees Valley is a major centre for the chemical and process industries, with an innovative industrial base and companies are actively involved in developing future technologies such as clean manufacture, biotechnology, biofuels, hydrogen technologies and printable electronics. The Institute has strong, active research links with ABB, SABIC, Johnson Matthey and Lucite International, members of one of the EU's largest manufacturing hubs based in the Tees Valley.



As well as developing applications-focused new knowledge and technologies, the Institute provides a wide range of services through its strong, long-standing relationships with public and private sector organisations. Collaborators and partners include some of the world's leading companies and research organisations such as Rolls-Royce, IBM, Qatar Project Management, HOCHTIEF-Vicon and Ramboll and universities and research institutes such as Sheffield, Manchester, Oxford, VTT Finland, Tokyo. The Institute has been particularly successful in exploiting knowledge and technology transfer mechanisms, including knowledge transfer partnerships and supporting start up and spin out companies as a route to securing impact.

Michael Steifman, CEO, Utilisave

In 1992, Michael Steifman founded UtiliSave seeking to educate clients on their energy use, uncover billing errors, and develop trustworthy relationships to identify cost saving opportunities. In the 25 years since, UtiliSave has grown to an industry leader, driven towards assisting clients who seek to rectify utility billing issues, recover and optimize their utility costs. With a staff of experienced professionals, Michael has developed proprietary technology used to capture, parse, scrub, and analyze massive amounts of utility billing data into meaningful information, imperative for a successful audit. Collecting, making meaningful use of, measuring, and monitoring this data has allowed Michael and his team to further expand UtiliSave's business into a wide range of products and services related to energy efficiency, procurement, benchmarking, and consumption optimization.

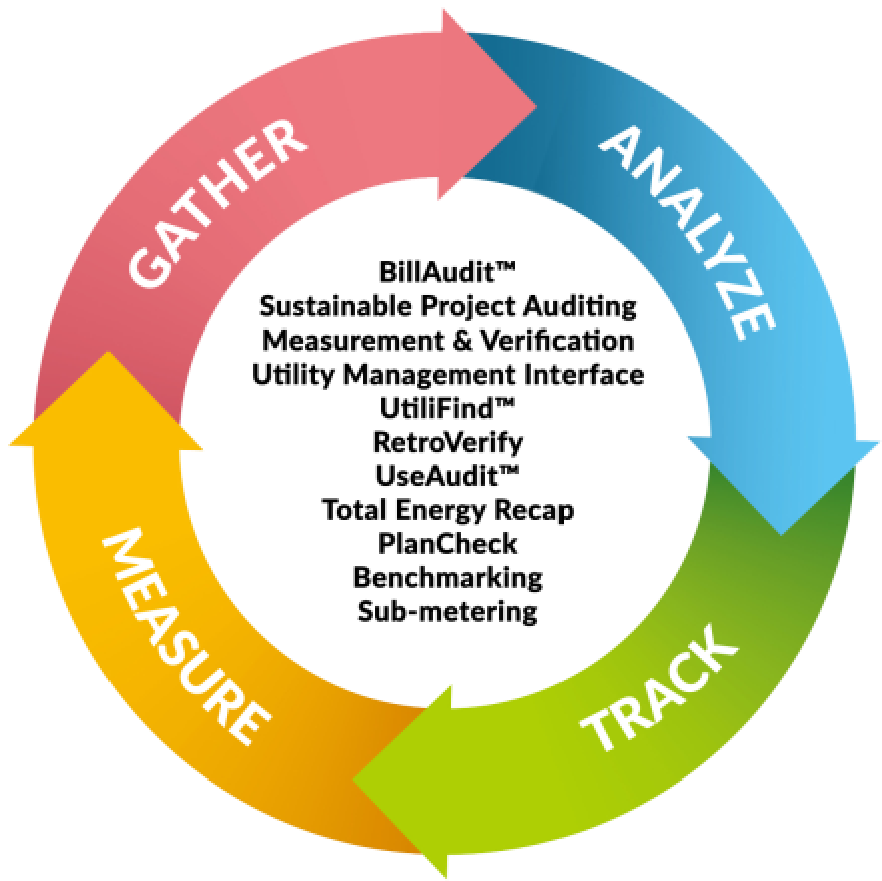
Michael's SP'16 keynote address demonstrated how UtiliSave is building on its years of experience as a foremost forensic utility bill auditing firm to provide a wider range of related services, evolving into a Total Utility Management Partner. One of the many interesting highlights of Michael's speech was when he took the audience through several case studies that exemplify just how Utilisave approaches big data optimization in the energy sector.

EIGHT MISSION CRITICAL GOALS OF UTILITY DATA:

1. Data Validation
2. Billing Validation
3. Revenue Enhancement
4. Measurement & Verification
5. Benchmarking
6. Finding Inefficient Use
7. Matching Data to Efficiency Project Opportunities
8. Client Engagement

Utilisave

UtiliSave, a total utility data management partner with unparalleled technology, is a US-based premier forensic Utility and Energy Bill Auditing Firm specialising in finding substantial savings in commercial utility bills. “*Data optimisation is mission critical to your businesses bottom line. Leveraging our proprietary platform, UtiliSave gathers your utility data; analyses your utility data to identity cost savings opportunities and improved efficiencies; advocates for our clients securing significant refunds for your organisation; provides in-depth guidance and analysis; and then tracks your utility data for continued verifications of value and benefits. All this to provide your enterprise with significant cost reductions and enhanced operations – which is mission critical to your success.*“



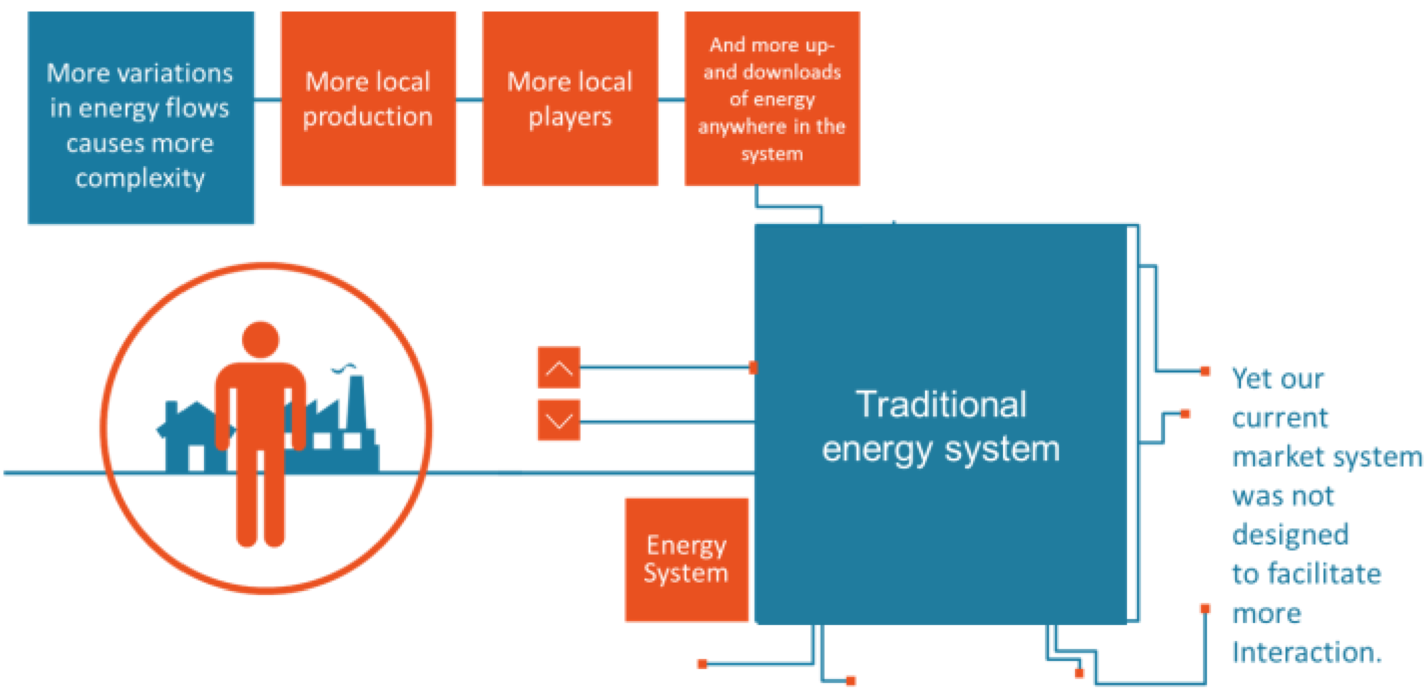
UtiliSave®

INFO.INSIGHTS.INCOME.

Marijn DeKoning, USEF

Marijn de Koning works as a Product Developer for [Powerhouse, an RWE-Essent subsidiary](). The Powerhouse platform enables businesses to valorize their flexibility in supply and demand by providing access to the energy markets. Previously he has held a variety of functions within Essent, the Dutch supplier that has been playing a leading role in the exploration of effective aggregation roles. With a thorough technical understanding as well as experience in both the regulatory and commercial domain, Marijn has become a renowned member of the USEF design team, representing USEF foundation at key industrial events and task forces. This was the role Marijn played at SP'16, shining light on the relationships between smart grids & EeB.

Marijn's SP'16 keynote address was entited, "Unlocking the value of energy flexibility" and it introduced the USEF interaction process models, communication protocols and even exemplary coding to accelerate software development.

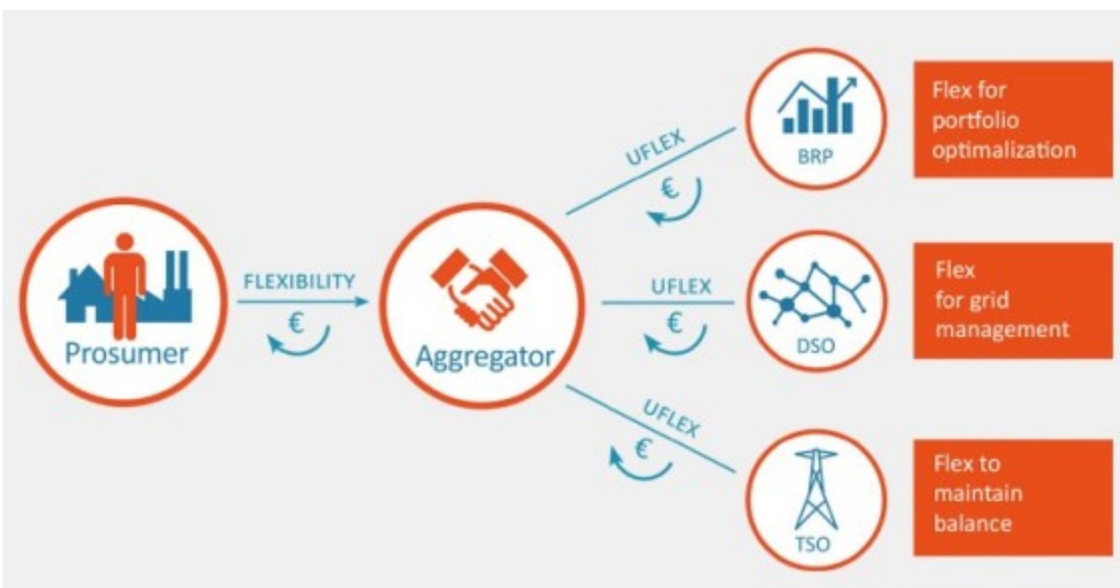


USEF

(Universal Smart Energy Framework)

USEF (Universal Smart Energy Framework) aligns the trading of consumer flexibility with existing wholesale market models. By extending standard key processes to include usage prognoses for individual consumers, USEF fits on top of most market models. USEF builds on what exists, rather than requiring a whole new market design.

By delivering a common standard on which to build smart energy implementations, USEF connects people, technologies, projects and energy markets. It is the basis for an integrated smart energy future that is both efficient and cost-effective. The framework defines each stakeholder role in the energy market, how they interact and how they can benefit by doing so. With existing detailed specifications and real-life pilots in the market, USEF is perhaps the most comprehensive, advanced initiative of its kind.

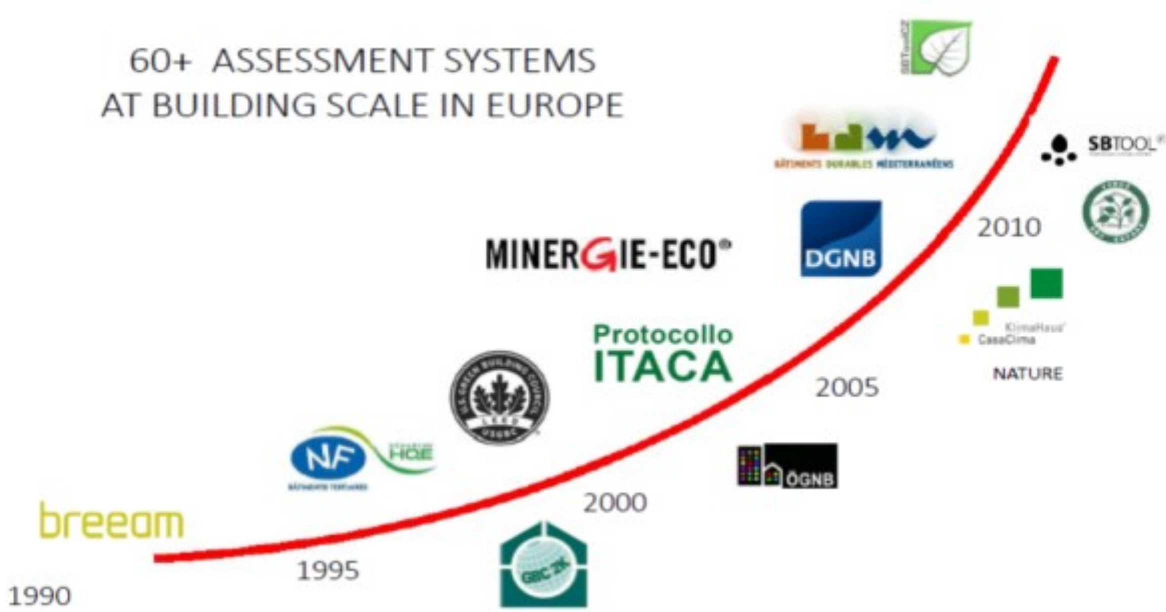


USEF

Andrea Moro, iiSBE ITALIA

Andrea Moro is an architect and researcher in the field of sustainable building at national and international level since 1996. He's the scientific referent of ITACA (Federal Association of Italian Regions) for the development and management of the national assessment system Protocollo ITACA (UNI PdR13). He's Past president (2007-2011) of the no profit organization iiSBE (international initiative for a Sustainable Built Environment) and since 2005 he's the President of the national Chapter iiSBE Italia. He carries out research activities for public organizations (regions and cities) in the field of sustainability assessment of buildings and neighborhoods. He's Vice-President of the CESBA international association (Common European Sustainable Built Environment Assessment).

Andrea's SP'16 keynote address was entitled, "INCREASING THE IMPACT OF POLICIES: THE ROLE OF SUSTAINABLE BUILT ENVIRONMENT ASSESSMENT SYSTEMS" where he explained how the ITACA protocol has become a common assessment framework for green building assessment and how it's currently being leverages at district scale.



iiSBE Italia

(International Initiative for a Sustainable Building Environments)

iiSBE Italy is a non – profit organisation aimed at disseminating policies, methodologies and tools for the promotion of a sustainable built environment. The association is a branch of international iiSBE and shares the same purposes.

The main objectives of the association are:

- disseminate the principles and practice of sustainable construction;
- encouraging research and developing innovative ;
- undertake activities to promote the recognition of buildings with high environmental performance;
- act as an information center for the different stakeholders;
- promote initiatives in the field of training and retraining.

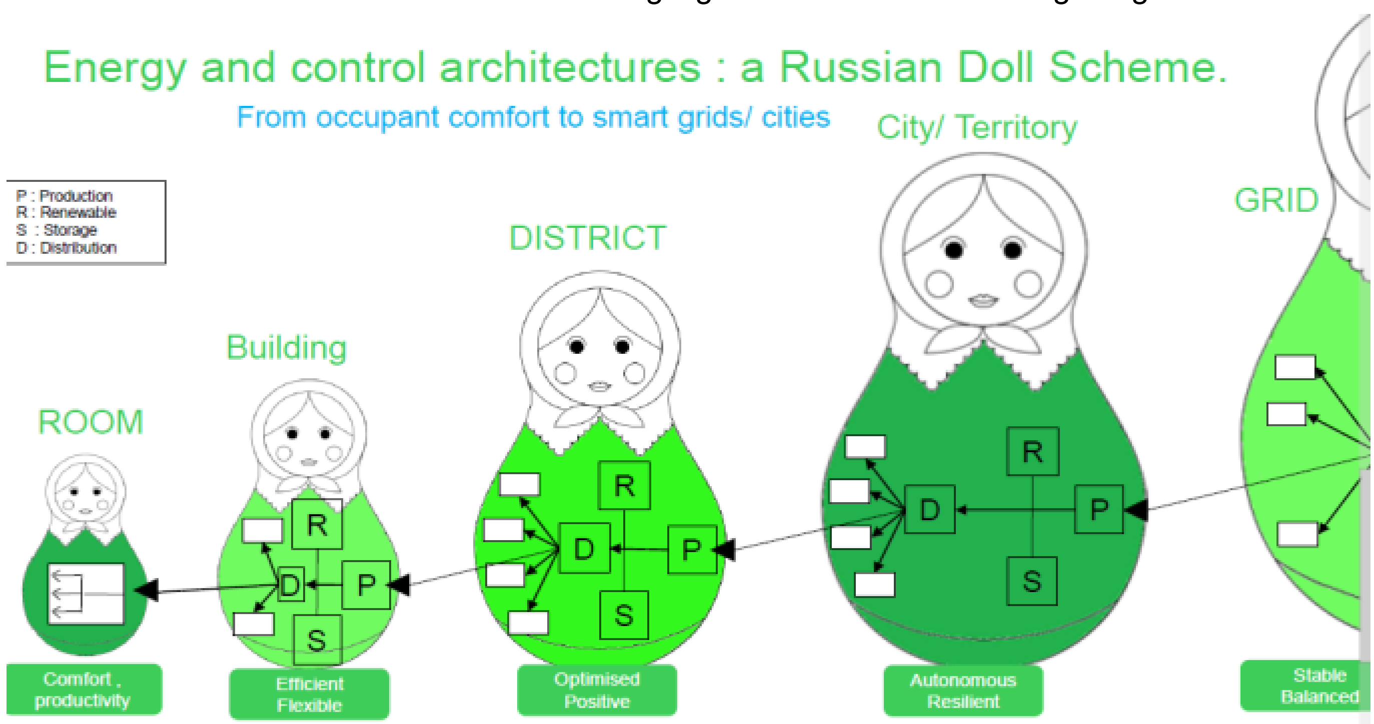
iiSBE helps specialists and generalists to get to know each others' abilities and needs. This occurs formally through databases and newsletters., and informally through every-day e-mails. In 2008, iiSBE was retained to develop a common assessment system for the SB Alliance, a grouping of primarily European assessment and certification-oriented organizations. The work has involved the consulting services of iiSBE experts from Spain, Italy, USA and France, and the first phase was completed in December, 2008.

The Sustainable Building Information System (SBIS) is a multi-language, web-based database of international R&D information relating to sustainable building. The system is attracting users from around the world - see <www.sbis.info>;. Finally, iiSBE has established a web-based database called the Skills Registry, which features a searchable file of the skills and experience of individuals and organizations who are iiSBE members. Anyone can browse the Skills Registry at <www.iskr.net>

Olivier Cottet, Schneider Electric

Mr. Olivier Cottet is the marketing manager for the market of the building at Schneider France, Olivier Cottet, 45 years old, has been appointed president of the Europtibat association. Former student of the Institute of electricians from Grenoble, Olivier Cottet has comencé career in the sector of automation of the building within the Merlin-Gerin company in 1981. In 1995, he joined the strategic Division France of the Schneider group marketing department, supports offer low voltage, before being appointed in 1998, marketing manager of the building for Schneider France market. Appointed president of the association for three years, Olivier Cottet wish "strengthen the dynamic fort current Association by expanding its audience in the professional circles and by promoting the development of the service offerings of exploitation maintenance around its product repository.

Olivier's SP'16 keynote address was entitled, "Energy landscapes: introduction to ENERNET roundtable" where one of the highlights included the following image:



Schneider Electric

Schneider Electric develops connected technologies and solutions to manage energy and process in ways that are safe, reliable, efficient and sustainable. The Group invests in R&D in order to sustain innovation and differentiation, with a strong commitment to sustainable development.

Schneider Electric is responding to today's megatrends in six strategic ways:

Responsible, sustainable growth

Digital transformation of customers

Creating new opportunites

Improved productivity and precision

Expanded presence in new economies

Energy efficiency everywhere

SP'16 CONFERENCE TRACKS 1-5

SP’16 CONFERENCE TRACKS 6-10

TRACK 1:

DATA-DRIVEN DESIGN, TOOLS, AND POLICIES FOR SMART BUILT ENVIRONMENTS

Chaired by:

Aurelien Henon, Nobatek

T.1: DATA-DRIVEN DESIGN, TOOLS, AND POLICIES FOR SMART BUILT ENVIRONMENTS

Contributing Authors

SUSTAINABLE PLACES 2016
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“Data-driven development in the smart city: Generative design for refugees camps in Luxembourg” (LIST)

Authors

Elie Daher, Arch. He studied Architecture in Lebanon, (he is graduated from the Institute of Fine-Arts, department of Architecture, Lebanese University, Tripoli, Lebanon, in 2009). After four years of experience acquired in well recognized construction projects in several countries, he pursued the Master of “Global Design, specialty Architecture, Modelling and Environment” at the “Ecole Nationale Supérieure d'Architecture” of Nancy, France in 2014). Since February 2015, Elie Daher is a R&D engineer at LIST. His applied works are covering the design computing, BIM processes, BIM management, BIM implementation, 3D coordination, 4D BIM simulation, parametric architectural modelling and optimisation.

Sylvain Kubicki, Dr. Arch. He studied Architecture in France and Switzerland. He was graduated from the Architecture School of Nancy, France, in 2003. He got a PhD in Architecture Science, with a thesis entitled “Assisting flexible coordination in building construction activity. A model-driven approach to design cooperation context visualization tools”. He is now Senior Research and Technology Associate at Luxembourg Institute of Science and Tehnology, working on Building Information Modeling and construction technologies, both through research projects and consultancy services.

Annie Guerriero, Dr. Arch. She is a senior research engineer at the Luxembourg Institute of Science and Technology (LIST, Luxembourg) where she workds since 2005. She is an architect graduated from the Victor Horta Institute (Brussels, 2001) and she performed a master in “Modelling and simulation of built spaces” (Henri Poincaré University, Nancy) in 2002. She obtained her PhD in April 2009 in Architecture Science at the INPL (Institut National Polytechnique de Lorraine). Her thesis, entitled “Representation of trust in the collective activity. Application to the coordination of the building construction activity ”, suggests a new approach for coordinating the AEC (Architecture, Engineering and Construction) activity based on trust assessment and multi-visualisation. This work received a distinction by the Academy of Architecture (France) in 2010. Currently, her research works is led at the LIST in the field of Building Information Modeling, smart systems and collective decision-making support dedicated to the construction sector.

"Data-driven development in the smart city" (LIST)

Innovation

This paper describes a research work carried out to investigate the potential application of computational design to assist humanitarian activities. The output of this research consists of a prototype capable of generating a village of parametric containers from data requirements (e.g. regulations, technical constraints). It enables new capacities of intervention in post-disaster situations answering in fast way problems that occur by creating new methods for humanitarian sheltering. The originality of the proposed idea relies on the innovative capacities of intervention in urban planning based on generative design for more responsiveness and efficiency. The parametric approach proposed should help in (1) enhancing the quality and reducing the time needed for the planning, especially in the initial steps, (2) enabling a smooth collaboration and information exchanges between different stakeholders, (3) allowing non-experts to contribute to the development of urban planning, through the rapid 3D visualization, and (4) providing a generative decision-support computer system based on computable parameters. This approach contributes to the resilience of cities and territories facing the problem of migrant flows.

Paper Abstract

This work investigates the potential application of computational design to assist humanitarian activities. It explores the capacity of parametric modeling to assist the development of containers' villages for refugees, in order to help architects, humanitarian people and policy makers in the strategic planning and decision-making. It starts with developing a design process for the container village. This process is based on the optimization of the spatial layout related to expected usages, taking into account contextual constraints (e.g. site accessibility, orientation, etc.) and numerical constraints (e.g. containers dimensions or number of received migrants, etc.). The result is a prototype of parametric containers' village. This prototype based on generative design computerizes the constraints and part of the design process related to refugees' camps. This approach improves the resilience of cities facing to the problem of migrants flux. The current prototype presents some limits. The research focuses on the identification of parameters for modeling a prototype shelter and a layout of a camp. Aspects related to construction materials and costs are not considered in the implementation, at the moment. The originality of the proposed idea relies on the innovative capacities of intervention in the urban planning based on generative design for more responsiveness and efficiency. The parametric approach proposed should help in (1) enhancing the quality and reducing the time needed for the planning, especially in the initial steps, (2) enabling a smooth collaboration and information exchanges between different stakeholders, (3) allowing non-experts to contribute to the development of urban planning, through the rapid 3D visualization, and (4) providing a generative decision-support computer system based on computable parameters.

“Low-carbon heating & cooling for non-domestic buildings in UK: drivers, challenges, and energy policies” (BSRIA, Ltd.)

Author

Miss Divya Deepankar, BSRIA Ltd., United Kingdom Short bio:

Divya is a Civil Engineer from India and a fresh graduate with MSc in Environmental Change and Management from the University of Oxford. I am currently working as a Research Engineer in the Sustainable Construction Group at BSRIA Ltd., UK where I focus on the European Research Projects. This involves engaging with the partners to deliver the work package deliverables, report content writing, and engaging with dissemination activities.

Innovation

This presentation critically examines the drivers, issues and challenges related to adopting low carbon heating and cooling systems in the non-domestic building sector in the UK. The potential impact of the energy related regulatory policies like ESOS (Energy Savings Opportunities Scheme), MEES (Minimum Energy Efficiency Standards), and NZEB (Nearly Zero Energy Buildings) on employing low carbon technologies is assessed, and based on the industry opinion, recommendations are provided on how to make these policies more effective.

T.1: DATA-DRIVEN DESIGN, TOOLS, AND POLICIES FOR SMART BUILT ENVIRONMENTS

"Low-carbon heating & cooling" (BSRIA, Ltd.)

BSRIA

Presentation Abstract

"Heat alone is responsible for about one-third of the UK's greenhouse gas emissions; hence in order to meet the carbon-emission reduction targets, it is essential to consider low carbon heating and cooling systems in buildings. In line with this, the UK government initiated a new policy development project focused on decarbonisation of heating and cooling in non-domestic buildings which aims to achieve the target of zero-carbon emissions from heating and cooling in buildings by 2050.

This presentation examines the drivers, issues and challenges related to adopting low carbon heating and cooling systems in the non-domestic building sector. The potential impact of the energy related regulatory policies like ESOS (Energy Savings Opportunities Scheme), MEES (Minimum Energy Efficiency Standards), and NZEB (Nearly Zero Energy Buildings) on employing low carbon technologies is assessed, and recommendations are provided on how to make these policies more effective. Information has been gathered through literature search, research and consultation with BSRIA's experts, surveys and discussions with industry experts on the uncertainties, potential issues, and evidence gaps.

This study identified that although a number of studies, initiatives, policies and standards relevant to low carbon heating and cooling technologies exist, there is a lack of evidence on the effectiveness of employing them in real projects, both in terms of their environmental and financial benefits. The study highlighted that the high initial cost of low-carbon technologies with difficulties in evaluation of their effectiveness are major deterrents to their use. Currently, there is little incentive for companies to consider low carbon heating and cooling technologies in their projects and the primary drivers for using these technologies in the UK, are regulatory requirements of Part L, BREEAM (Building Research Establishment Environmental Assessment Methodology) credits and planning requirements.

With regard to the NZEB, a clear definition for "Nearly" is needed to determine the level of ambition for such buildings in terms of energy consumption and/or CO2 emissions, in order to set the principles and test such principles on reference buildings. To make MEES more effective, guidance and case studies are needed to support landlord's decisions for improvement measures. There are a growing number of energy-related policies like ESOS, Climate Reduction Commitment (CRC), Climate Change Levy (CCL) and Mandatory GHG (Greenhouse Gas) reporting that can be more effective if combined to create one overarching scheme closely aligned with ESOS.

TRACK 2:

D-RES MONITORING & CONTROL

Chaired by:

Juan Manuel Espeche, R2M Solution

SUSTAINABLE PLACES 2016 June 29-July 1, 2016 Anglet, France

RESILIENT www.resilient-project.eu

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Mas²tering

Use Cases and Business Opportunities of Multi- Agent System (MAS) ICT Solutions for LV Flexibility Management” (MAS2TERING) 38

Thermoeconomonic Analysis and Monitoring Campaign of the Savona Campus Smart Polygeneration Microgrid” (RESILIENT)

Authors

Stefano Barberis, University of Genova, Italy

Stefano Barberis was born in Genoa in 1988. He obtained his PhD with a thesis titlet “Polygenerative District and Integration with Energy Storage System”. He joined TPG as PhD student in 2013 and he carries out research about renewable energy, smart grids and energy district collaborating to RESILIENT project.

Stefano Barberis, University of Genova, Italy

Alberto Traverso has been Scientific Responsible for the University of Genoa of more than 1Meuro research projects, including EU funded projects (Energy-Hub, RESILIENT, Bio-HyPP), International projects (National Energy Technology Laboratory, USA), National projects (Regional Council), private company research (Ansaldo Energia, D’Appolonia, Techcom, etc.).

Innovation

The monitoring activities of two seasons of one of the most innovative polygenerative test pilot in Europe. The integration of heat pump to exploit thermal energy storage to store electricity too.

T.2: D-RES MONITORING & CONTROL

"Smart Polygeneration Microgrid" (RESILIENT)

Paper Abstract

"The Savona Campus Smart Polygeneration Microgrid is one of the most relevant European test bench for the study of smart grids, polygeneration and distributed generation technologies such as CHP units and their combination with energy storage. It is one of the three FP7-RESILIENT Project demosites. The SPM plant is made up by (i) two auxiliary boilers (500kWth each), (ii) four micro gas turbines (30kWe, 2x65kWe and 100kWe), (iii) an internal combustion engine fed by natural gas (20kWe), (iv) an absorption chiller (100 kWf) and (v) PV panels for a total power installed of 100 kWe. Generators are "distributed" around the campus and they are coupled to electrical and thermal storages. Since the system is constituted by co-generative prime movers it can supply both electrical and thermal energy of the campus and the integration of storage is really important in order to follow both the requests, pursuing the best management strategy. The Savona Campus SPM was inaugurated in March 2014 and in this paper the experimental activities led within the FP7 RESILIENT project are presented, describing the Distributed Energy Management Systems (DEMS) which control the grid and how this software decided to manage the SPM generators in order to supply heat, cooling and power to the University Campus during two complete winter heating seasons (2014-2015 and 2015-2016) and a two summer seasons (2014 and 2015). Starting from a previous research about the role of energy storage in the management of the grid, the possible replacement of one of the already installed boilers with an Air-to-Water Heat Pump is investigated in order to maximize the exploitation of thermal storage in the heat and power supply of the grid. The analysis of this smart-grid is performed exploiting a software developed by the Author's research group, which allows for the thermo-economic optimization of poly-generative energy systems. A model of the real plant was built and it was implemented in the software. The off-design curves of the real devices installed in the campus were used in order to increase the reliability of the simulation results. The grid was simulated considering the time dependent nature of the demands throughout the whole year. The model was used to simulate the smart grid behavior during the whole year starting from the real monitored energy demand, and find the best operational strategy. A time-dependent thermo-economic hierarchical approach has been used, considering the time-dependent electrical, thermal and cooling load demands during the year as problem constraints. The results are presented and discussed in depth and show the strong interaction between fossil and renewable resources, particularly how to store electricity through a thermal media thanks to an air-to-water heat pump. A dedicated model of the heat pump was implemented and exploited in the code.

Use Cases and Business Opportunities of Multi- Agent System (MAS) ICT Solutions for LV Flexibility Management" (MAS2TERING)

Author

Juan Manuel Espeche, R2M Solution, Italy

Juan Manuel Espeche holds a MSc degree in Electronics and Telecommunications from Polytechnic of Turin, Turin, Italy and a MSc degree in Renewable Energy coordinated by the Association of European Renewable Energy Research Centres (EUREC). He has a specialization in Grid Integration and Distributed Generation from the University of Zaragoza, Zaragoza, Spain. During the specialization he has worked on Smart Grids, Demand Side Management and Energy Efficiency. In July-December 2015 he has worked as a researcher in the Energy Department of the Polytechnic of Turin, with a research topic of the Power Quality (PQ) of Building Integrated Photovoltaic systems (BIPV) connected to the distribution network. Juan has also worked during 2013/2014 as a Telecommunication Engineer in Telecom Italia Laboratories, performing test and validation of the new generation of Telecom Access Gateway (AG). His major skills are to design solutions and provide consulting of Renewable Energy, Smart Grids, Energy Efficiency and Telecommunications.

Innovation

The MAS^{2}TERING project conceptualizes Local Energy Communities (LEC), which are defined as the collection of consumption and/or production nodes that are managed by a single energy management entity (ESCO, aggregator, local authority energy department); The nodes of a local community belong to a portion of the grid supplied by an individual MV/LV transformer but several local communities, each related to an energy management entity, can coexist in the same geographical area; Local Flexibility Aggregator (LFA): the LFA represents a local community of prosumers within the MAS^{2}TERING framework. Local Flexibility Market: a framework that allows the trade of local flexibility between parties.

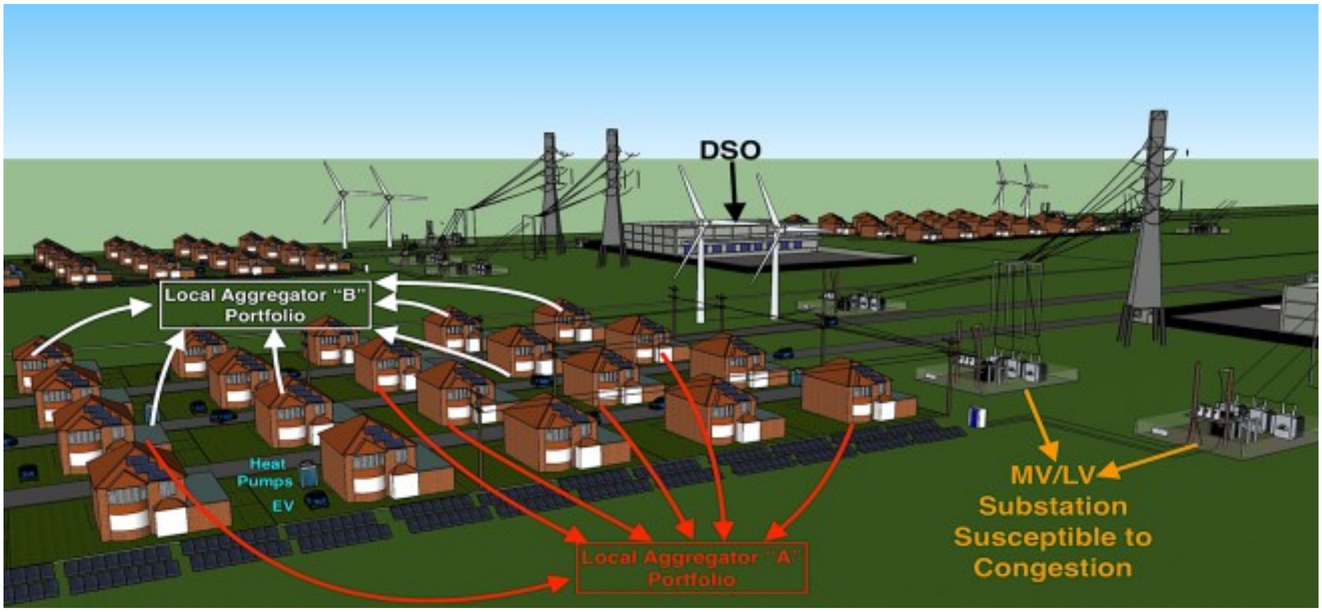
T.2: D-RES MONITORING & CONTROL

“LV Flexibility Management (MAS²TERING)”

Presentation Abstract

This paper describes the use cases and business models opportunities of a Multi-Agent System (MAS) ICT solution for LV Flexibility Management. The MAS platform provides a technological solution that enables new collaboration opportunities between actors in the LV portion of the grid, namely, distribution system operators, ESCOs (in particular Telecoms) and consumers/prosumers.

MAS have potential for efficient decision-making in the LV part of the grid due to the large number devices, users and variables and which makes more efficient a decentralized decision making approach. To support the new collaborations and business strategies amongst these actors, new business models are required and the ecosystem forms series of multi-sided platform business models. In this paper, the approach to business model development is detailed and 17 resultant business model opportunities are identified. These business models are then mapped to the use cases for future analysis.



TRACK 3:

INNOVATIVE ENERGY CONTRACTUAL FRAMEWORKS & MARKETS

Chaired by:

Sylvain Kubicki, LIST

T.3: INNOVATIVE ENERGY CONTRACTUAL FRAMEWORKS & MARKETS

Contributing Authors

“Capacity Building on Energy Performance Contracting in European Markets in Transition” (EnPC-INTRANS)

Author

Matija Vajdić, MSc.E.E., Energy Institute Hrvoje Požar,: Croatia

Matija Vajdić works as a Senior Researcher at the Energy Institute Hrvoje Požar. He manages technical and financial analyses of different types of EE projects. During his carrier he has consulted clients ranging from ministries, governmental institutions and agencies, international development organizations, international and commercial financial institutions and funds. He had worked for five years for the UNDP on a GEF funded project “Removing Barriers to Energy Efficiency in Croatia”. Together with his team he had been working on implementation of EE technologies in Croatian public sector and development of Energy management information system. He holds a MSc degree in Power Engineering from Faculty of Electrical Engineering and Computing at the University of Zagreb. During the studies he spent a semester on the University in Graz as an Erasmus scholar.

Innovation

Innovate financing schemes promoted in EnPC-INTRANS are based on Energy Performance Contracting (EPC) models for energy services ensuring the efficient generation and use of energy in public buildings and services. EnPC-INTRANS is addressing markets for energy services in 9 different European countries, which are actually at various stages of transition towards a low-carbon economy.

T.3: INNOVATIVE ENERGY CONTRACTUAL FRAMEWORKS & MARKETS

"Capacity building (EnPC-INTRANS)"

Presentation Abstract

"The overall objective of EnPC-INTRANS is to increase the market uptake of technologies for the improvement of energy efficiency (EE) in public buildings and services by means of fostering private sector participation in innovative financing schemes for EE investments. This will be achieved by means of implementing large-scale capacity building for local public authorities and SMEs to jointly set-up and use adapted EPC models for EE services for the financing of their investments in EE improvements of public municipalities and services.

EnPC-INTRANS capacity building concepts and tools are jointly developed by the project partners on the basis of international, interdisciplinary and inter-sectorial stakeholder consultations, cooperation, and exchange of concepts, ideas, and experience. The resulting training concepts and tools will be implemented and demonstrated in the partner countries Croatia, Germany, Greece, Latvia, Romania, Serbia, Slovakia, Slovenia and the Ukraine, and presented for further dissemination and replication to experts and stakeholders in all EU28 member states.

The major project tasks are:

• European best practices in EPC are adapted to local conditions and presented to relevant target groups in the partner countries.

• Training needs of local public authorities and SMEs are assessed in intensive stakeholder dialogue, providing the basis for design and implementation of efficient training concepts and tools making use of advanced on-line technologies for European-wide capacity development.

• Trainers are trained throughout the partners' networks and the developed training concepts and tools are demonstrated in national and international cooperation seminars.

• The achieved impact of large-scale capacity development on the European market for EPC projects is continuously monitored and evaluated and the project results are disseminated to all EU28 member states.

The final results are that at least 50 trained trainers and 3,000 trained experts will directly benefit from the project and cater for the initiation and development of EPC projects in partner countries and beyond, providing for energy savings of more than 60 GWh per year when implemented.

Projects website: http://www.enpc-intrans.eu

“Energy positive neighbourhoods: part of the solution to integrating distributed electricity generation into current electricity networks” (TEESSIDE UNIV)

Authors

Tracey Crosbie, Teesside University, UK

Dr Tracey Crosbie (F) has been researching issues associated with energy consumption in built environment and ways of informing its reduction for more than fifteen years. She is a trans disciplinary academic with degrees in the social and technical sciences. Her main research interests involve the development of socio-technical approaches to applying ICTs to urban sustainability and the development of business models to exploit those ICTs. She has a wide experience of research within the Utilities industry and managing EU projects and work packages. She led a work package related to business models in the recently completed IDEAS FP7 project and is currently leading dissemination in an ongoing H2020 project DRBOB.

Michael Short, Teesside University, UK

Dr Michael Short (M), a senior lecturer in electronics and control, is the technical coordinator of the DR_BOB H2020 Innovation project. He is a full member of the Institute of Engineering and Technology (MIET), a member of the International Association of Engineers (IAENG) and a member of the Fault tolerant and Dependable Systems (FTDS) sub-committee of the IEEE Industrial Electronics society. He holds a BEng degree in electronic and electrical engineering and a PhD degree awarded following research into algorithms and architectures for distributed real-time control. He has more than eight years' experience of research at post-doctoral level, and has authored/ co-authored over 60 reviewed publications in the area of advanced control, optimization and real-time systems, and has also recently won an

IEEE award for his contributions to factory communications and industrial informatics. He was the PC chair/organizer of the 2011 International Workshop on Real-Time Computer Networks, is a PC member of the IEEE ETFA Factory Communications Conferences, and is involved as PC member for several other international conferences including the IEEE Real-Time Systems Symposium and IFAC Informatics in Control, Automation and Robotics. He is named as primary inventor on a patent related to control and communications (currently pending).

T.3: INNOVATIVE ENERGY CONTRACTUAL FRAMEWORKS & MARKETS

“Energy positive neighborhoods (TEESSIDE U)”

Innovation

Identification of the impact of current electricity distribution tariffs on the potential of optimising local renewable electricity production and consumption to contribute to the integration of distributed renewable energy sources into current electricity networks.

Presentation Abstract

European governments aim to meet ambitious CO_2 reduction targets by applying financial instruments and other polices to encourage Distributed Renewable Energy (DREG). However, moving from large scale centralised controllable energy generation, which is largely fossil-fuelled, to small scale intermittent DREG is problematic for existing energy networks. Particularly in the electricity industry where the need to match electricity supply with demand to balance network load is acute. An approach which could contribute to resolving the integration of DREG into current electricity networks lies in the concept of an energy positive neighbourhood (EPN): in which the optimisation of local energy supply and demand contributes to the efficient operation and security of the wider energy networks. The development of EPNs is dependent on the possibilities provided by energy arbitrage and the efficiency gains that can be obtained through optimising the production, storage/retrieval, and sale of DREG at the neighbourhood scale. Current predominantly volumetric distribution network charges are designed to support traditional national network systems operation and represent a barrier to the development of EPNs. The research presented, involves a detailed computational experiment which explores the possibilities of the optimisation of energy supply and demand at the neighbourhood scale combined with differentiated local and national distribution network charges to support the local consumption of DREG. The findings show that a simple two-tiered distribution could encourage the use of local generation, and reduce the net amount of electricity handled wholesale and requiring transportation over transmission and distribution networks by up to 50%.

TRACK 4:

INNOVATIVE BUILDING DESIGN STRATEGIES

Chaired by:

Christophe Cantau, Nobatek

T.4: INNOVATIVE BUILDING DESIGN STRATEGIES

Contributing Authors

“Semantic Labels for Energy Efficient Building Design enabling Early Design evaluation” (STREAMER)

Author

Freek Bomhof, TNO, The Netherlands

Short bio: Freek Bomhof is the coordinator of the FP7 STREAMER project. He has extensive background as a consultant and project manager in ICT research. He graduated from University of Twente in 1990 in the field of Pattern Recognition and since then held various positions at KPN (the Dutch national telco) and then joined TNO where he is now in the Data Science department that focuses on applied research in the field of data analysis and semantic technology.

Innovation

The innovative aspect of the presented methodology is the usage of a pragmatic implementation of semantic technology, combined with practical energy-related data and with knowledge from experts that can be expressed in computer-processable Design Rules. The link between the Program of Requirements and an initial design in BIM enables the evaluation of designs in a very early phase, focusing not only on energy efficiency, but also operational quality, and cost.

T.4: INNOVATIVE BUILDING DESIGN STRATEGIES

“Semantic Labels for EeB design (STREAMER)”

Presentation Abstract

"When designing buildings, it is a challenge to take into account Energy Efficiency in the early design stage. Especially for hospitals this is difficult because these buildings combine many different room types and functions that allow for a large multitude of design directions. Choices made in an early stage have a large influence on the final performance of the building, but it is hard to evaluate these design choices in terms of Key Performance Indicators when details are not yet available. The Semantic Labels of the STREAMER project provide a means to optimize a design in an early design phase because they capture the most relevant aspects of the Program of Requirements. Using this, design rules can be applied to the design to detect inconsistencies or suboptimal solutions. Also, using default values for label values, the design can already be evaluated using simulation tools.

An additional tool, the Early Design Configurator, can automatically convert a Program of Requirements to an inital BIM design proposal that respects the Design Rules. The Semantic labels describe standard values for Construction (floor height and strength, accessibility), Hygiene class (from public spaces to operational theatres), Equipment (electric power requirements, safety), User profile (when the room is used), Comfort classe (like daylight) and Access security (who can enter). Design rules may express conditions like the preferred spatial separation between rooms, or whether rooms should be placed at outer walls, or with incompatible access requirements and user profiles.

"Innovative technologies for retrofitting: Coventry University as a Living Lab " (RESSEEPE)

Authors

Monica Mateo-Garcia, Coventry University United Kingdom Dr. Monica Mateo-Garcia is an Architect with over 8 years professional and academic experience. She holds a PhD in Architecture and Sustainable Urban Planning from the University of Alicante, Spain. In 2008, she moved from professional practice to academia, joining the University of Alicante as an Assistant Lecturer teaching modules in Construction and Energy efficiency in Architecture. In 2015 she joined Coventry University as a Research Associate in Low Carbon Refurbishment in the project EU FP7 RESEEPEE.

Abdullahi Ahmed, Coventry University United Kingdom Dr. Abdullahi Ahmed is a Senior Lecturer in Built Environment with over 10 years industry and professional experience in the field of building physics and sustainable design. Dr Ahmed has participated in several funded projects over the last 3 years. He is leading Coventry University's contribution to the EU funded project RESSEEPE. Dr Ahmed is managing a number of PhD students in the area of BIM, Urban Resilience and Low Carbon Technologies. Dr Ahmed has skills and experience of building information modelling and the transient simulation of buildings and building systems.

Danny McGough, Coventry University United Kingdom Mr. Danny McGough is a Lecturer in BIM at Coventry University and is leading the development and integration of BIM into Coventry University delivery of teaching and learning activities. Danny is an investigator on the current FP7 RESEEPEE project. Danny has also been involved in developing consultancy for companies within the West Midlands to develop BIMM systems and strategies within construction organisations. Danny is currently managing 2 ERDF KEEN projects that assist SME's to optimise their processes through the implementation BIM. Danny's particular research interest is in the retrospective application BIM in performance management of existing buildings stock.

Innovation

The paper shows a Higher Education building case study used as a Testing Bed for innovative technologies developed specifically within the project framework, for the improvement of energy efficiency in buildings. These advanced technologies are not aimed at refurbishing the building as a whole, being applied just in some areas in order to evaluate the performance of the retrofitted elements in isolation. The idea behind the Living Lab pilot case is to monitor the performance of those installations in order to get results which allow us to obtain conclusions about the replicability of the technologies selected.

T.4: INNOVATIVE BUILDING DESIGN STRATEGIES

"Innovative technologies for retrofitting (RESSEEPE)"

Presentation Abstract

"Retrofitting Solutions and Services for the enhancement of Energy Efficiency in Public Buildings (RESSEEPE) is an EU funded project which aims to bring together design and decision making tools, innovative building fabric manufacturers and a programme to demonstrate the improved building performance achievable through the retrofit of existing buildings at a district level. The RESSEEPE framework is being validated by a strong demonstration programme, envisaging the renovation of 102,000 square metres of public buildings. The core idea of the project is to technologically advance, adapt, demonstrate and assess a number of innovative retrofit technologies implemented on several pilot cases with different climate conditions across Europe (Coventry-UK, Barcelona -Spain and Skellefteå-Sweden) to ensure a high potential replication of the retrofit solutions. The three demonstration sites are involved as the main promoters of a very ambitious district level renovation, demonstrating a systemic approach to technology installation and evaluation, taking into account the benefits of a set of technologies, which properly combined in terms of cost effectiveness and energy performance could achieve reductions around 50% in terms of energy consumption. Coventry University is acting as a Living Lab in order to test some Advanced Technologies already on the market and others developed specifically within the RESSEEPE project. Those innovative technologies implemented in the pilot case are: Vacuum Insulated Panels, PCM tubes, Ventilated façade with Photovoltaic Panels, Electrochromic windows and Aerogel Mortar. The main feature of this installation is that it acts as a testing bed for where to install different advanced technologies covering specific areas ofthe building, rather than refurbishing it as a whole. This paper documents the testing of prototype technologies in a pilot case in Coventry University, analysing the process of selection of the different technologies and showing all the challenges faced during installation and coordination of installation activities. The installation process is shown and discussed, highlighting the difficulties, setbacks and challenges faced during the low carbon refurbishment. The key issues are related to technical and health and safety risks. Also, to financial, coordination, planning and legislation barriers etc. It will also show ways forward and solutions adopted. The study also analyses the process of monitoring the energy performance of the spaces retrofitted and the data obtained through the monitoring of the building before and after the installation of the different technologies. The idea behind the Living Lab pilot case is to monitor the performance of those installations in isolation in order to get results which allow us to obtain conclusions about the replicability of the technologies selected in other locations. Ultimately, what is discussed is the overall process followed. This discussion seeks to show the lessons learnt throughout the process and to obtain conclusions from the barriers and engagement issues faced during the installation when retrofitting a public building.

“The On-demand Room: a step towards sustainable places” (Fondation Rennes 1 & IRISA)

Author

Michele Dominici University of Rennes 1 & IRISA, France

Michele Dominici is the holder of the chair Smart Home and Innovation at University of Rennes 1. He holds a PhD in computer science and an engineering degree. His research focuses on smart homes and was presented in international shows including Batimat and French press including Le Moniteur, Batiactu, Batinfo and Ouest France. He previously collaborated with EDF R&D on a research project aiming at realizing an energy efficient smart home.

Innovation

Several dwellings share the same room, which saves built surface and, namely, heating and cooling energy. Information and communication technologies (ICT) allow appropriation by users thanks to customization, guarantee a fair use of the room and maximize the occupation ratio. The same room is located in different apartments: it is dynamically “plugged” into a dwelling or the other. This requires dynamically modifying the rights to control and receive information from the room’s equipment: appliances, HVAC systems, sensors, etc. This is done in a transparent fashion, so that off-the-shelf devices and appliances can be used.

“The On-demand Room (FONDATION RENNES1 & IRISA)”

Presentation Abstract

"In many countries, including France, households experience financial restrictions, while housing costs increase with the raise of real estate and energy prices. Novel initiatives and behaviors appear, like house-sharing, teleworking and longer stay of children in parents' homes. Flexible housing is required to accommodate these evolving needs. Existing solutions provide technical means to modify the dwelling layout or perimeter depending on medium- to long-term needs. However, built space and associated resources are left unused in case of periodical or short-term fluctuations in use. Common rooms are sometimes used as a way to mutualize resources in the short term, including built surface, equipment and energy. However, the social housing experience shows that these spaces happen to be monopolized by few occupants, left unused or repeatedly damaged. The On-demand Room aims at saving space and energy in apartment buildings, while preserving residents' comfort and guaranteeing fair and respectful use. It consists in a space that is physically shared by a small group of apartments, but is assigned for the sole use of one or few particular ones at the time. The space actually becomes a new room of the dwelling: the access is direct and exclusive, while automatic customization of the indoor environment make occupants feel they did not leave their apartment at all. HVAC, lighting, digital decoration and even transformable furniture automatically adopt the preferred settings of occupants. Individual and secure storage is at their disposal during occupation. Automatic access control and room booking guarantee users privacy and room availability. A fair use of the room is guaranteed by fixing thresholds of maximum occupation time per apartment. Energy and water consumptions of the room are charged to the dwelling that actually generates them. As part of the demonstration activities, we realized a prototype of the on-demand room in an immersive interactive virtual-reality CAVE. By wearing 3D glasses and a marker on their hand, users can literally walk inside two apartments, which share an on-demand room. Occupants can open doors and observe how the configuration of the on-demand room changes to become a part of one dwelling or another. We also connected actual domestic appliances to the platform: we showed that a real light switch, located in the virtual on-demand room, can change its behavior and alternatively control one of the two real lamps, each located in one of the apartments. We are currently collaborating with a social landlord to prepare an experimentation of the On-demand Room in its social housing stock. This work is conducted as part of the chair “Smart Home and Innovation” at University of Rennes 1, funded by Cardinal Edifice, the Chamber of Commerce of Rennes, Néotoa, Rennes Métropole and Veolia. Further information is available at the address: https://fondation.univ-rennes1.fr/la-chaire-habitat-intelligent-et-innovation

TRACK 5:

SMART GRID BUSINESS MODELS

Chaired by:

Juan Manuel Espeche, R2M Solution

T.5: SMART GRID BUSINESS MODELS

Contributing Authors

“A Multi-Sided Business Model for Local Flexibility Management in Low Voltage Distribution Networks” (MAS^{2}TERING)

Authors

Patrick Lynch, RIKON-WIT, Ireland

Patrick is the director of RIKON-WIT, a business innovation research centre located in Waterford Institute of Technology. He has published extensively on business models and networked innovation in top-tier journals and peer-reviewed conferences. He has amassed considerable industry, consultancy and applied innovation research experience in process optimisiation, business modelling & strategy and market models.

Richard Hickey, RIKON-WIT, Ireland

Richard is a Business Development Strategist in RIKON-WIT and works closely with organisations to find solutions to their business model challenges by developing and applying various research methodologies and helping them achieve their research goals.

Thomas Messervey, R2M Solution, Italy

Tom Messervey has over 20 years of engineering experience spanning military service in the US Army Corps of Engineers, Industrial Experience with the Italian Engineering Company D’Appolonia, teaching excellence at the United States Military Academy at West Point, and Coaching services as the EU Facilitator for the Intelligent Manufacturing Systems program. He is currently an organizer of the annual International Electronic Conference on Sensors and Applications.

Innovation

This paper provides a more nuanced picture of the potential of multi-sided business model for local flexibility management in the low voltage grid to disrupt the long-standing business models within the sector because value network analysis focuses not on the actor or the industry but the value-creating system itself, within which different economic actors perform roles and who work together to co-create value of local flexibility. Analysing the value flows along the multi-commodity flow chain perspective, including interactions and potential conflicting objectives provide us with a contextual understanding of how a networked economy/multi-sided business model could potentially materialise.

T.5: **SMART GRID BUSINESS MODELS**

“A Multi-Sided Business Model (MAS2TERING)”

Mas²tering

Presentation Abstract

"In traditional industries, users can be homogenous and/or bilateral exchanges follow a linear path as vendors purchase inputs, transform them, and sell output. The electric power network has historically operated in this fashion. However, the energy model landscape is changing with flexibility at the core of a new energy market design. Empowered by information and communication technologies (ICT) analytics and smart technologies, consumers, prosumers and local energy communities are emerging as active participants in the energy value chain. If homes can individually and collectively level their demand load profile, then the generation, distribution and storage of electricity at the Low Voltage (LV) level (and indirectly at higher voltages) can be optimized. However, the integration of ICT into the energy infrastructures will profoundly change the business model structures of the electricity value chain. As business value will be increasingly attached to the bi-directional flows of electricity, data and revenue where flows are driven by a coupling of stakeholder optimization objectives and free market principles, new participatory business platforms will emerge to unlock the potential advantages of distributed energy resources and flexibility possible by the individual and collective actors at the LV level. In general, participatory network platforms provide a mechanism for providers and buyers of products and services to interact and co-create value that could not be created individually. In particular, multi-sided platforms (MSPs) has gained prominent attention as a business model that creates value by enabling direct interactions between several distinct groups of actors who need each other in order to deliver goods or services to their customers. However, as MSPs are less familiar and complex within the energy market, there has been little investigation in modelling this dynamic ecosystem beyond viewing business model value creation from the perspective of an individual actor which is not very effective when trying to ignite network based business models. Utilising the business modelling methodology of value network analysis and the key informant technique, value flows were modelled within the context of a multi-sided business platform to understand the value creation, value delivery and value capture in a network of interdependent relationship, its networked position and the stakeholder interactions required for delivery of local flexibility. Supported by this analysis, this paper focuses on the LV area of the smart grid, and presents a MSP, its strengths and weaknesses, its actors, their objectives and roles, along with value propositions and collaboration opportunities. The MSP presented involves local energy communities and where a local flexibility aggregator facilitates flexibility management between retailers, distribution system operators, and consumers/prosumers. In comparison to the traditional utility model, the complexity of this recharacterization of the industry ecosystem is significant. While it presents new opportunities for incumbent energy providers to collaborate and develop new products, it will also dramatically reshape the value model of the industry as a whole and the networked economy value propositions required by the market.

“Smart Micro Grids and Cellular Grids” (Easy Smart Grid)

Author

Thomas Walter, Easy Smart Grid, Germany

Thomas Walter earned a diploma in electrical engineering from the University of Karlsruhe (now KIT) in 1982, with a year specializing in telecoms at the University of Essex. He earned a PhD at RWTH Aachen on sensor/automation in 1989. Since 1983, he worked in innovation management roles (technology, product management, strategy, finance) in various international companies and in different sectors. He was involved in and observed digitization in industries such as audio, multimedia, telecoms, banking, automotive and energy. In 2014 he founded Easy Smart Grid to develop an effective solution to integrate renewables. Already in 2014 Easy Smart Grid was selected as a top 3 smart energy start-up in the European EIT Digital competition, and now is active in various projects to develop and promote practical solutions for the electricity sector.

Innovation

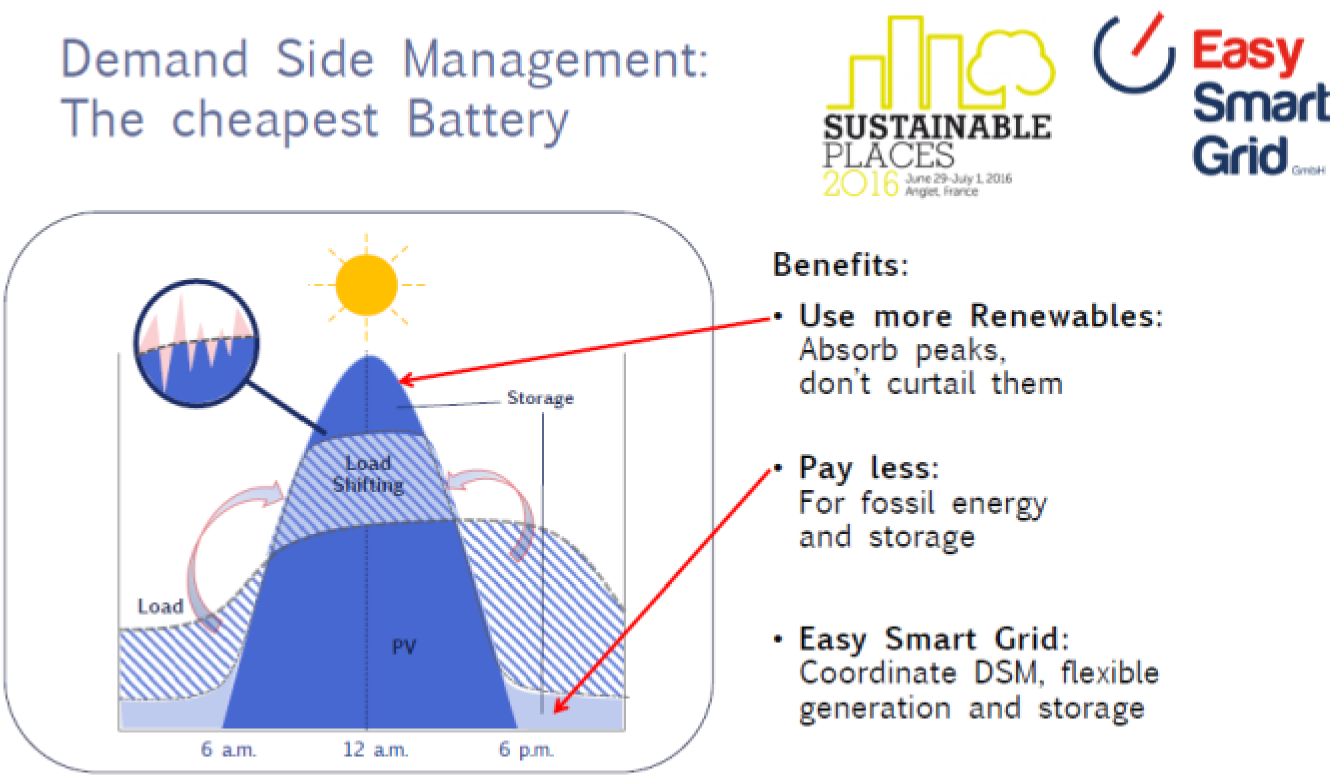
Most existing Smart Grid approaches are based on the current energy system that has evolved over more than 100 years. As a result, they create specifications on ICT that are unlikely to be achievable (cost, latency, cyber security, data protection, manageability, availability). With a greenfield/systems approach which instead is based on the requirements of a future renewable driven energy system and the knowledge of available technologies, alternative solutions emerge that offer an alternative path to system transformation.

T.5: SMART GRID BUSINESS MODELS

“Smart Micro Grids (Easy Smart Grid)

Presentation Abstract

The energy system was designed for large central fossil generation stations. Digitizing an old system does not make it more suitable for decentralized renewable generation. Therefore, in response to the needs of a future 100% renewables driven system where production from sun and wind varies temporally and spatially, the concepts of real time markets and cellular grids are introduced. Existing approaches are combined to propose a novel grid topology, and Easy Smart Grid is introduced as a candidate to manage energy in micro grids. Early application areas and the benefits for isolated micro grids (island grids) are introduced.



TRACK 6:

ENERGY-EFFICIENT DISTRICTS & CITIES

Chaired by:

Stefano Barberis, UNIGE

T.6: ENERGY-EFFICIENT DISTRICTS & CITIES

Contributing Authors

“Energy performance simulation of districts applied to typical districts” (EFFICACITY)

Authors

Mohamed Said, Patricia Bonneau, Romain Bonabe de Rougé, Patrick Schalbart, Arnold Kamsing, Jean Luc Hubert, Dan Dimeca, Peter Riederer, EFFICACITY

Energy concept	Primary energy consumption [kWh/m2/y]	CO2 emissions [kgCO2/m2/y]	Global costs of energy [€/MWh]
Local Heating – Turbine	275,20	34,76	63,61
Local Heating – Air Source Heat Pump	217,85	6,75	73,30
Local Heating – Condensing Boiler	216,59	24,56	88,02
Local Heating – CHP ICE	263,93	32,94	97,89
District Heating – Heat Sharing Network - Aquifer	221,72	6,88	97,94
Local Heating – Boiler	232,10	28,19	99,48
District Heating – Central Heat Pump - Aquifer	211,91	6,57	103,42
Local Heating – Fuel Cell	348,47	1,34	110,98
Local Heating – CHP Stirling	245,89	30,01	112,21
District Heating – Heat Sharing Network - Geothermal	233,55	7,24	123,77
Local Heating – Electric Heater	341,52	10,59	131,40
District Heating – Central Heat Pump - Geothermal	224,54	6,96	136,06
District Heating – Condensing Boiler	219,04	21,77	143,96
District Heating – Boiler	231,34	24,64	153,04
District Heating – CHP Turbine	272,72	32,86	161,27
District Heating – CHP Stirling	246,84	27,73	177,82
District Heating – CHP ICE	262,76	30,84	180,65
District Heating – CHP Fuel Cell	337,41	2,10	306,98

Example: Performances for the residential District—Parametric study results sorted by energy costs in €/MWh

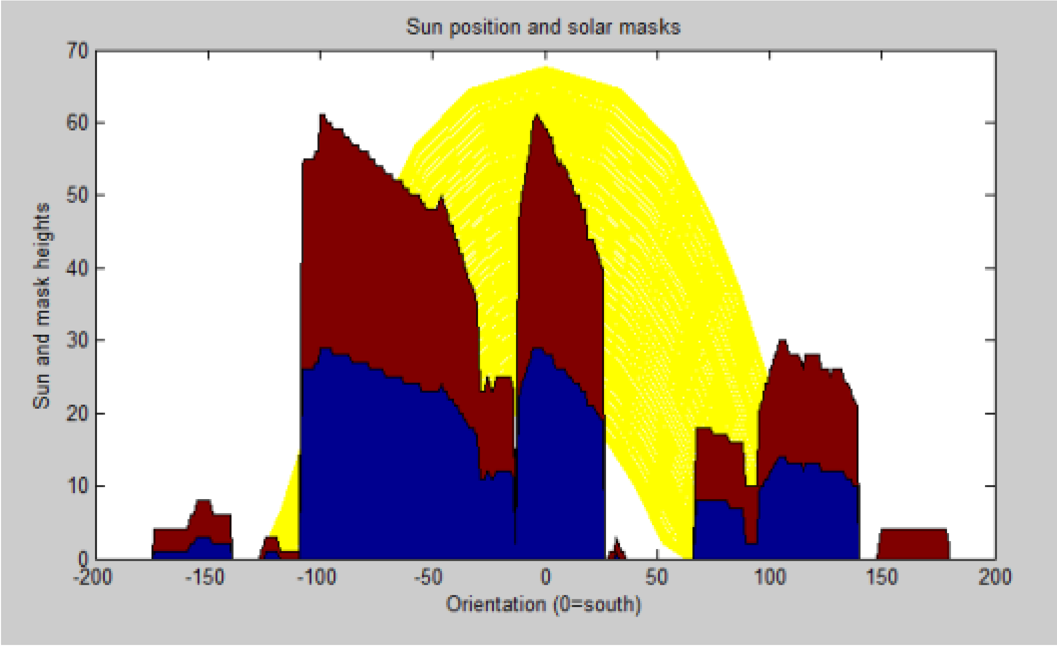
T.6: ENERGY-EFFICIENT DISTRICTS & CITIES

"Energy performance simulation (EFFICACITY)"

efficacity

Presentation Abstract

An energy performance simulation tool for districts (PowerDis) is being developed by the french research institute Efficacity. Efficacity is a research institute integrating a large number of industrial, private and public partners. The tool allows the simulation of districts with the objective of optimizing the global energy concept on a district level considering available energy resources (renewable or rejected energy sources) on a central or decentral level. While the tool can be applied to a specific district (existing or new) in order to optimize the energy concept using KPI's (based on energy, economic and environmental criteria) it can also be used to calculate and illustrate appropriated solutions for typical districts. This will allow to develop generic guidelines for district planners. Therefore, an approach is presented allowing to classify the French territory to 10 districts and then to determine a typical district representing each class. The approach is based on data analysis of national data bases (INSEE data bases,BD TOPO, …). Simulations on one of these typical districts using the PowerDis tool are presented in order to illustrate the approach.



Solar masks from surrounding buildings and ground

-Mask heights on floor of buildings

-Mask heights on roof of building

-Sun positions (yellow)

At each time step, calculation of solar gains on different envelop parts

“Development of a Virtual Power Plant (VPP) prototype and case studies for the use of energy balancing across cities” (iURBAN)

Authors

Michael Oates, IES Ltd UK—Michael Oates PhD, is technical analyst on commercial, and research and development (R&D) projects. Working for IES for over 3 years Michael has been technical lead /analyst on 6 European projects, FP7, H2020, and Marie Curie etc., http://www.iesve.com/research. Research project topic areas included glazing (electrochromic glazing), retrofit technologies, manufacturing, city modelling, and application development including gamification.

Aidan MeliaIES Ltd UK—Aidan Melia is a project manager working on commercial and research and development (R&D) projects. Working for IES for over 3 years Aidan has managed 3 European projects, such as FP7 and H2020. These focus on the areas of smart cities and ICT developments, as well as more recently focusing on areas such as gamification. He has studied in a number of countries such as Ireland, the US, Spain and Germany." "Dr Ruth Kerrigan ruth.kerrigan@iesve.com, Director of Research Development

Ruth Kerrigan IES Ltd UK—is Director of Research and Development. Ruth is a chartered engineer with both industrial and academic experience with respect to research projects. Ruth is responsible for the R & D department within IES and as such with respect to achieving IES’s vision for sustainable communities and developing new products for new markets to reach this goal. She has vast experience with the coordination of public funded research projects with multiple consortium partners. " "Dr

Valeria Ferrando IES Ltd UK—Valeria Ferrando PhD, is EU Head of Research. In 2013 Valeria joined the Research and Development (R&D) division of IES Ltd where she deals with EU funded research, managing projects ensuring that they lead to marketable products for the company and finding new funding opportunities and research grants at European level to support IES R&D, setting up partnerships and writing proposals."

T.6: ENERGY-EFFICIENT DISTRICTS & CITIES

"Development of a VPP prototype (iURBAN)"

Innovation

"In the context of this work the VPP is considered a high level design tool, modelling city level, or user defined and selected levels such as district, neighbourhood, low voltage electricity network, district heating network etc. from load aggregation of near real-time metered energy demand and generation data at building/apartment levels. Target users, city planners and utility companies, will be able to use the VPP to gain an understanding of energy demand/generation at user defined and selected levels of interest ranging from high level city planning to the selection of individual buildings or user defined energy networks and so on. 'What-if' scenarios aid in future development and planning of cities.

Presentation Abstract

"This paper summarises Virtual Power Plant (VPP) development within the European Seventh Framework Programme (FP7) project Intelligent URBAn eNergy tool (iUrban).

In the context of this work the VPP is considered a high level design tool based upon load aggregation of near real-time metered energy demand and generation data at building/apartment levels. Selected data is aggregated up to city level, or user defined and selected levels such as district, neighbourhood, low voltage electricity network, district heating network etc. Two types of analysis are performed by the VPP: 'as is' model(s), representing the structures and consumption patterns currently in place (the status quo), and 'what if' (variant) model(s), representing possible alternatives such as adding photovoltaics (PV) at building and/or distribution levels. Target users, city planners and utility companies, will be able to use the VPP to gain an understanding of energy demand/generation at user defined and selected levels of interest ranging from high level city planning to the selection of individual buildings or user defined energy networks and so on. 'What-if' scenarios aid in future development and planning of cities. The paper outlines VPP case studies from the iUrban project.

TRACK 7:

END-USER ENERGY MANAGEMENT

Chaired by: Zia Lennard, R2M Solution

T.7: END-USER ENERGY MANAGEMENT

Contributing Authors

“Demand Response in Blocks of Buildings: Opportunities and Requirements” (DR-BoB)”

Authors

Tracey Crosbie, Teesside University, UK- has been researching issues associated with energy consumption in built environment and ways of informing its reduction for more than fifteen years. She is a trans disciplinary academic with degrees in the social and technical sciences. Her main research interests involve the development of socio-technical approaches to applying ICTs to urban sustainability and the development of business models to exploit those ICTs. She has a wide experience of research within the Utilities industry and managing EU projects and work packages. She led a work package related to business models in the recently completed IDEAS FP7 project and is currently leading dissemination in an ongoing H2020 project DRBOB.

Michael Short, Teesside University, UK- a senior lecturer in electronics and control, is the technical coordinator of the DR_BOB H2020 Innovation project. He is a full member of the Institute of Engineering and Technology (MIET), a member of the International Association of Engineers (IAENG) and a member of the Fault tolerant and Dependable Systems (FTDS) sub-committee of the IEEE Industrial Electronics society. He holds a BEng degree in electronic and electrical engineering and a PhD degree awarded following research into algorithms and architectures for distributed real-time control.

Muneeb Dawood, Teesside University, UK- is a Research Assistant at Technology Futures Institute, TU. He has a PhD degree in Communication (Electrical) Engineering and an MSc degree in Telecommunications and Computer Networks Engineering, both from UK. His experience and research interests include modelling and simulation of renewable energy resources, real-time communication protocols for wired and wireless networks, error-resilience techniques for real-time communication, monitoring protocols and communication infrastructure for smart grid and visualization of scientific data.

Richard Charlesworth, Siemens Plc, UK- is a Solution Architect for Siemens and has over 20 years of experience in IT in a variety of roles from developer to Lead Technical Architect. He has over 15 years proven track record in utilities and metering systems of all sizes. Richard was responsible for key stages of the technical bid, specification, design and delivery of the Manchester Triangulum project, and otherwise has consulted on Smart Metering, Demand Response and eCar across UK and Europe. He was Lead Author on the Low Carbon London "Report 10 - Opportunities for smart optimization of new heat and transport loads." He is also leads a technical work package in the DR_BOB H2020 project.

T.7: END-USER ENERGY MANAGEMENT

"Demand Response in Blocks of Buildings (DR-BoB)"

Innovation

Identification of the present and expected future opportunities for DR programs for small and medium scale customers and the suitability and opportunities for DR in blocks of buildings in the EU with a particular focus on the UK, Romanian, Italian and French electricity sectors.

Presentation Abstract

Increased Demand Response (DR) is essential to fully exploit European power systems, which in turn is an absolute prerequisite for meeting European targets related to energy efficiency and climate change. Essentially DR involves consumers reducing or shifting their electricity usage during periods of peak electricity demand in response to time-based tariffs or other forms of financial incentives. The opportunities for realising demand response vary across Europe as they are dependent on the particular regulatory, market and technical contexts in different European counties. Nevertheless successful DR programs are becoming increasingly common for large industrial customers. However DR programs aimed at small and medium scale customers have mostly failed to meet their expected potential. Blocks of buildings offer more flexibility in the timing of energy use, local energy generation and energy storage than single buildings and as such researchers and the energy industry are beginning to consider how blocks of buildings can operate collectively within energy networks to enhance the effectiveness of DR programs. This paper identifies the present and expected future opportunities for DR programs and the suitability and opportunities for DR in blocks of buildings with a particular focus on the UK, Romanian, Italian and French electricity sectors. The work presented is part of an ongoing European Horizon 2020 project entitled Demand Response in Blocks of Buildings.

“Lighting the way towards smarter and more sustainable cities: the REMOURBAN regeneration model” (REMOURBAN)

Innovation

REMOURBAN is leading its main effort leveraging the convergence area among energy, mobility and ICTs in cities, where the potential to achieve environmental, economic and social benefits is very high. Thus, the urban regeneration model, based on the innovative approach to address temporal goals, key priority areas and the frameworks to manage, finance and evaluate the actions, can lead to

Author

Cristina de Torre , Fundación CARTIF, Spain

Short bio: Industrial Engineer (2006) and MSc. Eng. in Energy Engineering (2010), both from the University of Valladolid (Spain). Working as researcher and Head of Projects at CARTIF's Energy Division. Along her work career at CARTIF, she has been involved on many National and European Projects linked mainly on integration of renewable energies in buildings, energy performance simulation, buildings energy refurbishment, energy audit, monitoring and control of solar thermal heating and cooling installations and low energy buildings. She has contributed to different congresses of national and international relevance related to renewable energies and energy efficiency.

Miguel Á. García-Fuentes, Fundación CARTIF, Spain

B.Arch. (2010) and MSc Arch. (2012), from the Valladolid University (Spain). Working as European Projects Coordinator at the Energy Division of CARTIF Technology Centre in European RTD Projects in the framework of Smart Cities and Nearly Zero Energy Cities, he currently coordinates REMOURBAN and OptEEmAL EU-H2020 funded projects. He has contributed to various national and international relevant congresses related to sustainability and energy efficiency in buildings. Recently, he has been appointed as member of the Special Interest Group (Advisory Council) of the FP7 funded project OPTIMUS and as member of the Technical Committee for the 3rd Spanish Congress on NZEB.

T.7: END-USER ENERGY MANAGEMENT

“Lighting the way (REMOURBAN)”

Presentation Abstract

"REMOURBAN is an European project whose main objective is the development and validation in three lighthouse cities (Valladolid-Spain, Nottingham-UK and Tepebasi/Eskisehir-Turkey) of a sustainable urban regeneration model that leverages the convergence area of the energy, mobility and ICT sectors in order to accelerate the deployment of innovative technologies, organizational and economic solutions to significantly increase resource and energy efficiency, improve the sustainability of urban transport and drastically reduce greenhouse gas emissions in urban areas. For developing this model, REMOURBAN is implementing several strategies at city level based on: 1) Creation of a holistic catalogue of innovative technologies and solutions, focused on energy (building and district refurbishment interventions), mobility (sustainable transportation strategies) and ICTs (smart grids and city information platforms), whose potential and cost-effectiveness will favor the replicability. 2) Identification and overcome of non-technical barriers, by addressing strategies for optimizing the regulatory frameworks, enhancing the innovative public procurement procedures and promoting the concept of smart city and its social acceptance. 3) Development of new integrated business models, oriented at the creation of a European market for innovation, by offering technology solutions to economies of scale and by generating strategies for a smart combination of investments and reduction of risks. 4) Definition of a complete evaluation procedure using both sustainability and smartness indicators, in order to assess, in an integrated way, the impact of the foreseen interventions and the most significant aspects from the sustainability point of view. This urban renovation strategy is focused on the citizens, where they become the cornerstones to making a smart city a reality For this reason, citizens are being actively engaged in REMOURBAN and the population awareness about energy and environmental impact of their daily activities are increased. In order to ensure the usefulness and high replication of the REMOURBAN project at European level, the sustainable urban regeneration model is aimed at the decision makers, investors, public administrations and the industrial sector. Furthermore, in order to ensure this replicability, two follower cities, Seraing (Belgium) and Miskolc (Hungary) are involved in the project so they can apply the developed model once it is validated. The project will allow demonstrating that, by means of improving the current conditions of a city, it is possible to achieve low energy districts and more sustainable urban transport, as well as to perceive a greater quality of life. REMOURBAN, thus, will focus on improving the energy efficiency, reduction of GHG emissions, refurbishment of districts, transport sustainability, access to urban information and citizen engagement. A big impact across Europe is intended to be achieved by the REMOURBAN project results at European level, showing the model for sustainable urban regeneration can be easily applied and replicated. With the aim at maximizing the impact of the project results, REMOURBAN is deploying a powerful communication and dissemination plan that integrates a citizen engagement strategy and has started to disseminate the benefits of the project to a wide variety of audiences.

TRACK 8:

ENHANCING IMPACT OF EEB TECHNOLOGIES

Chaired by: Mike Oates, IES ltd.

Contributing Authors

“Services and tools to enhance the impact of EeB PPP Projects” (EeB-CA2 CSA)

Author

Régis Decorme, CSTB, France

ICT Engineer (University of Nice - Polytech Sophia Antipolis '04) with than 10 years of experience in IT Research and Innovation addressing societal challenges.

I am currently focusing on Information Technologies and Open Innovation for business-oriented domains such as Energy-Efficient smart Buildings and eco-districts.

Coordinator of the H2020 – EeB-CA2 CSA project - http://www.e2b-clusters.eu/

Innovation

The 4 CSAs aim at enhancing and rationalising coordinated and broader dissemination, technology transfer and future exploitation activities of clustered projects..

T.8: ENHANCING IMPACT OF EEB TECHNOLOGIES

Chqired by

Presentation Abstract

The European Commission is supporting 4 Horizon 2020 Coordination and Support Actions (CSAs) - namely EeB-CA2, EEBERS, AMANAC and SWIMING – which aim at enhancing the impact of EeB PPP Projects. Very pragmatic opportunities and services are developed and offered to EeB PPP projects1 such as:

Clustering workshops for establishing synergies (e.g. upcoming online webinars to highlight success stories from EeB PPP projects which managed to take up their research results to higher TRLs);

Joint dissemination opportunities in relevant fairs (e.g. upcoming opportunities to co-exhibit at European Utility Week, Smart City Expo, BAU2017); Trainings on R&D technology transfer and exploitation; Online tools and services for enhanced visibility (e.g. a geoclustering platform is developed and offers a semantic map of the pilot case studies from the EeB PPP projects). The aim of this presentation will be to promote and update the audience with available upcoming opportunities offered by the 4 CSAs at the time of the SP16 conference2. See the 2016 project review booklet – designed by EeB-CA2 - which offers a short description of all EeB PPP projects at

http://ectp.ectp.org/cws/params/ectp/download_files/36D3750v1_EeB_PPP_Project_Review.pdf

“Minimizing the gap between computed and measured energy performances using real-time calibration” (TRIBUTE)”

Author

Emmanuel Onillon, Centre Suisse d’Electronique et de Microtechnique, CSEM, Switzerland

Emmanuel ONILLON, M.Sc EE in 1991 PhD. in Control and Signal Processing (1994), 14 years in CSEM. Extensive experience in hardware/software and system integration, testing. Multidisciplinary project management in international environment practice, including space related projects and energy development related projects. He managed projects on various green technology projects, ranging from optimal heating control (Neurobat product development) to optimization of energy fluxes in buildings.

Innovation

Tribute proposes an innovative building key parameter selection and associated automatic calibration. The proposed presentation describes the developed methods for the sensitivity analysis and calibration methods, as well as the achieved results on test sites.

T.8: ENHANCING IMPACT OF EEB TECHNOLOGIES

“Minimizing the gap (TRIBUTE)”

Presentation Abstract

"As of today, Building Energy Performance Simulation (BEPS) analysis tends to show a large discrepancy with real energy performance. Reasons are manifold, including use of over simplified models, incorrectness of the occupancy patterns. One of the main reasons can be the inadequacy of the values of the parameters used in the simulation model, derived from the Building Information Model. Sensitivity analysis, relying on BEPS, allows assessing the main variables affecting the building energy performance.

The study, performed in the frame of the FP7 European project Tribute (Grant Agreement 608790, extending between 2013 and 2017), aims at developing a sensitivity analysis method applied on two buildings, a public library in Torino, Italy, and a public building in la Rochelle, France. After selection of building key parameters, automatic calibration methods are put in place (surface vector machine, gradient based methods, genetic algorithm based methods) for identifying the building key parameters values.

TRACK 9:

BEYOND ENERGY

Chaired by:

Raymond Sterling, R2M Solution

SUSTAINABLE PLACES 2016 June 29-July 1, 2016 Anglet, France

“Thermo-economic and Experimental Analysis of the Seaspoon Wave Energy Converter coupled to an Energy District” (UNIGE)”

Authors

Stefano Barberis, University of Genova, Italy—Stefano Barberis was born in Genoa in 1988. He obtained his PhD with a thesis titlet “Polygenerative District and Integration with Energy Storage System”. He joined TPG as PhD student in 2013 and he carries out research about renewable energy, smart grids and energy district collaborating to RESILIENT project.

Vincenzo Alessandro Santamaria ,University of Genova, Italy— was born in Genoa in 1985. He obtained his Master Degree in Informatics Engineering at University of Genoa in 2012 with the Thesis “Techniques of variables selection for sensor diagnostic: application to a micro gas turbine-based test rig”. He joined TPG (Thermochemical Power Group) of the University of Genoa in 2012 as temporary research fellow.
He carries out research about the control and monitoring system of Seaspoon, an innovative Ocean Energy device for distributed microgeneration.

Alberto Traverso, University of Genova, Italy— has been Scientific Responsible for the University of Genoa of more than 1Meuro research projects, including EU funded projects (Energy-Hub, RESILIENT, Bio-HyPP), International projects (National Energy Technology Laboratory, USA), National projects (Regional Council), private company research (Ansaldo Energia, D’Appolonia, Techcom, etc.).

Francesco Roncallo, University of Genova, Italy— was born in Genoa in 1989. He obtained his Master Degree in Mechanical Engineering at University of Genoa in 2014 with the Thesis “Sustainable energy solutions in developing countries”. He joined TPG as PhD student in 2015. He’s doing research about an innovative renewable energy system based on wave energy conversion, the “Seaspoon”.

Innovation

"The test of a full scale WEC prototype for medium energy content seas. Its integration in a polygenerative district and its impact according to its stochastic production.

"Seaspoon Wave Energy Converter (UNIGE)"

UNIVERSITÀ DEGLI STUDI DI GENOVA

Presentation Abstract

" "The conversion of ocean wave power into sustainable electrical power represents a major opportunity to Nations endowed with such a kind of resource. At the present time the most of the technological innovations aiming at converting such resources are at early stage of development, with only a handful of devices close to be at the commercial demonstration stage. The Seaspoon device, thought as a large energy harvester, catches the kinetic energy of ocean waves with promising conversion efficiency, and robust technology, according to specific "wave-motion climate". University of Genoa developed and patented a prototype to be deployed in medium average energy content seas (i.e. Mediterranean or Eastern Asia seas). This paper presents the installation phases of the first real scale prototype installed in the gulf of Genova and the monitoring of its performances. A brief description of the Seaspoon WEC is presented together with the monitoring equipment and procedures. In this research a thermoeconomic analysis of its integration in a real polygenerative district is also investigated. The impact of such this kind of stochastic renewable generator in the Savona Campus Smart Polygeneration Microgrid (SPM) is evaluated. The SPM plant is made up by (i) two auxiliary boilers (500kWth each), (ii) four micro gas turbines (30kWe, 2x65kWe and 100kWe), (iii) an internal combustion engine fed by natural gas (20kWe), (iv) an absorption chiller (100 kWf) and (v) PV panels for a total power installed of 100 kWe. Generators are "distributed" around the campus and they are coupled to electrical and thermal storages. Since the system is constituted by co-generative prime movers it can supply both electrical and thermal energy of the campus and the integration of storage is really important in order to follow both the requests, pursuing the best management strategy. The analysis of this smart-grid is performed exploiting a software developed by the Author's research group, which allows for the thermo-economic optimization of poly-generative energy systems. A model of the real plant was built and it was implemented in the software. The off-design curves of the real devices installed in the campus were used in order to increase the reliability of the simulation results. The grid was simulated considering the time dependent nature of the demands throughout the whole year. The model was used to simulate the smart grid behavior during the whole year, and find the best operational strategy. A time-dependent thermo-economic hierarchical approach has been used, considering the time-dependent electrical, thermal and cooling load demands during the year as problem constraints. The results are presented and discussed in depth and show the strong interaction between fossil and renewable resources, particularly the impact of unpredictable and randomized generators like the WECs ones. A dedicated model of the Seaspoon was implemented and exploited in the code..

“Development of efficient district cooling systems (INDIGO)”

Authors

Andrea Costa is originally a graduate from the Politecnico di Milano. He pursued and was awarded a PhD in Civil Engineering from the National University of Ireland Galway (NUIG) with a PhD topic of providing support to the energy manager in improving the building operation strategy with considerations on building energy use and occupant comfort throughout the building lifecycle. He is expert in building simulation with experience on an array of building energy simulation software and ISO 50001 certification tools. After his PhD, he was awarded an industrially supported Postdoctoral Fellow co-funded by IRCSET (Irish Research Council for Science Engineering and Technology) as part of the Enterprise Ireland Partnership Scheme and D’Appolonia Spa in Italy. Andrea Costa brings with him a balance of field and research experience including FP7 projects for energy efficiency with targeted focus for office buildings, airports, sport facilities, and schools.

Francesco Passerini holds a Doctoral degree from the University of Trento in Environmental Engineering with specialization in sustainable buildings. His research work focused on passive solar systems, the calculation of the building energy performance and the refurbishment of blocks of flats. He has dealt with sustainable buildings and energy modeling, both at the academic level and in the private sector. He is member of AICARR (Italian Association for HVAC systems) and of IBPSA-Italy (the Italian regional affiliate of the International Building Performance Simulation Association).

Krzysztof Klobut , TEKNOLOGIAN TUTKIMUSKESKUS VTT OY , Finland
Senior Scientist, has 30 years of scientific experience in the field of heating systems, energy consumption in buildings, RES, district heating and residential applications of fuel cells. He was involved in a number of projects co-funded by EC FP5&6 (JOULE-PSI, EDIFICIO, SSHORT, BOILERNOISE), SAVE-programme (Boilsim, Indirect, Savelec) and IEA co-ordinated (ECBCS, Annexes 37 and 42). Recently he was involved in the following just completed EC-funded projects: IDEAL EPBD (IEE), IntUBE (FP7) and AmI_MoSES (FP7). Mr. Klobut has authored or co-authored over 80 scientific publications.

Innovation

predictive controllers
new system management algorithms
new planning tool
more efficient district cooling systems

T.9: BEYOND ENERGY

“Efficient district cooling systems (INDIGO)”

Presentation Abstract

Since the demand of cooling for buildings is increasing, developing more efficient cooling systems is important for the sustainability of the European cities. Directive 2012/27/EU of the European Parliament and of the council on energy efficiency states: “Member States should carry out a comprehensive assessment of the potential for high-efficiency cogeneration and district heating and cooling”. The EU project INDIGO is investigating this issue considering also the economic efficiency and the use of renewable energy sources.

In a district cooling system different kinds of cooling production can be combined. E.g., the use of absorption chillers with waste heat or through the solar cooling or the use of free cooling (generally the heat is rejected to seas, lakes, rivers or waterways) offer the possibility of a more sustainable way of cooling. Controlling those systems in an efficient way is a complex problem (consider that the cooling demand is much more difficult to predict than the heat demand, particularly the peaks, and sources such as the solar energy and the waste heat are not predetermined by the designers).

The main results of INDIGO will be the development of:

- predictive controllers (responsible for obtaining the HVAC systems set-points and based on component dynamic thermos-fluid models, some of them also including embedded self-learning algorithms);
- system management algorithms (focused on energy efficiency maximization or energy cost minimization);
- an open-source planning tool (based on design and performance parameters as well as simulation and optimisation results; LCA framework will be used as a method for both economic feasibility and climate impact assessment).

To validate the results, the consortium is analysing case studies, both through energy modelling and through on-site observations and measurements.

“Sustainable water networks, an automated fault detection and diagnosis of water network systems (WATERNOMICS)”

Authors

Domenico Perfido, R2M Solution, Italy- is a registered professional engineer in Italy in the field of civil engineering with specializations in hydraulic engineering, energy engineering and environmental engineering.

Chiara Zanotti, R2M Solution, Italy- holds a summa cum laude Master Degree in Environmental science form the Universita Milano Bicocca.

Niall chambers, NUI Galway, Ireland- is a graduate of NUI Galway (2014), in the new and innovative Energy Systems Engineering bachelor’s degree course, in which he specialised in Mechanical Engineering and achieved a high first class honours.

Louise Hannon, NUI Galway, Ireland- works as an employee at NUI Galway and as chartered engineer with 18 years’ experience in a wide variety of civil end environmental engineering projects.

Marcus Keane, NUI Galway, Ireland- has extensive knowledge and experience in the development of integrated Building Information Models (BIM) that encapsulate the processes and data associated with holistic environmental & energy management in buildings and industrial processes.

Eoghan Clifford, NUI Galway, Ireland- is currently a lecturer in Civil Engineering, NUI Galway with 12 years’ experience in the areas of water, wastewater, waste treatment and sustainable transport in the academic, research and private spheres.

Andrea Costa , R2M Solution, Italy- is a qualified chartered engineer and building energy rating (BER) assessor in Italy and a Certifiend Energy Manager (CEM) affiliated to the Association of Energy Engineers (AEE). He is expert in building simulation with experience on an array of building energy simulation software and ISO 50001 certification tools.

Innovation

The novelty of this project is to apply to water systems field all the best practices and innovation already applied to the energy field. FDD has been applied recently in energy and HVAC systems but not yet to water systems and water network simulation environment, this is done for the first time within this project.

“Sustainable water networks (WATERNOMICS)”

Journal Paper Abstract

This paper present one of the results of the WATERNOMICS project, the key problem addressed in WATERNOMICS is the lack of water information, management and decision support tools that present meaningful and personalized information about usage, price, and availability of water in an intuitive and interactive way to end users. On average water networks in EU have leakages and inefficiencies that results in 20-30% water losses, new technologies are needed to solve this issue and make EU more sustainable. The paper will give an overview of the WATERNOMICS project and present the of FDD approach for water networks developed within the project. In particular, the FDD system developed is based on the hydraulic modeling of the water network, the real time values of flow and pressure obtained from installation of innovative ICT and commercial smart meters and the application of the ADWICE algorithm adapted for the drinking water network. The FDD system developed is useful when more than one parameter need to be considered at the same time to determine if an anomaly or fault is in place in a complex water network. The system is designed on purpose to cope with a larger features set. The new FDD system will be implemented in an Italian demo site, the Linate Airport Water network in Milan, where a large water distribution network is in place and where, due the many variables coming into play, it could be very difficult to detect anomalies with a low false alarm rate. The anomaly detection module will be based on an existing algorithm, called ADWICE [2]. This class of algorithms is based on modelling the system selecting the best set of parameters that characterize the operational conditions (flow rate, pressure, energy consumption for pumps system, ground water level for the wells, etc.) assuming normal operation, i.e. absence of problems (leaks, faults, etc.). This model will be used as a comparison baseline with the operational values observed by the water sensors installed in the network in real time. Whenever the system under observation is not found to be operating in the modelled normal region and the deviation between the normality and the current situation exceeds a certain threshold, an alarm is raised. [1] M. Raciti, “Anomaly Detection and its Adaptation: Studies on Cyber-Physical Systems,” Linköping University, 2013. [2] M. Raciti, J. Cucurull, and S. Nadjm-Tehrani, “Anomaly Detection in Water Management Systems,” in Advances in Critical Infrastructure Protection: Information Infrastructure Models, Analysis, and Defense, 2012, pp. 98–119.

TRACK 10:

BUILDING ENERGY MODELLING & OPTIMIZATION

Chaired by: Regis Decorme, CSTB

Contributing Authors

“ARMA vs Deep Networks for Time Series forecasting” (PERFORMER)

Author

Anthony Mouraud, CEA, France—Responsible of Machine Learning and Software Engineering Projects at CEA Tech Nantes.

ARMA MODELS

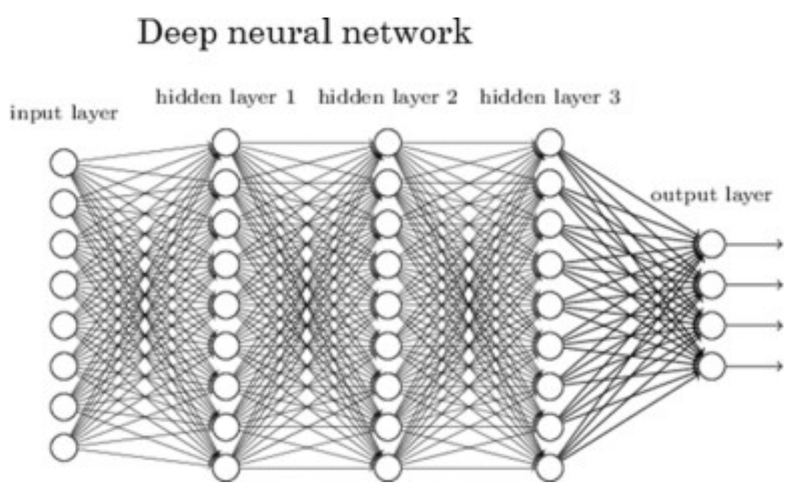
- Auto regressive
- Moving average

- $X_t = C + \mu + \sum_{i=1}^{n} \propto_i X_{t-i} + \sum_{i=1}^{p} \beta_i \varepsilon_{t-i} + \varepsilon_t$

- Perdiodic, stationary signals
- Learn $\propto_i$ and β_i parameters

DEEP NETWORKS MODEL

- Multilayer feedforward
- Deep Highway Network
  - $y = H(x, W_H).T(x, W_T) + x.C(x, W_C)$
- Learn W_H, W_T and W_C matrices
- Adapted to problem ?



T;10: BUILDING ENERGY MODELLING & OPTIMIZATION

ARMA vs. Deep Networks (PERFORMER)

Innovation

Gives an insight in comparative performances of a commonly used model in time series prediction and a state of the art model in deep learning.

Presentation Abstract

"Over "Growing interest in meaningful indicators extraction from the huge amounts of data generated by energy efficient buildings instrumentations has led to focusing on so called smart analysis algorithms. This work proposes to focus on statistical and machine learning approaches that make use only of available data to learn relationships, correlations and dependencies between signals. In particular, time series forecasting is a key indication to anticipate, prevent and detect anomalies or unexpected behaviors. As part of the PERFORMER European project, this work focuses on real data produced by instrumented buildings recorded time series among environmental, energy or occupancy domains. We propose to compare performances of a classical ARMA approach to a Deep Highway Network on time series forecasting only making use of past values of the series. In recent years, Deep Learning has been extensively used for many classification or detection tasks. The complexity of such models is often an argument to discard such approaches for time series prediction w. r. t. more common approaches performances. Here we give a first attempt to evaluate benefits of one of the most up to date models in the literature for time series prediction.

“Interdisciplinary approach for energy management in office buildings: Energy Optimization Model” (TREND Control Systems)”

Authors

Maciej.Czajka, Trend Control Systems Ltd., UK

Master of Science in Robotics, PhD student of controls at the Poznan University of Technology (PL), Sr Technical Manager in TREND Control Systems Ltd. He has multidisciplinary experience in both process and building controls. Designer, pro grammer, commissioning engineer, project manager, trainer in a range of control systems. Author of articles on PID autotuning. He is interested in self-learning and auto-adaptive algorithms. Member of PERFORMER Special Interest Group.

Bartłomiej Dessoulav-Śliwiński, University of Warsaw, Poland

lecturer and rsearcher at Faculty of Economic Sciences, University of Warsaw, Poland. He has experience in Facility Management and Real Estate both as researcher and consultant. Trainee at Fraunhofer (Germany) and IBM TJ Watson Research Center (USA). Certified Business Process Modeler and a member of the Facility Management Committee and Chair of Real Estate Market Committee at Polish Committee for Standardization. Author of books and articles on process management and Facility

Innovation

We would like to show that integrated energy management of an office buildings is necessary to use technical capabilities most effectively. The proposed Integrated Energy Management Model for Facilities Managers provides insight into the assessment of parameters that affect energy use, but also maintenance costs, organizational performance and risk in facilities. This model helps to create an energy strategy that addresses financial obligations and affords scalability for the future. Model Predictive Control (MPC) is presented to optimize alternatively 3 main factors of building utility consumption/ emission. The model is estimated on-the-fly, that feature enables adaptation as the model is fitted using past & recently data. Presentation discusses the importance of adopting an integrated interdisciplinary approach to Facility Management strategy, showing, that energy optimization must be seen as a part of a complex system, which is supported by technical means and IT tools. We would like to show selected models that have been developed to measure and improve the energy efficiency and apply them into integrated performance measurement model for FM.

"Energy management in office buildings (TREND)"

Presentation Abstract

Trend (UK) is a leader of networked building controls focused on energy savings (BeMS). Beginning from simple solutions as self-reseting setpoints through optimized start-stop algorithms up to model based energy optimizer Trend tries to keep the comfort conditions and human's satisfaction on high levels decreasing energy use in a background. The latest solution that is still in beta phase gives absolutely positive feedback and helps to reduce cost, energy or CO2 emission in new buildings and old ones. The more points of installations are monitored/ controlled the more energy can be saved. The model collects data about ambient and installation parameters, checks energy demands and estimates the best adjustments for main "energy consumers" in a building, e.g. chillers, boilers, AHUs.

The positive action of the optimizer can be seen through a simple day-after-day switching strategy that changes user's adjustments to calculated ones and vice-versa. Despite technology development and wide plans to deploy smart metering in office buildings, there is still little knowledge of occupant energy use in offices. The objectives of the presentation is to investigate the effect of individual feedback on energy use at the workplace, and to show the relationship between occupant behavior, Facility Management strategy and building technology. Office energy use is influenced by variety of factors, some within the control of BeMS, while others are perhaps beyond the control. Our presentation is based partly on "Energy Cultures" framework presented by Stephenson et al.'s (2010), where he suggests that energy consumption behavior results from interactions between cognitive norms, material culture and energy practices." In the presentation we would like to show that Facility Management strategy driven by technological change would be more rational way to obtain minimal energy use in office building than implementation of pure energy-saving technology. Solving this problem actors must take interdisciplinary viewpoints (real estate, space management, finance, energy market, occupant behaviors, organizational behavior, building technology). We would like to show how modern technology helps to overcome organization's unwillingness to consider changes to their energy behaviours and helps Facility Managers to do it properly.

Energy management in office buildings is very important part of Facility Managers strategy. Presentation discusses the importance of adopting an integrated interdisciplinary approach. The need for a wide range of factors is initially required including occupants behaviors and their comfort zones, organizational primary processes, cost/benefit solutions etc. and all influence Facility Management practice.

“New application of BIM and factors determining business model for the innovative IT tool” (HISER, BERTIM)”

Author

Przemysław Dana, ASM-Market Research and Analysis Centre, Poland

ASM Market Research and Analysis Centre is a Partner in HISER and BERTIM project specialised in a wide range of research and management consultancy with expertise in construction market research & analysis. ASM leads the market and exploitation tasks in the project as well as is responsible for dissemination and communication activities. Przemysław Dana - International PR Manager at ASM responsible for PR, communication & dissemination activities especially with regard to international markets. Diploma in International Relations, Mass Media & American studies, IV Certificate in Public Relations at Uniworld Business College Sydney.

Innovation

The presentation will focus on one hand on new application of innovative Building Information Models (BIM) and on the other on business models which guarantee a successful implementation of the new IT tools. Both projects go beyond the state of the art. The centre of gravity of HISER overlays innovation and demonstration activities aiming to bridge current obstacles to higher levels of recovery of raw materials from complex End-of-Life buildings and derived C&DW, covering the existing gaps within the whole supply chain, while BERTIM wants to contribute to increased energy efficient building renovation rates in Europe by means of developing energy efficient and cost-effective products for the wood industry. The presentation will show how to build commercialization strategies for the new types of BIM solutions aimed at improvement of building energy efficiency and better reuse of raw materials from construction and demolition waste. As the innovative character of the HISER and BERTIM projects implies special requirements for business strategies linked to the BIM technologies, the main aim of this speech is to identify those technical elements of the aforementioned projects which have a crucial impact on the business models assumptions. The presentation will also include a description of links between the identified technical elements and the main areas of business model.

T;10: BUILDING ENERGY MODELLING & OPTIMIZATION

New application of BIM (HISER, BERTIM)

Presentation Abstract

"Over the past decades, there has been a growing interest of the construction sector in using Building Information Models (BIM) as a consequence of potential benefits and resource savings. BIM adoption is growing fast and is becoming mandatory or at least recommended in several countries, especially when dealing with public procurement . The vast majority of scientific knowledge focuses on the the construction process (programming and design). However, current research shows that a new, innovative types of BIM can be used in many other daily works in sustainable construction sector.

Demolition/deconstruction planning in the context of BIM is one of the novel area of research and development. Improvement in decision making methods and tools about demolition and management of subseguent waste materials arising from residential and non-residential stocks is needed. It is one of the aim of HISER project (Holistic Innovative Solutions for an Efficient Recycling and Recovery of Valuable Raw Materials from Complex Construction and Demolition Waste). A new Building Information Modeling based tool (so called as Smart BIM-SD tool) will be designed and developed. That specific BIM for selective demolitions/renovations of existing buildings will help European demolition companies to quickly identify and quantify potential new raw materials through the smart processing of data. The BIM based tool will provide users with harmonized inventories and supply chain tracking information with the purpose of identifying the most feasible and secure recovery options for the subsequent Construction and Demolition Waste (C&DW) materials.

BIM can be also widely used in energy efficient deep renovation process which will be proved in BERTIM project (Building Energy Renovation Through Timber Prefabricated Modules). BERTIM will develop a prefabricated solution which will provide the opportunity to renovate improving energy performance, air quality, aesthetics, comfort, and property value at the same time, while ensuring low intrusiveness during renovation works. Additionally, the manufacturing of the solution will be included in a holistic methodology for the renovation project process, from data collecting to installation. The systemic methodology will be based in a digital data flow in BIM that will be implemented in a software named RenoBIM, that will enable reduction of renovation operation time, customized mass production, and lower financial risk for investors.

SPECIAL SESSIONS:

RESILIENT FINAL EVENT, AND

PERFORMER PRIVATE MEETING

SUSTAINABLE PLACES 2016 June 29-July 1, 2016 Anglet, France

PERFORMER Project

The PERFORMER project tackles energy efficiency at building level. PERFORMER will develop a solution to reduce the gap between estimated and actual buildings energy consumption. PERFORMER aims to devise a holistic (total lifecycle, multi-aspects, context-based) building energy monitoring methodology that factors in appropriate energy performance indicators, information models, and simulation tools, to achieve building energy performance targets. The project energy performance simulation and monitoring aspects will rely on an ICT infrastructure that will re-use, adapt, and further develop a number of open source and commercial technological blocks, including: an “energy instrumentation kit in a box”, an energy simulation environment, and a building legacy and monitored data storage and computing infrastructure.

RESILIENT project

The RESILIENT project aims to design, develop, install and assess the energy and environmental benefits of a new integrated concept of interconnectivity between buildings, DER, grids and other networks at a district level. The RESILIENT approach will combine different innovative technologies including smart ICT components, optimised energy generation and storage technologies, also for RES, integrated to provide real time accounts of energy demand and supply at a district level and assist in decision-making process.

The project strategy relies on a comprehensive R&D and demonstration approach. The proposed integrated concept will be first modeled and simulated for different typologies of buildings and different climates and then installed, monitored and evaluated in three pilot projects (including residential and non residential buildings) in the UK, Belgium and Italy. These demonstrators will be used to assess the energy and environmental benefits of the new integrated concept and also to validate models and technologies in order for the concept to be easily replicable throughout different climatic areas.

The major impact from RESILIENT will be the development of a complete value chain where the annual primary energy demand of buildings collated at a district level is decreased by at least 20% compared to their expected energy performance summed on an individual building basis, this energy gain being associated with a decrease of more than 20% of the CO_2 emission reference level.

SPECIAL SESSIONS:

RESILIENT FINAL EVENT, AND

PERFORMER PRIVATE MEETING

SUSTAINABLE PLACES 2016

June 29-July 1, 2016
Anglet, France

SPECIAL SESSION N°1: (**RESILIENT**)

Partners welcome	DAPP
ICT framework development & Demonstration session	CSTB/CEA/BRE
Coffee break	
Energy technology enhancement & Demo site improvements – Energy savings and Environmental benefits	UNIGE/BGCBC/CORDIUM/ /CU
After Resilient: future development opportunities	DAPP/UNIGE/CSTB/CEA…

SPECIAL SESSION N°1: (RESILIENT)

RESILIENT project FINAL EVENT: Coupling renewable, storage and ICTs, for low carbon Intelligent energy management at district level (Grant Agreement No. 314671) [www.resilient-project.eu]

The final event was undertaken by the RESILIENT project (FP7) consortium will occur on 29th June, from 14:00h to 17:00h, and is open to all SP'16 attendees.

FINAL EVENT AGENDA

The RESILIENT Final Event aims to present to a wide audience involving different stakeholders the main project achievements classified in the following categories:

- ICT Framework development
- Energy technology enhancements, Demosite realisation, Monitoring and ICT framework deployment

Key Exploitable Results, standardisation and liaison activities

The final event will combine both presentations and a live demonstration.

FINAL EVENT CONTEXT

RESILIENT is a FP7 Collaborative Project Co-funded under the umbrella of EeB.NMP.2012-1 – Interaction and integration between buildings, grids, heating and cooling networks, and energy storage and energy generation systems.

The project timeframe is 1st of September, 2012 – 31st of August 2016.

RESILIENT project advocates the development of an open energetic ecosystem based on the innovative integrated combination of the micro-grid and energy hub concepts applied at district level. In particular the RESILIENT concept generalises the building-to-building and building-to-grid energy interactions enabled by and agent-based ICT framework, providing real time accounts of energy demand and supply at a district level and assisting in decision-making.

SPECIAL SESSIONS

RESILIENT

www.resilient-project.eu

RESILIENT DEMONSTRATION SITES

The project relies on a comprehensive R&D and demonstration approach. The proposed integrated concept is first modelled and simulated for different typologies of buildings and different climates and then installed, monitored and evaluated in three pilot projects (including residential and non-residential buildings) in the UK, Belgium and Italy. These demonstrators will assess the energy and environmental benefits of the new integrated concepts and also validate models and technologies in order for the concepts to be easily replicable throughout different climatic areas.

There are three project demonstrator sites in the RESILIENT project:

EBBW VALE

Pilot site area size: 750,000 sq meters

Location: Ebbw Vale, S. Wales, UK

CORDIUM

Pilot site area size: 6,600 sq meters

Location: Cordium, Hasselt, BE

UNIV CAMPUS SAVONA

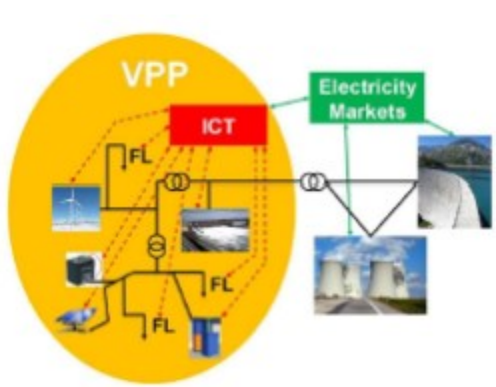
Pilot site area size: 50,000 sq meters

Location: Savona, IT

SPECIAL SESSIONS

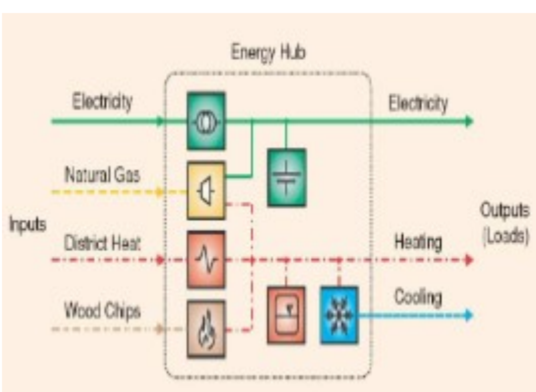
RESILIENT
www.resilient-project.eu

To improve the integration of Renewable Energy Sources (RES) in the grid, several concepts have been developed by RESILIENT project collective efforts:



Virtual Power Plant (VPP). VPP is a cluster of distributed energy generation installations (such as CHP, wind-turbines, small hydro, etc.) which are collectively run by a central control system over an information network (managed by ICT). To balance the weather-dependent power production, flexible loads (FL) and storage capabilities are added. Therefore, the group of DER is comparable to a power plant connected to the transmission grid. Participation in the energy market is then facilitated. Interaction of different energy carriers is only rarely considered.

Microgrid. A microgrid is a cluster of DER and loads operating as a single, autonomous grid either in parallel to or “islanded” from the existing utility power grid. In the most common configuration, DER are tied together on their own feeder, which is then linked to the grid at a single point of common coupling. More than 160 microgrid projects are currently active around the world, with power generation capacity totalling more than 1.2 GW. For reasons of reliability microgrids should be implemented in a small local area.



Energy Hub. An energy hub is a unit where multiple energy carriers can be converted, conditioned, and stored. It represents an interface between different energy infrastructures and/or loads. Energy hubs consume power at their input ports connected to, e.g., electricity and natural gas infrastructures, and provide certain required energy services such as electricity, heating, cooling, and compressed air at the output ports. Within the hub, energy is converted and conditioned using, e.g., CHP technology, transformers, power-electronic devices, compressors, heat exchangers, and other equipment. This concept is quite new.

SPECIAL SESSION N°2: (PERFORMER CLUSTER)

PERFORMER CLUTERING WORKSHOP (Private Meeting)

Organisers: PERFORMER, Tribute, Energy in Time, DIRECTION (to be confirmed)

Since the SP2014 event, PERFORMER, Tribute, EIT (Energy In Time) and Direction meet up every year to create and develop synergies between. The DIRECTION project ended last year and is no longer part of the Clustering workshop but the three other projects aim at reducing the gap between expected and actual building energy performance using different approaches, however, similar tools and methods are devised in each project to achieve their objectives. It is therefore important to understand how the projects can benefit from each other and optimize their results and overall performance.

It is one of the European Commission requirements to encourage projects to make the most of their synergies and cultivate their common ground to eventually come up with greater results and expand their expertise.

Performer, Tribute and EIT identified and defined the technical and strategic fields that they had in common and strived to put together their exploitable results. Since the last workshop at SP2015, they pushed their ambition forward to come up with an exploitation map that will help to compare their common exploitable results and understand how they stack against each other. This step is important for each project to understand the most valuable results they should focus on when devising their business models. As they all mostly reached an advanced stage, the projects will have to undertake a new path towards *a time to market* scale and get aligned with the European Commission objectives to drive Research towards Business.

This year, PERFORMER, Tribute and EIT will present their exploitable results and will discuss the potential business models they could develop as well as the strategy that each of them should adopt to eventually make their offer unique on the market.

Chair : Anna Perehinec, PERFORMER

Co-organisers : Giulia Barbagelata, (EIT) – Henri Obara, (TRIBUTE)

SPECIAL SESSION N°2: (**PERFORMER CLUSTER**)

PERFORMER Demo Sites

Hotel de Las Letras; Madrid SP

St Teilo School; Cardiff UK

Woopa office; Lyon FR

Baltic Plaza Hotel; Kolobrzeg PL

WORKSHOPS N°1-N°3

WORKSHOPS N°3-N°5

SP'16 WORKSHOPS N°6-N°9

PAGE 188: WS-6: Workshop on "New Tools to Reduce the ENERGY PERFORMANCE GAP"

- **HIT2GAP**: Highly Innovative building control Tools Tackling the energy performance gap [www.hit2gap.eu]
- **TOPAs**: Tools for Continuous Building Performance Auditing [www.topas-eeb.eu]
- **QUANTUM:** Quality management for building performance [www.quantum-project.eu]
- **MOEEBIUS:** Modelling Optimisation of Energy Efficiency in Buildings for Urban Sustainability [www.moeebius.eu]

PAGE 206: WS-7: Workshop on "ADAPTABLE INDUSTRIALISED ENVELOPES: Modules Integrating Systems for the Renovation of Existing Buildings"

- **E2VENT**: Energy Efficient Ventilated Facades for Optimal Adaptability and Heat Exchange enabling novel NZEB architectural concepts for the refurbishment of existing buildings [www.e2vent.eu]
- **BRESAER**:BREakthrough solutions for adaptable envelopes for building refurbishment [www.bresaer.eu]
- **BERTIM:** Building Energy Renovation Through Timber Prefabricated [www.bertim.eu]
- SymBIO2 Biofacades: Microalgae production in symbiosis with the building

PAGE 224: WS-8: "FASUDIR RESULTS workshop: towards Friendly and Affordable Sustainable Urban District Retrofitting"

- **FASUDIR:** Friendly and Affordable Sustainable Urban Districts Retrofitting [www.fasudir.eu]

PAGE 230: WS-9: "ENERGISE workshop: COMMUNICATIONS INFRASTRUCTURE – Strategies for Smart Grid Applications"

- ENERGISE: ICT-based ENERgy Grid Implementation – Smart and Efficient [www.project-energise.eu]

SP'16 WORKSHOPS N°10-N°13

PAGE 236: WS-10: "How to get energy and cost savings during BUILDING OPERATIONS & MAINTENANCE workshop"

⇒ Energy IN TIME: Simulation-based control for Energy Efficiency building operation and maintenance[www.energyintime.eu]

PAGE 242: WS-11: "BUILT AS DESIGNED workshop: New Technologies for Self-Inspection and Quality Checks on the Construction Site"

⇒ ACCEPT: Assistant for quality check during construction execution processes for energy-efficient buildings [www.accept-project.com]

⇒ Built2Spec: Built 2 Specifications [www.built2spec-project.eu]

⇒ INSITER: Intuitive self-inspection techniques using augmented reality for energy-efficient buildings made of prefabricated components [www.insiter-project.eu]

PAGE 258: WS-12: Workshop on "Challenges of PUBLIC BUILDING RETROFITTING with Innovative Technologies – An exchange of experience"

⇒ **BRICKER:** Energy Reduction in Public Building Stock [www.bricker-project.com]

⇒ **A2PBEER:** Affordable and Adaptable Public Buildings Through Energy Efficient Retrofitting [www.a2pbeer.eu]

⇒ **RESSEEPE:** REtrofitting Solutions and Services for the enhancement of Energy Efficiency in Public Edification [www.resseepe-project.eu]

PAGE 274: "TRIBUTE workshop: Improvement of the predictive capability of a state-of-the-art commercial BEPS"

⇒ **TRIBUTE:** Take the energy bill back to the promised building performance [www.tribute-fp7.eu]

WS-1

"HISTORIC CITIES IN TRANSITION:

TOWARDS A SUSTAINABLE AND RESILIENT ENVIRONMENT"

Chaired by:

FASUDIR, EFFESUS

WORKSHOP-DEDICATED WEBPAGE:

http://sustainable-places.eu/sp-2016/programme/sp16-workshops/historic-cities-transition/

FASUDIR: "Friendly and Affordable Sustainable Urban Districts Retrofitting [www.fasudir.eu]" 110

EFFESSUS: "Energy Efficiency for EU historic districts' Sustainability www.effesus.eu" 114

WS-1: "**HISTORIC CITIES IN TRANSITION**: TOWARDS A SUSTAINABLE AND RESILIENT ENVIRONMENT"

Workshop Context

Context

During last decades, the international community has become aware of the need to adapt to the effects of climate change, as the sensitivity of natural and human systems gained relevance. Europe is one of the most urbanised regions, accounting for a 73% of people living in urban areas a share which, together to the increase of urban land take, has concentrate the fight against climate change in cities, considered as one of the most vulnerable areas.

European cities are characterised by a wide range of cultural heritage, which is commonly encountered in what is usually defined as the historic city. In order to support the protection of urban heritage in a constantly changing environment, emphasis needs to be put on the integration of conservation management and planning strategies within wider goals of overall local sustainable development and urban planning and practice.

Historic cities have a great potential in contributing to the city's economy by stimulating tourism and enhancing investment climate. Modern conservation strategies should therefore address a balance between urban growth and quality of life in a sustainable way and should match the interrelationships of physical forms, spatial organisation, natural features and social, cultural and economic values. Furthermore, the need to address a new generation of strategies, adapted to new climatic scenarios, should be considered as a priority for an effective management of the whole city.

Agenda

The "Historic Cities in Transition, Towards a Sustainable and Resilient Environment" workshop enables discussions surrounding innovative methodologies, urban data models, and ICT solutions to assist urban managers in improving the sustainability and resilience of historic cities from a multi-scale perspective. Two papers were presented and discussed.

Historic cities in transition: towards a sustainable and resilient environment

Aitziber Egusquiza, Alessandra Gandini (Tecnalia, Spain)

The energy consumption in the cities currently exceeds 70% of world energy consumption and in regards to emissions, 75%, - origin mainly from energetic character - are already produced in the urban environment while the occupied surface does not exceed 2%. All this suggests not only the need for energy networks and infrastructures that allow to distribute the necessary energy but also find alternative energy sources and new tools that will reduce consumption and emissions in existing cities.

Climate change risks reduction in historic cities

Alessandra Gandini, Rosa San Mateos, Leire Garmendia (Tecnalia, Spain)

The innovation potential of the methodology lies in the definition of context-specific indicators/variables for cultural heritage characterization (multilevel/multilayer), vulnerability mapping and definition of "typologies" with regards to climate change vulnerability/ resilience. The project proposes a holistic strategy incorporating synergies in adaptation and mitigation measures contributing to a more effective advice in the decision making process.

FASUDIR: "Friendly and Affordable Sustainable Urban Districts Retrofitting"

FASUDIR develops new business models and financial supporting tools, to support the necessary building-retrofitting market mobilisation in Europe towards EU-targets in 2020 and 2050. The key instrument will be the Integrated Decision Support Tool (IDST), developed to help decision makers to select the best energy retrofitting strategy to increase the sustainability of the whole district. With stakeholder feedback loops, training, and validation in three diverse urban areas, the IDST will ensure robustness and applicability in the entire value chain.

The IDST Decision making

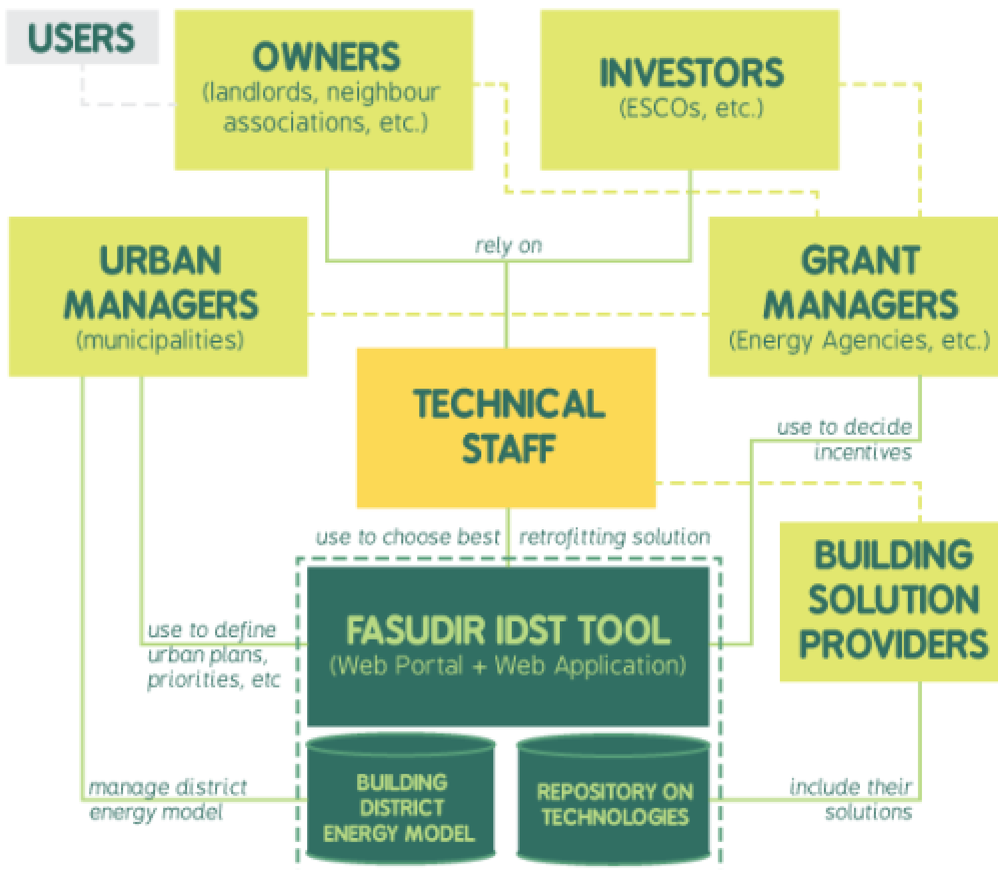
The key instrument will be the Integrated Decision Support Tool (IDST), developed to help decision makers to select the best energy retrofitting strategy to increase the sustainability of the whole district. With stakeholder feedback loops, training, and validation in three diverse urban areas, the IDST will ensure robustness and applicability in the entire value chain.The IDST will be based on a decision making methodology, designed to select and prioritise energy efficiency retrofitting interventions. It will implement existing and new cost-effective solutions, for significant sustainable improvements in the rehabilitation of urban districts.

Taking into account the different European urban typologies and the priorities of the decision makers, the methodology will support retrofitting actions that are deployed as a unique intervention, but also scheduling sequential interventions in the most cost-effective way. This methodology will focus on the initial stage of the retrofitting process at district level, in which the retrofitting framework is established, with the definition of strategies and technological solutions. Ultimately, the IDST will allow selecting the optimal, off-the-shelf technologies and strategies for each specific energy retrofitting project in terms of sustainability as a whole (environmental, economic and social). To ensure usability and effectiveness, the IDST will contain a collection of sustainable retrofitting strategies and technical solutions at building and district level. Each strategy will be characterized according to different aspects, such as adequacy, costs, technical properties, environmental parameters, and so on.

The software will enable modelling the district and building with an adequate level of definition, in such a way that evaluation results will be precise enough, but the input data to define the retrofitting project will be easily supplied. The IDST will feature a 3D graphical user interface, in order to facilitate the interaction between the multiple stakeholders involved in the decision making process. The users will be able to select the most promising sustainable retrofitting strategies and technical solutions at building and district level, by choosing from a ranked list of possible scenarios proposed by the IDST.

FASUDIR
Friendly and Affordable Sustainable Urban Districts Retrofitting

The traditional approach to the building energy efficient retrofitting brings poor results in relation to the urban sustainability, resource efficiency and economic return. Although the district retrofitting approach is frequently the most sustainable and cost-effective, the complexity of decision making grows exponentially when the intervention targets larger scale, even more when considering the fragmentation of the construction sector. The FASUDIR project was born to develop new business models and financial supporting tools, to support the necessary building-retrofitting market mobilization in Europe to fulfill EU-targets in 2020 and 2050.



Intended Outcomes

The IDST shall be validated in three different European urban developments that are representative of different district typologies that are common in Europe, and especially in need of energy retrofitting initiatives:

✦ **Cultural heritage districts**: historic city quarter of Santiago de Compostela, Spain (founded in the XIII century)

✦ **Communist era district from the XX century**: Residential district with public buildings in Budapest, Hungary

✦ **Residential districts built up on the 1970's decade of the 20th century**: Heinricht-Lübke-Siedlung in Frankfurt, Germany

Wherever possible, the validation will be carried out against real data, to compare the results that are provided by the tool with the ones that were achieved by the real retrofitting project.

The case studies will be crucial to improve the global functionality and the application process of the IDST.

Consortium members

1. Fundación Tecnalia Research & Innovation Spain (PC)
2. University of Applied Science, Munich Germany
3. ACCIONA Instalaciones SA Spain
4. D'Appolonia S.p.A. Italy
5. Integrated Environmental Solutions LtD, UK
6. Geonardo Environmental Technologies LtD Hungary
7. ABUD Mernokiroda KFT Hungary
8. CalCon Deutschland AG Germany
9. Consorcio de Santiago Spain
10. London Business School United Kingdom
11. iiSBE Italia R&D srl Italy

EFFESUS: Energy Efficiency for EU Historic Districts Sustainability [www.effesus.eu]”

Introduction

EFFESUS is a research project investigating the energy efficiency of European historic urban districts and developing technologies and systems for its improvement. The term “historic urban district” in the context of EFFESUS, is defined as a significant grouping of “old” buildings built before 1945 and representative of the period of their construction or history, not necessarily protected by heritage legislation. EFFESUS is funded by the European Commission under its Seventh Framework Programme.

Consortium

The EFFESUS consortium unites 23 partners from the academic sector, industry and municipal authorities from 13 different European states:

TECNALIA Research & Innovation – Spain

Fraunhofer-Gesellschaft – Germany

FRAUNHOFER-INSTITUTE FOR BUILDING PHYSICS IBP – Germany

FRAUNHOFER-CENTER FOR INTERNATIONAL MANAGEMENT AND KNOWLEDGE ECONOMY IMW – Germany

R.E.D. SRL – Italy

Integrated Information Systems (I2S) – Greece

SNEKKERIET VERDAL AS – Norway

SAMPAŞ Nanotechnology (SNANO) – Turkey

D’APPOLONIA SPA – Italy

Consortium of the City of Santiago de Compostela (SANTIAGO) – Spain

ACCIONA Infrastructures S.A. – Spain

Uppsala University (UU) – Sweden

EURAC RESEARCH – Italy

Delap & Waller EcoCo Ltd. (DWE) – Ireland

Dennis Rodwell (RODWELL) – United Kingdom

National Research Council – Institute of Atmospheric Sciences and Climate (CNR-ISAC) – Italy

University of Stuttgart – Institute of Materials Testing (USTUTT) – Germany

Norwegian University of Science and Technology (NTNU) – Norway

BOFIMEX BOUWSTOFFEN BV – Netherlands

Historic Environment Scotland (HES) – United Kingdom

Proctor Group Ltd. (APG) – Uinted Kingdom

HOR-BER Ltd. – Hungary

SAS GOUAS – France

Advanced Management Solutions Ltd. (AMS) – Greece

Active Aerogels (AA) – Portugal

Intended Outcomes:

The member states of European Union have committed themselves to saving 20 percent of their primary energy consumption by 2020 and thus reduce CO2 emissions. Accordingly, a main focus of Europe's effort is to increase the energy efficiency of buildings. Historic buildings and districts have so far received little attention. The EFFESUS project is therefore to investigate all energy related aspects relevant to historic buildings and urban districts. The project will consider both the energy efficiency of individual buildings, building ensembles and districts, as well as energy generation from renewable sources within historic urban districts. The concept behind the EFFESUS is to reduce the environmental impact of Europe's valuable urban heritage by making significant improvements to its energy efficiency and thereby improving its sustainability while conserving and even promoting the architectural, cultural, historic and urban values of Europe's historic cities. The overall objective of EFFESUS is to develop and demonstrate, through seven case studies, a methodology and criteria for selecting and prioritising energy efficiency interventions, based on existing and new, costeffective technologies and systems compatible with heritage values, to achieve significant lifecycle energy efficiency improvements in the retrofitting of historic districts.

The four main scientific objectives are:

1. Categorisation of European historic districts and development of a multiscale data model

2. Evaluation, development and implementation of cost-effective technologies and systems for significantly improving energy efficiency in historic districts

3. Development of a methodology and a software tool to assess energy retrofitting interventions in historic districts

4. Overcoming technical and nontechnical barriers for the implementation of project results

The main output of the project will be a Decision Support System (DSS), a software tool, which includes all the parameters needed to select suitable energy efficiency interventions. The seven EFFESUS case studies are essential to the research project, as they will, at real scale, demonstrate the suitability of the new technologies developed through EFFESUS as well as validate Decision Support System (DSS), a software tool. The selected cities will be good practice examples to promote the overall use of EFFESUS technologies all over Europe and beyond.

WS-2

“BIM-BASED DESIGN:

ICT TOOLS FOR BUILDING SIMULATION & ASSESSMENT OF HIGH-PERFORMANCE BUILDINGS”

Chaired by:

HOLISTEEC, Design4Energy, STREAMER, and eeEmbedded

WORKSHOP-DEDICATED WEBPAGE:

http://sustainable-places.eu/sp-2016/programme/sp16-workshops/bim-based-design/

WS-2: "**BIM-BASED DESIGN:** ICT TOOLS FOR BUILDING SIMULATION & ASSESSMENT OF HIGH-PERFORMANCE BUILDINGS"

Workshop Leadership & Project-Dedicated Webpages on the SP'16 website

WS-2: "**BIM-BASED DESIGN:** ICT TOOLS FOR BUILDING SIMULATION & ASSESSMENT OF HIGH-PERFORMANCE BUILDINGS"

Workshop Context

SUSTAINABLE PLACES 2016
June 29-July 1, 2016
Anglet, France

The "BIM-BASED DESIGN" workshop at SP'16 will address tools for BIM collaborative design, and KPIs definition for EeB and smart cities. Specifically, the following topics will be addressed:

- Collaborative and integrated approach in order to involve in the decision-making process all the strategic stakeholders, increasing the harmonization among the design of the different building design components
- BIM (Building Information Model) use since the early design stagesas a common basis on which rely on in order not to miss or duplicate information over the whole project implementation
- A performance-based approach so that to emphasize the setting of project targets as functional targets of end product (building) and evaluate the fulfillment of these targets during design, construction and operation. This approach is based on the definition of a performance evaluation framework in terms of Key Performance Indicators (KPIs).

The workshop targets stakeholders involved in the activities related with building design processes: Building owners, Construction managers, Architects, Engineers and Contractors, Facility managers and building permitting authorities.

Attendees will be able to get current information on:

- The latest developments of best practices in building design methodology.
- The latest advancements in software and tools development for building design processes.
- Few examples from demonstration activities of tools developed within EC flagship projects for the building domain, in relation with communication management issues for the BIM processes and in KPI management for a performance based evaluation of building design models.

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Workshop Agenda

SUSTAINABLE PLACES 2016 June 29-July 1, 2016 Anglet, France

Session 1 (10.30 – 12) : "Methodologies and KPIs for performance-based design" (1h 30m)

- HOLISTEEC – Project and focus, methodology features and KPI definition (20 mins)
    - workflow to collaboratively design and construct building (Davide Mazza)
    - KPI-based design: definition, computation and management (Dirk Van Maercke)
- STREAMER – A methodology for hospitals application (20 mins) ◦
    - Presentation of the design methodology adopted in STREAMER (Freek Bomhof)
    - KPI management in the STREAMER project (André van Delft)
- eeEmbedded – Project and focus, methodology features and KPI definition (20 mins)
    - Collaborative design methodology and KPI definition (Romy Guruz)
    - Interoperability and interlinking among design models (Mathias Kadolsky)
- Design4Energy – Design methodology for creating energy-efficient buildings (20 mins)
    - Overview of the workflow and the underlying methodology (May Bassanino / Terrence Fernando)

Session 2 (14 – 15.30) : "Tools for performance-based design" (1h 30m)

- HOLISTEEC – The HOLISTEEC design platform (Asier Mediavilla) (20 mins)
- STREAMER – The tools for hospital performance-based design (20 mins)
    - Tools developed for STREAMER project to support design flow (Marc Bourdeau)
- eeEmbedded – eeBIM Lab and Collaborative Design Platform (Raimar Scherer) (20 mins)

Design4Energy: “Building life-cycle evolutionary Design methodology able to create Energy-efficient Buildings flexibly connected with the neighborhood energy system” [www.design4energy.eu]

Project Introduction

“If we want to create long term energy efficient building we must not only consider the present building life cycle scenario but also VISUALIZE THE FUTURE”. Visualizing the future will help us to design energy efficient building not only for the present but also for the future, ensuring an Energy Efficient Life Cycle of the building. Design4energy project will take this into consideration and will develop tools and methodologies that can help designing energy efficient buildings that can consider both short term performance as well as future scenarios, considering important factors such as deterioration curves, technology evolution, climate change effect, users, energy neighborhood configuration, continuous commissioning alternatives while evaluating their impact in the Building Life Energy Performance. The continuous commissioning will include strategies as preventive maintenance, renovation of energy systems technologies (HVAC, RES) etc, including deep retrofitting strategies.

The proposed methodology will be based on a sophisticated technology platform that will make use of energy attributes of building components, deterioration of building components and systems, neighborhood energy systems, energy related parameters, energy simulation tools and current usage parameters of the tenants, derived from maintenance and operation data. The technology platform developed within the Design4energy project will allow the stakeholders to explore various design options and make validated and qualified choices as early as possible.

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DESIGN4ENERGY

Intended Outcomes

Design4Energy project aim to develop an innovative Integrated Evolutionary Design Methodology that can allow the stakeholders to predict the current and future energy efficiency of buildings (both at individual level and neighbourhood level) and make better informed decision in optimising the energy performance at building life cycle level, including operation and maintenance. Develop Information platform to connect Design process with neighborhoods and grids configuration, predicting relevant information for energy matching and performance optimization.

Mapping of the building design solutions that increase energy efficiency in building, maximizing the use of local energy matrix.

The Design4Energy platform will work with current building context and he will allow the creation of evolutionary scenarios in adjacent energy systems.

The Design4Energy platform will allow the creation of evolutionary scenarios that take into account the technological evolution of building materials, components and energy systems and the future user behavior changes.

Creation of Dynamic Energy Efficient oriented Building Design and Information Platform (DEEBDIP) that enable a holistic approach to the energy management in buildings from the initial sketch of the building until the end of its service life, including operation, maintenance and commissioning strategies.

Development of a decision support tool that will suggest the most accurate design options to increase the building energy efficiency.

Creation of a virtual workspace that will allow the actors to interact with the buildings and explore "what-if" scenarios to create energy efficient buildings.

Development of a complete interoperable data exchange protocol among design platform, the energy model module, the monitoring and control system, the metering and the energy benchmarking module and the energy management system.

To validate the Design4Energy methodology including DEEBDIP in three demonstration buildings with different use and different climate conditions, in order to demonstrate the adaptability and replicability of the new methodology.

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Consortium Members

1. Solintel
2. TUD
3. VTT
4. 3L
5. LU
6. FHR
7. Uninova
8. klepierre
9. SALD
10. SYMELEC
11. IZNAB
12. GSM
13. MRI
14. Ancodarq

eeEmbedded: "Collaborative Holistic Design Laboratory and Methodology for Energy-Efficient Embedded Buildings" [www.eeembedded.eu]

Project Introduction

eeEmbedded project is part of the 7th framework program, with a duration time of 4 years. It started on 1. October 2013 and has a budget of nearly 11 M€. A test period of 12 project months, overlapping the first 42 development months of the project, will provide a real pre-market validation of the system on two existing embedded buildings of different types, for instance residential, office or hospital buildings. The development work will be soundly based on 2 business models – the business model of the owners and hence the equipment providers and the business model of construction and design companies, and on a set of ISO and industry standard data structures and specifications such as IFC, STEP, CityGML and OWL.

A new ontology-based Link Model will provide the bridge between the multiple physical and mathematical models involved in the eeBuilding domain warranting the desired data and services interoperability.

Intended Outcomes

eeEmbedded will develop an open BIM-based holistic collaborative design and simulation platform, a related holistic design methodology, an energy system information model and an integrated information management framework for designing energy-efficient buildings and their optimal energetic embedding in the neighbourhood of surrounding buildings and energy systems.

A new design control and monitoring system based on hierarchical key performance indicators will support the complex design collaboration process. Knowledge-based detailing templates will allow energy simulations already in the early design phase, and BIM-enabled interoperability grounded on a novel system ontology will provide for a seamless holistic design process with distributed experts, and a seamless integration of simulations in the virtual design office (energy performance, CO_2, CFD, control system, energy system, climate change, user behaviour, construction, facility operation), thus extending it to a real virtual design lab.

Consortium Members

The eeEmbedded consortium features a mix of 15 partners from 9 European countries, covering the whole knowledge transfer chain and all key areas of research and development relevant to the project goals. They represent 4 types of market segments:9 Software vendors; 4 End-users; 1 University & 1 Research Institute; & 1 BIM consultant.

1. Technische Universität Dresden – Institute of Contruction Informatics
2. Technische Universität Dresden – Institute of Power Engineering
3. Fraunhofer Gesellschaft e.V., Institute IIS/EAS, Germany
4. NEMETSCHEK ALLPLAN SLOVENSKO SRO, Slovakia
5. Data Design System ASA, Norway
6. RIB Information Technologies AG, Germany
7. Jotne EPM Technology AS, Oslo, Norway
8. Granlund Oy, Finland
9. SOFiSTiK Hellas AE, Greece
10. iabi – Institute for Applied Building Informatics, Germany
11. Fr. Sauter AG, Switzerland
12. Obermeyer Planen + Beraten GmbH, Germany
13. Centro de Estudios de Materiales y control de Obra S.A., Spain
14. STRABAG AG, Austria
15. Koninklijke BAM Groep nv, Netherlands

HOLISTEEC: Holistic and Optimised Life-cycle Integrated Support for Energy-Efficient building design and Construction [www.holisteecproject.eu]"

Project Introduction

The **HOLISTEEC** project aims at providing the European AEC/FM industry with a comprehensive design approach taking into account the whole building life-cycle and the influence of the neighborhoods, with the objective to make a decisive contribution to built environment energy efficiency improvement. By means of **HOLISTEEC**, all the actors involved in the building value chain including architects, designers, contractors, owners, component suppliers, users and related public authorities will be able to effectively interact in the different design, construction, operation, and maintenance phases of the building, ensuring that the best construction techniques are applied, possible problems and drawbacks early detected and correction strategies promptly applied, contributing to boost high quality new energy efficient buildings design and construction. Despite recent evolutions of tools/practices in the Architecture Engineering, Construction and Facility Management have already resulted in considerable advances, some limitations remain, related to the complexity and variability of building life cycles, addressing building end user awareness and participation, lack of new business models, life cycle fragmentation, limited interoperability of the ICT supports.

The main objective of HOLISTEEC is thus to design, develop, and demonstrate a BIM-based, on-the-cloud, collaborative building design software platform, featuring advanced design support for multi-criteria building optimization. This platform will account for all physical phenomena at the building-level, while also taking into account external, neighbourhood -level influences. The design of this platform will rely on actual, field feedback and related business models / processes, while enabling building design & construction practitioners to take their practices one step forward, for enhanced flexibility, effectiveness, and competitiveness. HOLISTEEC main assets are: (i) an innovative feedback /loop design workflow (ii) a multi-physical, multi-scale simulation engine; (iii) A unified data model for Building and Neighbourhood Digital Modeling (iv) a full-fledged open software infrastructure for building design tools interoperability leveraging available standards; (v) innovative and flexible user interfaces. HOLISTEEC is expected to have a direct impact at a marco level on the construction sector as a whole, through the following aspects: improved overall process efficiency, improved stakeholders collaboration and conflict resolution, lifecycle cost reduction, reduction of errors and reworks. These impacts will be quantitatively evaluated during the demonstration and validation phase of the project, where the proposed design methodology and tools will be extensively applied to four real construction projects, in parallel to standard design approaches.

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HOLISTEEC

Intended Outcomes

The main objective of the project is to **design, develop, and demonstrate a BIM-based, on-the-cloud, collaborative building design software platform**, featuring advanced design support for multi-criteria building optimization, taking into account external neighbourhood-level influences. The **HOLISTEEC** platform and tool will be applied to real cases, namely four pilot projects especially selected to demonstrate the new holistic approach in different contexts and typologies of building projects, proving its potential for market replication.

Consortium

1. D'Appolonia S.p.A., Italy
2. Koninklijke Bam Groep Nv, The Netherlands
3. Acciona Infraestructuras, Spain
4. NEMETSCHEK ALLPLAN SLOVENSKO SRO, Slovakia
5. Senaatti-kiinteistöt, Finland
6. GDF Suez, France
7. S.T.I. Engineering S.r.l., Italy
8. Bergamo Tecnologie Sp z o.o., Poland
9. Cype Soft S.l., Spain
10. G.E.M. Team Solutions Gdbr, Germany
11. Geomod, sarl, France
12. Pich-Aguilera Arquitectos S.L.P., Spain
13. Centre Scientifique et Technique Du Batiment, France
14. Commissariat A L'energie Atomique Et Aux Energies Alternatives, France
15. Fundacion Tecnalia Research and Innovation, Spain
16. Technische Universitaet Dresden, Germany
17. Teknologian Tutkimuskeskus Vtt, Finland
18. INSTITUT FUR ANGEWANDTE BAUINFORMATIK EV-INSTITUTE FOR APPLIED BUILDING INFORMATICS IABI, Germany
19. National Taiwan University of Science and Technology, Taiwan

STREAMER: "Semantics-driven Design through Geo and Building Information Modelling for Energy-efficient Buildings Integrated in Mixed-use Healthcare Districts" [www.streamer-project.eu]"

Introduction

STREAMER is an industry-driven collaborative research project on Energy-efficient Buildings (EeB) with cases of mixed-use healthcare districts. Such districts are the best real examples of neighbourhood with integrated energy system consisting of mixed building types (i.e. hospitals and clinics; offices and retails; laboratories and educational buildings; temporary care homes, rehabilitation and sport facilities). The energy use of 1 healthcare district could exceed that of 20,000 dwellings. In almost every European city there is at least one healthcare district making a huge impact on the whole city's energy performance.

STREAMER aims at 50% reduction of the energy use and carbon emission of new and retrofitted buildings in healthcare districts. Healthcare-related buildings are among the top EU priorities since they play a key role for a sustainable community, but their energy use and carbon emission are among the highest of all building types. Take for instance a typical hospital building that is part of the healthcare district. It uses 2.5 times more energy than an office. In the EU, there are some 15,000 hospitals producing 250 million tonnes of carbon per annum. The EeB design complexity is extremely high; and therefore, both holistic and systemic approaches are crucial. STREAMER will resolve this by optimising Semantics-driven Design methodologies with interoperable tools for Geo and Building Information Modelling (Semantic BIM and GIS) to validate the energy performance during the design stage. STREAMER will enable designers, contractors, clients and end-users to integrate EeB innovations for: 1) building envelope and space layout; 2) medical, MEP and HVAC systems; and 3) building and neighbourhood energy grids.

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STREAMER

Streamer

European research on energy-efficient healthcare districts

Objectives

Healthcare buildings and districts are among the top EU priorities for Energy-efficient Buildings (EeB) since they play a key factor for a sustainable community, but their energy use and carbon emission are among the highest of all building types. A hospital – which is a part of a healthcare district– uses 2.5 times more energy than an office in average. There are some 15,000 hospitals in the EU responsible for at least 5% of the annual EU’s carbon emission (~ 250 million tonnes). Healthcare accounts for nearly 10% of EU’s GDP, and hospitals can take up to 60% of a country’s health expenditure (source: WHO and European Hospital and Healthcare Federation, 2012 statistics). In order to cope with the energy, financial, political, societal and environmental crises, all healthcare districts in Europe are urgently seeking to substantially reduce their energy consumption and carbon emission by 30–50%. Therefore, they are planning new energy-efficient building projects as well as energy-efficiency retrofitting of the existing buildings. At present and in the near future, clients, architects, technical designers, contractors, and end-users really need a breakthrough in designing energy-efficiency buildings integrated in the healthcare districts.

STREAMER results will be validated in the 4 real projects involving the Implementers Communities. The outcome will be used to extend the standardisation in EeB design and operation, open BIM–GIS (IFC–CityGML), and Integrated Project Delivery (IPD).

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STREAMER

Streamer
European research on energy-efficient healthcare districts

RTD focusing on Semantic-driven Deasign methodology is geared to achieve real Eeb optimisation in three keys areas:

- Functional and technical optimisation of the spatial layout and the building envelope directly related to innovative services and building operations within the healthcare districts and surrounding areas.

- Cost-effective optimisation of the MEP and HVAC systems in the buildings, taking into account the inter-dependencies between medical equipment, building components and energy systems. STREAMER will solve the most crucial design failures that cause transmission / efficiency loss between equipment and buildings during operation, especially when modern equipment is installed in existing building or energy systems. Optimisation will be done regarding the inter-connections between medical equipment and MEP/HVAC systems, through product modelling in relation with Building Information Modelling (BIM) and Geo Information Systems (GIS) as well as through process modelling to feed Building Management Systems (BMS).

- Optimal interaction between the building's and neighbourhood's energy systems in the healthcare district and surrounding areas (e.g. smart grid, smart use of district heating/ cooling and energy generation).

In order to develop, demonstrate and validate the optimised design methodology the project and environmental context will be represented by 1. The design phase of new and retrofitted buildings in healthcare districts: focusing on the hospital buildings, and including all other types of buildings (i.e. policlinics, offices, research and educational facilities, and residential buildings) which are integrated in the healthcare district; and 2. The interactions between the healthcare districts and the surrounding neighbourhoods in the urban context: addressing the aspects of improved quality of healthcare services in the city; logistic and traffic management in the surrounding areas; sustainable resources and waste management; and optimal health, comfort and safety of the urban environment. Within the overall aim, there are a number of specific objectives that relate to the optimisation of energy-efficient designs of new and retrofitted buildings in the healthcare district and designing new advanced tools. Therefore, STREAMER's mainly focus is to reduce the energy use and carbon emission of healthcare districts in the EU by 50% in the next 10 years by enabling clients, architects, and technical designers, contractors, building operators and occupants to design new and retrofitted energy-efficient buildings integrated in the healthcare district energy systems using optimized Semantic-driven Design methods and interoperable tools for Building and Geo Information Modelling (BIM-GIS).

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STREAMER

The STREAMER consists of 19 partners: 12 industrial partners (7 large companies + 5 SMEs + 1 non-profit private hospital), 4 research organisations, and 3 public bodies (hospital institutions). The STREAMER consortium is driven by the majority of industry partners and clients/users under the coordination of the research institutes with extensive experience and high reputation in managing large-scale EU research projects. This is the best possible composition of a research consortium than can guarantee the most effective practical impact (industry) through the most efficient collaborative effort (research).The STREAMER consortium is multidisciplinary with partners that have solid track records in implementing a broad range of technologies and services in all fields and types of energy-effcient buildings (EeB), including sustainable healthcare buildings and districts.

1. TNO (NL)
2. Ipostudio Architetti (IT)
3. Jong Gortemaker Algra (NL)
4. Becquerel Electric(IT)
5. DWA (NL)
6. AEC3 LTD (UK)
7. Karlsruher Institut fur Technologie (DE)
8. DEMO Consultants (NL)
9. Bouygues Construction (FR)
10. NCC AB (SE)
11. Mostostal Warszawa S.A. (PL)
12. Stichting Rijnstate Ziekenhuis (NL)
13. Assistance Publique-Hopitauw de Paris (FR)
14. The Rotherham NHS Foundation Trust (UK)
15. Azienda Ospedaliero-Universitaria Careggi (IT)
16. Mazowiecka Agencja Energetyczna (PL)
17. Commisariat a l'Energie Atomique et aux Énergies Alternatives (FR)
18. Centre Scientifique et Technique du Batiment (FR)
19. Locum AB (SE)

WS-3

"**SMART GRID BUSINESS CONVERGENCE**: FLEXIBLITY TRADING FOR PROSUMER COMMUNITIES"

Chaired by

MAS²TERING, USEF, BGCBC, & EASY SMART GRID

WORKSHOP-DEDICATED WEBPAGE:

http://sustainable-places.eu/sp-2016/programme/sp16-workshops/smartgridbusinessconvergence/

WS-3: "**SMART GRID BUSINESS CONVERGENCE**: FLEXIBLITY TRADING FOR PROSUMER COMMUNITIES"

Workshop Leadership & Project-Dedicated Webpages on the SP'16 website

WS-3: "SMART GRID BUSINESS CONVERGENCE: FLEXIBLITY TRADING FOR PROSUMER COMMUNITIES"

Workshop Context

The "Smart Grid Business Convergence" workshop at SP'16 is a public event that clusters and presents the ongoing development of several influential and demonstrative initiatives, facilitating the market uptake of innovative business models, ICT solutions, and evaluation mechanisms for the trade of energy flexibility. The "Smart Grid Business Convergence" workshop at SP'16 brings together industrials, ICT and cyber security experts, energy suppliers / retailers, distribution grid operators (e.g. DSO, DNO), scientists, business analysts, and power engineers to share and exchange their experiences and ideas towards progressing state-of-the-art in (dis) aggregated flexibility trading leading to prosumer-oriented smart European energy communities.

The "SMART GRID BUSINESS CONVERGENCE" workshop at SP'16 is motivated by the need for Europe to transition its energy markets (generation, distribution and consumption) into smart energy systems that support bi-directional flows of revenue, energy and information via flexibility services procurement and new business models. The success of the European vision of a low carbon electricity grid that minimises greenhouse gas emissions, and securely enhances quality and reliability of supply, depends on how power infrastructures empower new and incumbent market actors. Recent communications from the European Commission have called for a redesign of the energy markets (COM340) to take advantage of system wide flexibilities and a New Deal for EU energy consumers (COM339) that empower choice and participation in the smart grid.

AGENDA

- **Quantifying the value proposition**—Modeling and examples of the value to consumers; Modeling and examples of the value to DSOs; Modeling and examples of value to the energy markets
- **Delivering the value proposition**:- Examples of working aggregator business models – or how to make them work; Examples of bundled services – or services that are ripe to be bundled; Examples of incentives / programs / stimulus that have kicked off a local energy community or what incentives / programs / stimulus are needed to make it work

MAS^{2}TERING: "Multi-Agent Systems and Secured coupling of Telecom and Energy gRIds for Next Generation smart grid services" [www.mas2tering.eu]

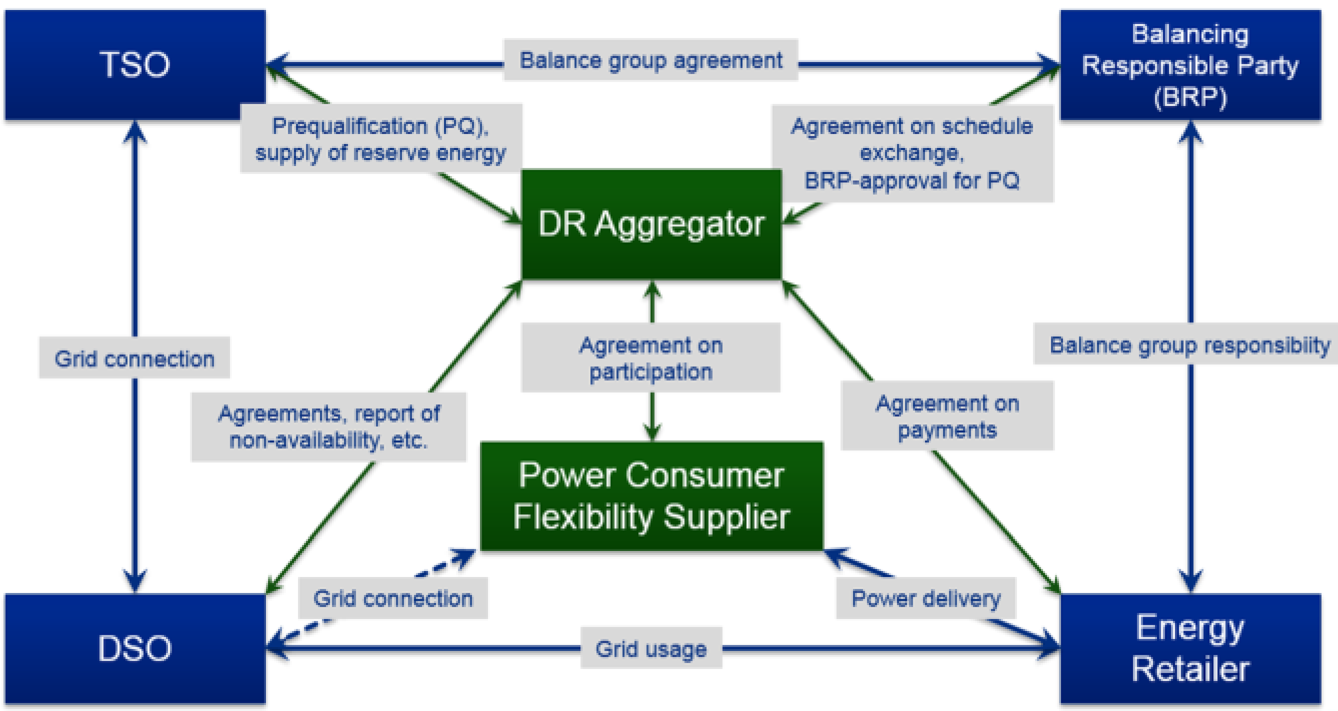
Project Introduction

MA^{S}2TERING develops home area network ICT technologies that connect consumers and prosumers to the grid and then apply multi-agent system optimisation techniques with the objective to lower consumer energy bills and facilitate DSO capacity management – and this has benefits on the grid at large. The ICT software unlocks benefits on three progressive levels: a prosumer lowering the family energy bill, a local energy community exchanging flexibilities to lower the community energy bill, and lastly the local energy community integrated into the low voltage grid to both lower energy bills and facilitate DSO capacity management. Central to making this possible is the role of the Local Flexibility Aggregator and new business strategies and collaboration opportunities between utilities, telecoms, and consumers in a multi-sided platform business model

WS-3: "**SMART GRID BUSINESS CONVERGENCE**: FLEXIBLITY TRADING FOR PROSUMER

MAS2TERING

In the MA^{S}2TERING smart grid conceptual framework, the prosumer is the provider of flexibility and is part of a local community of prosumers. The community is composed by prosumers all belonging to the same local area (a portion of LV grid) and represented by the same Local Flexibility Aggregator (LFA). The "local" aspect of this community is the focus and added value of MA^{S}2TERING. Flexibility is not only aggregated in a central way by wholesale market aggregators (representing huge portfolios of prosumers); in MA^{S}2TERING it is first used by prosumers of the community for in-home optimization and then traded at local level both to bring added value to prosumers and LFA and to support DSOs in congestions management. The local optimization of flexibility is enabled by the MA^{S}2TERING key technologies (Energy Box), tools (MAS optimization) and services (cyber security) and is based on the market-based mechanism envisioned by the Universal Smart Energy Framework (USEF), which has been extended and adapted to the MA^{S}2TERING business case.


TSO
Balance group agreement
Balancing Responsible Party (BRP)
Prequalification (PQ), supply of reserve energy
Agreement on schedule exchange, BRP-approval for PQ
DR Aggregator
Grid connection
Agreement on participation
Balance group responsibility
Agreements, report of non-availability, etc.
Agreement on payments
Power Consumer Flexibility Supplier
Grid connection
Power delivery
DSO
Grid usage
Energy Retailer

Consortium members

MAS^{2}TERING consists of nine project partners from five EU countries:

1. CEA (France)
2. SMS, Plc. (United Kingdom)
3. R2M Solution (Italy)
4. ENGIE (France)
5. Airbus CyberSecurity (France)
6. Telecom Italia (Italy)
7. Cardiff University (United Kingdom)
8. Waterford Institute of Technology (Ireland)
9. Laborelec (Belgium)

USEF: “Universal Smart Energy Framework” [www.usef.info]

Introduction

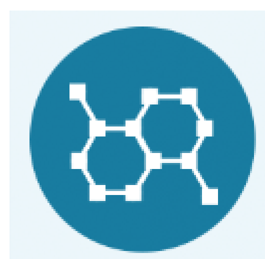
By delivering a common standard on which to build smart energy implementations, USEF connects people, technologies, projects and energy markets. It is the basis for an integrated smart energy future that is both efficient and cost-effective. The framework defines each stakeholder role in the energy market, how they interact and how they can benefit by doing so. With existing detailed specifications and real-life pilots in the market, USEF is perhaps the most comprehensive, advanced initiative of its kind

USEF Foundation develops, maintains and audits the framework. Founded by seven key players, active across the smart energy chain, USEF partners are working together to deliver the foundations of one integrated system which benefits all players - new and traditional energy companies and consumers

With detailed specifications, the USEF framework describes the processes and interaction between different roles and also addresses the contractual arrangements and agreements required to facilitate this. The market structure comprises specifications which define the roles and responsibilities of each stakeholder, how they interact and how they can benefit from doing so. A market-based coordination mechanism ensures the system is optimised based on least cost and maximum efficiency. The processes related to achieving this are also defined. The tools include descriptions of basic service requirements and a reference implementation for inspiration and exemplary coding. Privacy & security are defined to balance consumer confidence with security of supply. USEF complies with the new European General Data Protection Regulation.

An integrated market

USEF delivers the market model for the trading and commoditisation of energy flexibility, and the architecture, tools and rules to make it work effectively.



Connecting the dots

By providing an international common standard for smart energy, USEF unifies markets and ensures that projects and technologies are connected at the lowest

WS-3: “**SMART GRID BUSINESS CONVERGENCE**:
FLEXIBLITY TRADING FOR PROSUMER COMMUNITIES”

USEF

Intended Outcomes

General Benefits - By delivering a common standard on which to build smart energy implementations, USEF connects people, technologies, projects and energy markets. It is the basis for an integrated smart energy future that is both efficient and cost-effective. The framework defines each stakeholder role in the energy market, how they interact and how they can benefit by doing so. With existing detailed specifications and real-life pilots in the market, USEF is perhaps the most comprehensive, advanced initiative of its kind.

Connects smart energy products and projects - USEF’s open IT architecture provides the freedom to create unique and commercially competitive smart energy products and services, while delivering the common standard on which to build them. This ensures that all technologies and projects will be compatible and connectable to the future smart energy system.

Delivers smart energy market opportunities - The smart energy market will see existing roles adapted and new roles created, some of which will be appealing to all types of organisation, from supermarkets to insurance companies. By defining the individual roles, responsibilities and interactions required, USEF enables interested parties to both understand and realise smart energy opportunities.

Reduces costs - By delivering a common standard to build on, USEF reduces the cost to connect different technologies and projects to the energy system. Its market-based coordination mechanism then defines the rules required to optimise that whole system, ensuring that energy is produced, delivered and managed at lowest cost.

Accelerates smart energy transition - Rapid transition to a smart energy future requires that we think beyond existing roles, companies, regions and countries. We need to work together, based on a common standard, towards an integrated system that benefits everyone. USEF was founded on those principles and delivers the tools and rules to make it happen.

Benefits of the framework

Residential prosumer benefits:

The consumer role in the energy market is changing. We have access to more real-time information about our energy use and the associated costs. This allows us to make better choices to reduce bills. The introduction of multiple pricing mechanisms will offer financial incentives to encourage us to shift our usage to periods when overall demand is low, to reduce system stress. Many consumers have become prosumers, also generating energy via solar panels. Interconnectable smart appliances and apps are creating smart homes that we can interface with and control. The real revolution will come from unlocking consumer flexibility. Some of our energy use is not essential, or non-time- critical, and so we can be flexible about it. We could get paid for that flexibility by selling it to grid operators and those balancing supply and demand. They could then choose to move it in time, or not supply it at all, to help reduce periods of stress on the system. Given that a proportion of our bills are to pay for the system, helping reduce stress will lower our bills. USEF makes these things possible by delivering the market, tools and rules required to commoditise and trade energy flexibility. It also specifies the role of an Aggregator, who would buy flexibility from multiple consumers and collate enough if it to offer as solutions for system stress.

Business prosumer benefits:

Reducing or better timing energy use or better timing it can significantly reduce costs for a business. You can also benefit financially by selling your flexible energy use to energy system parties, either directly, or via an Aggregator. Where energy use is not time-critical, they buy the ability to move it to reduce stress on the grid or to avoid buying energy when prices are high. Access to back-up power supplies could also be sold as flexibility for use in emergency situations, allowing your company to be switched on to it when the grid is stretched and demand needs to be reduced quickly, or to be called on in grid blackout situations. USEF unlocks the value of this flexibility by turning it into a tradeable commodity (UFLEX) and delivering the market structure and tools and rules to make it work effectively. Adopting USEF can therefore provide new income, reduce or limits energy bills, and help your organisation be more sustainable. You may also choose to become an Aggregator based on USEF's role description and interaction model.

Benefits of the framework

Aggregator benefits:

USEF helps interested parties to understand the nature of the opportunity that the new Aggregator role offers and provides the tools to act on it. It makes the boundaries of an Aggregator's business model clear, without limiting opportunities. USEF defines the role and delivers the related interaction models and sample technical references. These things are particularly important where the role is of interest to companies not currently active in the energy markets but that have existing retail relationships and expertise. As well as gaining early access to commercial prosumers with the highest volumes of flexibility to sell, the first Aggregators to adopt USEF will play a role in setting the standard for the function, effectively creating a hallmark for the future which they can then apply to generate customer confidence in their brand.

BRP benefits:

Forecasting, and actively balancing, supply and demand in the most economical way have become increasingly challenging for the BRP. More renewables technologies and higher electricity reliance have made their portfolios less predictable, leaving them susceptible to imbalance charges and having to buy any shortfall during peak price periods. USEF helps to mitigate these risks. USEF offers a standardised way to incorporate flex to avoid imbalance and optimise your portfolio in a way that is closely related to current working procedures.

DSO benefits:

With the grid under increasing stress as a result of growing reliance on electricity and the introduction of new renewables technologies and electric vehicles, the role of the DSO is increasingly challenging. The risk of outage is rising and increasing daily and carries a significant financial penalty. Shoring up or replacing parts of the system is expensive, time-consuming and adds to complexity. USEF helps the DSO to mitigate risk and play a smarter role in the system. It delivers easier access to Prosumers' flexible supply and demand by making their active participation in the grid possible. This can be used to alleviate grid stress and defer or avoid grid upgrades. It also encourages prosumer reliance on the grid by providing them with the opportunity to benefit financially. This reduces the likelihood of their defection as storage technologies become more readily-available, making self-balancing achievable.

"EASY SMART GRID": [www.easysg.de]

Project Introduction

To make the electric energy system more flexible, Easy Smart Grid proposes a simple, affordable, secure and robust technology. It combines two established principles that so far have been used separately in the energy system:

- **The economic principle:** Variable prices in the energy market ensure the balance of production and consumption. As volatility grows with more renewables, real time markets maintain system balance by faster and more frequent electricity price updates.

- **The engineering principle:** Any imbalance of production and consumption leads to a change in grid frequency. This information is used to activate control power from fossil plants and, increasingly, large customers. This is also used for virtual power plants, executed by aggregators.

Easy Smart Grid combines these two established principles by coding a price signal onto grid frequency. Technical and economic stimuli now work in synchronism, and the resulting system becomes more efficient and less complex. With Easy Smart Grid each grid participant can take decisions that are optimal for him as well as for the grid.

Easy: In the past, energy was for specialists only. In the future, many more players will participate in the energy system. They need to understand how it works and how they can benefit to play an active and positive role in the transition. Easy Smart Grid is about making it easy to understand Smart Grid for everybody.

Smart: Smartness means creating maximum benefit with minimum investment and effort. It is about being ready for the future while having a solid foundation in the past. Smartness also means to take precautions against risks: ensuring a system will work whatever may go wrong. Easy Smart Grid is about using the best and most suitable technologies available to achieve our common goal: a climate friendly energy system.

Grid: Energy is more than electricity. Easy Smart Grid focuses on electricity because the growing use of sunshine and wind for electricity generation drives the energy revolution. We know that electricity interacts with other grids: heat, water, traffic, communication. So we make it easy for all to interact with each other.

WS-3: "**SMART GRID BUSINESS CONVERGENCE**:
FLEXIBLITY TRADING FOR PROSUMER COMMUNITIES"

EASY SMART GRID

Easy Smart Grid proposes an effective and efficient solution:

- Low investment in ICT (some investment required for decentral controllers and energy meters, but not for an extra communication network, grid instrumentation and aggregation) and therefore low transaction cost
- High robustness and security (protection of privacy, resilient against component failure and no open door for hackers)
- Trading platform for flexibility of all sizes, forms and with wide time span (from seconds - primary control - to days ahead)
- Maximum mobilization of customer flexibility allows higher renewable energy share or lower battery cost
- Future proof (designed for 100% renewable driven grids)

  Lower total energy cost in early markets where renewables are already cheaper than fossils

Intended Outcomes

Historically, only energy had a value in the "Energy Only Market", flexibility did not. Grid participants (such as renewable energy producers) that needed or could offer (like flexible consumers or battery owners) flexibility, mostly had no help to find their counterparts in the existing market and grid, and make mutually attractive agreements with them.

While more investment into flexibility would be needed, there still is no attractive business model. Easy Smart Grid leverages all flexibility in the grid. The commercial relationship between suppliers and consumers is based on a fair and transparent energy price that reflects the constraints and added value of all actors in the market (volatility, comfort, productivity, energy cost, flexibility and control).

WS-3: "**SMART GRID BUSINESS CONVERGENCE**:
FLEXIBLITY TRADING FOR PROSUMER COMMUNITIES"

EASY SMART GRID

The Easy Smart Grid mission is to facilitate and accelerate the energy system transformation by applying our knowledge and vision to the business of our partners.

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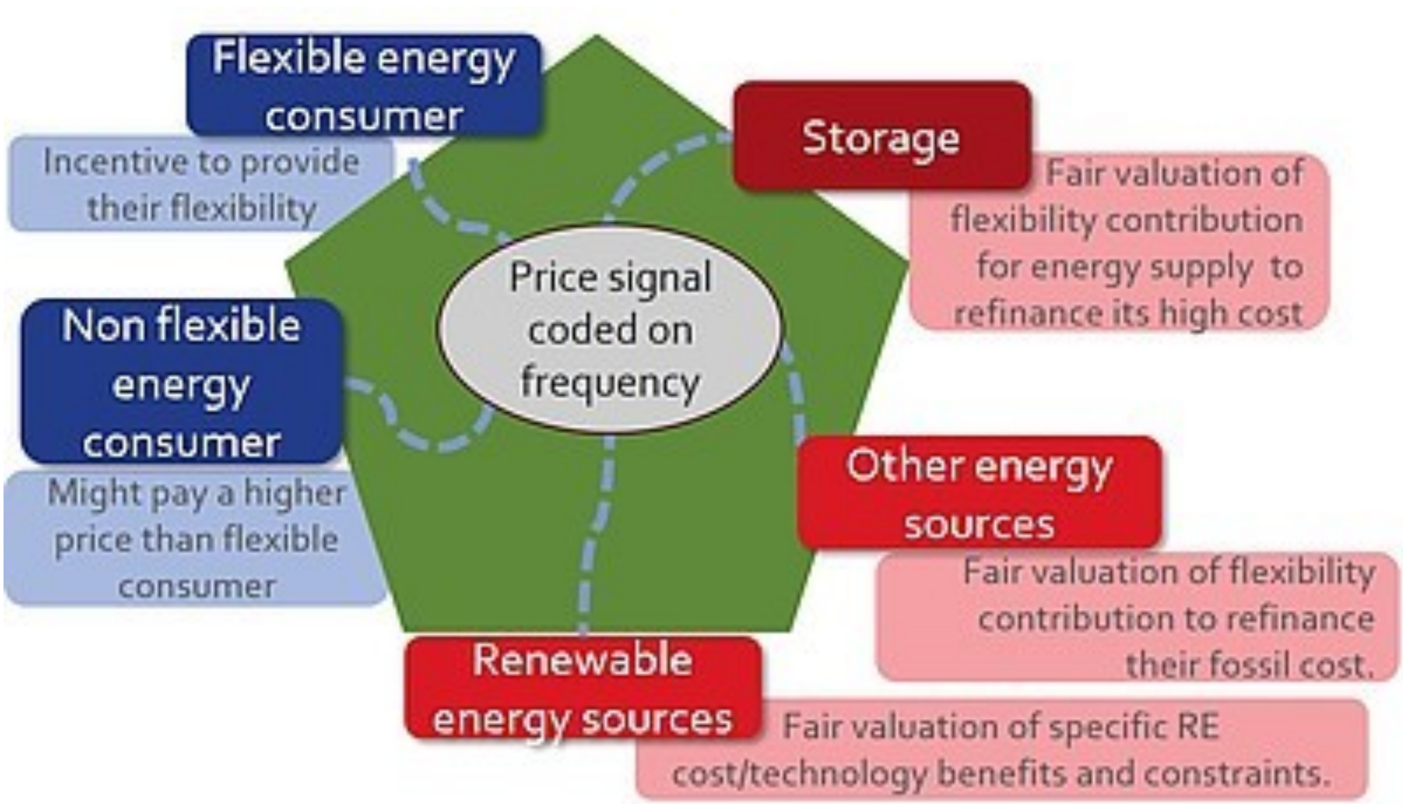

BGCBC: BLAENAU GWENT COUNTY BOROUGH COUNCIL [www.blaenau-gwent.gov.uk]

Project Introduction

The Blaenau Gwent County Borough Council (BGCBC) represents Blaenau Gwent, a county borough in South Wales, UK, formed in 1974 as a local government district. The involvement of Blaenau Gwent County Borough Council (BGCBC) in RESILIENT is via "The Works" at Ebbw Vale, Blaenau Gwent. The Works is a vibrant and distinctive development in the heart of the county. It is a major (£350 million) regeneration project to redevelop the former Ebbw Vale steelworks site. Once completed, the development aims to bring around 720 new homes to Blaenau Gwent and generate 2000 new jobs. Please see the Green Growth Wales: Local Energy Smart Living Demonstrator Framework "Supporting concept and structure" Outline Guide for details on current sustainability initiatives of BGCBC.

Strategic Importance for Blaenau Gwent, RESILIENT project

- Contributes to the development of a more sustainable environment
- Contributes to increased energy efficiency of buildings at a district level
- Opportunities to replicate project outcomes
- Contributes to Council objectives for improved economic attractiveness and wellbeing
- Contributes towards the Medium and Long Term Financial Plan
- Challenge –private sector business engagement

WS-3: "**SMART GRID BUSINESS CONVERGENCE**:
FLEXIBLITY TRADING FOR PROSUMER COMMUNITIES"

BLAENAU GWENT

Energy Priorities for Blaenau Gwent CBC

RESILIENT project

- Blaenau Gwent Strategic Needs Assessment 2012: "Blaenau Gwent has a green and sustainable environment" –USP
- Financial efficiency projects are a priority, includes reduction in energy use

Future aspirations for Blaenau Gwent...

RESILIENT project

Drivers:

- Smart Living/Energy Projects –key to addressing corporate priorities:
- Children and young people's learning and achievement levels are maximized
- People and communities are able to help themselves
- The living environment is vibrant and attractive
- Welsh Government –reducing emissions, improving energy efficiency and supporting low carbon energy in Wales'to create a sustainable, low carbon economy for Wales'

Activities/Opportunities:

- District Heat Network Opportunities
- Enterprise Zone
- Circuit ofWales
- Residential new build
- The Works –test bed for innovation

WS-4

“**DISTRICT RENEWAL:** INNOVATIVE TOOLS AND SYSTEMS FOR INCREASED PARTICIPATION IN DISTRICT RETROFIT & RENOVATION”

Chaired by:

OptEEmal, NewTREND, and Ecodistr-ICT

WORKSHOP-DEDICATED WEBPAGE:

http://sustainable-places.eu/sp-2016/programme/sp16-workshops/district-renewal/

WS-4: "**DISTRICT RENEWAL:** INNOVATIVE TOOLS AND SYSTEMS FOR INCREASED PARTICIPATION IN DISTRICT RETROFIT & RENOVATION"

Workshop Leadership & Project-Dedicated Webpages on the SP'16 website

WS-4: "**DISTRICT RENEWAL:** INNOVATIVE TOOLS AND SYSTEMS FOR INCREASED PARTICIPATION IN DISTRICT RETROFIT & RENOVATION"

Workshop Context & Agenda

SUSTAINABLE PLACES 2016 June 29-July 1, 2016 Anglet, France

Context

The design of retrofitted efficient buildings and districts must involve all stakeholders within a collaborative approach that allows the delivery of cost-effective solutions. This is only possible through improved planning and design processes – as IPD paradigm promulgates – and requires consistent and error-free data sharing, proper training of stakeholders and overcoming a number of technical barriers occurring in the current state-of-practice. Among them are: in-existence of proper tools for holistic planning for district refurbishment; lack of interoperability among existing tools; limited access to reliable material and equipment data bases; gaps and improvements needed in emerging technologies such as Building Information Modelling (BIM). All these concerns make software vendors and stakeholders reticent to invest in the development of interoperable tools and workflows. Thereby expected benefits both with respect to cost and quality of the end product designs are not realised. And apart from technical and industrial barriers, other ones related to economic, societal or organisational issues appear.

Agenda

Three European H2020 funded projects, OptEEmAL, NewTREND and Ecodistr-ICT, will work to overcome such barriers joining forces in this workshop to show how they will approach this scenario and will dedicate two specific discussion round tables with a panel of experts of the projects in order to exchange experiences and benchmarking focused on some important aspects tackled on the three projects, the data integration and interoperability and the performance evaluation speaking about indicators and tools used to reflect the performance in energy, environmental or economic terms among others.

WS-4: "**DISTRICT RENEWAL:** INNOVATIVE TOOLS AND SYSTEMS FOR INCREASED PARTICIPATION IN DISTRICT RETROFIT & RENOVATION"

Ecodisr-ICT Demonstration

SUSTAINABLE PLACES 2016
June 29-July 1, 2016
Anglet, France

OptEEmAL: “Optimised Energy-Efficient Design Platform for Refurbishment at District Level” [www.opteemal-project.eu]

Introduction

OptEEmAL, a project funded under the European Union’s Horizon 2020 research and innovation programme, will develop an Optimised Energy Efficient Design Platform able to design energy efficient retrofitting projects that are based on different energy conservation measures to improve the behaviour of a district. The tool will reduce time delivery and uncertainties and result in improved solutions when compared to business-as-usual practices. Under the coordination of Fundación CARTIF, 13 partners from 8 countries are working on delivering an optimised, integrated and systemic design tool based on an Integrated Project Delivery approach for building and district retrofitting projects.

Mission and Objectives

The main project objective – the development of an Optimised Energy Efficient Design Platform to improve the energy behaviour of a district – will be achieved through a mix of development and testing activities, including:

1. Developing a holistic and effective services platform for District Energy Efficient Retrofitting Design, which integrates interoperable modules and tools that are able to provide services for diagnosis and generate and optimise scenarios (according to stakeholders priorities) on criteria such as energy, cost, environment or social evaluation for data export.
2. Reinforcing the commitment of all involved stakeholders through an Integrated Project Delivery approach that allows them to articulate their needs through a collaborative and value-based process to deliver high-quality outcomes.
3. Creating an integrated ontology-based District Data Model that will contain key information in the fields of energy, comfort, environment, economic, social wellbeing and urban morphology.
4. Cataloguing Energy Conservation Measures including technical, operational, maintenance and cost information providing valuable and consistent outputs to the design and district operation and maintenance stages.
5. Developing an optimisation module with the aim of automating the decision making process to obtain the optimal design for an energy efficient retrofitting plan at district level.
6. Externally connecting the OptEEmAL Platform to relevant entities (i.e. existing tools enabling the calculation of indicators to generate and optimise the retrofitting scenarios); and

Strategic dissemination, training, exploitation and market deployment of the project’s developments and results.

OptEEmAL

Impact

The Optimised Energy Efficient Design Platform will create the possibility for stakeholders to receive an optimised, integrated and systemic design for their retrofitting projects of buildings or entire districts.

This leads to impacts on different levels:

- Economic impact through the reduction of costs during the design phase by 19% compared to business-as-usual. The costs of the operational phase are reduced by 25% by promoting holistic solutions, leading to a higher Return on Investment.
- Increase of market competitiveness through the utilisation of energy efficient solutions in a holistic integration and the improvement of the contractual processes.
- Growth of the European construction sector through the creation of new jobs and strengthening SMEs in the sector.
- Social impacts by the involvement of inhabitants in the decision making process. This ensures that their expectations are met, increases user acceptance of the activities carried out and will finally lead to an improvement of social wellbeing.
- Fostering the dissemination of the new knowledge at professional level through specific information channels and actions targeting the relevant stakeholder groups.

Validation of the Platform in Demonstration Sites

In order to validate the OptEEmAL platform, two steps are required:

1. Testing of the platform prototype in existing EU-wide energy efficient retrofitting projects at district level.

A wide spectrum of case studies will be selected, ensuring performance is tested under different conditions including climate aspects, boundary conditions, uses, building typologies, levels of intervention, conservation conditions, existence of specific barriers, consideration of historical buildings, etc. Six case studies have been pre-selected so far in four different countries with others expected to join:

- Sweden
- Turkey
- United Kingdom
- Spain (three different case studies with different uses, typologies and climatic conditions).

2. In an ambitious final stage for the validation procedure, OptEEmAL will be used by real stakeholders to carry out energy efficient retrofitting design projects for three districts.

Three different stakeholders in charge of designing retrofitting projects at district level are essential to become test-beds for validation: A municipality, a private consortium of technical offices and a municipal company. Each will head the demonstration of the performance, usefulness and user-friendliness of the tool for developing Integrated District Energy Efficient Retrofitting Plans in real environments. The final stage for the validation procedure will be carried out in three demo cases:

- San Bartolameo, Trento (Italy)
- Txomin Enea, San Sebastián (Spain)
- Polhem Area, Lund (Sweden)

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WS-4: "**DISTRICT RENEWAL:** INNOVATIVE TOOLS AND SYSTEMS FOR INCREASED PARTICIPATION IN DISTRICT RETROFIT & RENOVATION"

OPTEEmAL

Partners

The OptEEmAL consortium consists of 13 partners from 8 countries (Spain, France, Italy, Greece, Turkey, Germany, Ireland and Sweden), each one contributing specific knowledge to meet OptEEmAL objectives, according to their role in the project. The project partners represent key stakeholders within the value chain of the retrofitting design process of buildings and districts (research institutions, large industries, small and medium enterprises, including technical offices representing the final user, public authorities, and an exploitation and dissemination/communication expert partner).

Fundación CARTIF, Spain

Fundación TECNALIA , Spain

NOBATEK, France

Fundació Privada Universitat i Tecnologia, Spain

Technical University of Crete, Greece

ACCIONA Infraestructuras, Spain

United Technologies Research Centre, Ireland

Expert System, Italy

ARGEDOR Information Technologies Ltd., Turkey

Distretto tecnologico trentino per l'energia e l'ambiente, Italy

Fomento San Sebastián, Spain

City of Lund, Sweden

Steinbeis-Europe-Zentrum, Germany

NewTREND: "New integrated methodology and Tools for Retrofit design towards a next generation of ENergy efficient and sustainable buildings and Districts" [www.newtrend-project.eu]

Introduction

NewTREND seeks to improve the energy efficiency of the existing European building stock and to improve the current renovation rate by developing a **new participatory integrated design methodology** targeted to the energy retrofit of buildings and neighbourhoods, establishing energy performance as a key component of refurbishments.

The methodology will foster **collaboration among stakeholders** in the value chain, engaging occupants and building users and supporting all the refurbishment phases through the whole life cycle of the renovation.

The methodology will be supported by an online platform to ease collaborative design, which will play the role of exchanging information and facilitating dialogue between the different stakeholders involved in the retrofit process. It will store all the information useful to the design of the retrofit intervention in a cloud based interoperable data exchange server, i.e. the District Information Model server, which has the ability to and export multiple file formats thanks to semantic web technologies.

A **Data Manager** tool will be developed to guide the designers in the data collection phase, which might be a complex task for retrofit projects where information and drawings are scattered or even not available.

The NewTREND platform will be a tool for collaborative design allowing evaluation of different design options at both building and district level through dynamic simulations via a **Simulation & Design Hub**. Design options, including district schemes and shared renewables will be presented to the design team, together with available financing schemes and applicable business models, in a library which will build on lessons from past and ongoing R&D projects.

The NewTREND methodology and tools will be validated in **three real refurbishment projects in Hungary, Finland and Spain** where the involvement of all the stakeholders in the design process will be evaluated and specific activities will be dedicated to inhabitants and users.

WS-4: “**DISTRICT RENEWAL:** INNOVATIVE TOOLS AND SYSTEMS FOR INCREASED PARTICIPATION IN DISTRICT RETROFIT & RENOVATION”

NewTREND

Objectives

Integrated Design Methodology—Including a guided process through all steps of refurbishment from concept to operation and a decision process for the selection, design and optimisation of retrofitting solution for buildings in their neighbourhood context

Participatory Design-Focus on all stakeholders (including inhabitants and building users) in the design process, through pre-design multisession community design charrettes, review dialogue in the construction phases and post-occupancy evaluation workshops

Collaborative Design Platform-Ensuring the correct implementation of the Integrated Design Methodology through a project management infrastructure, a user friendly GUI customised to the stakeholders, including visualisation and participation options

District Information Model-Interoperable, distributed, multi-model data exchange server to store information on energy efficient design and integration with neighbourhood energy systems, linking existing data model formats at building and district levels

Data Manager-Enabling a structured, standardized crowdsourced data collection approach through a web-based tool accessible from tablets and smartphones, supporting design teams in on-site inspections and direct data entry in the DIM

Simulation and Design Hub-Cloud-based platform to evaluate retrofitting needs, guide the decision makers to select the best energy retrofitting strategy, balance the building in its district, through Dynamic Simulation Modelling, GIS, KPI and optimisation tools

One of the key concepts exemplified by the figure below is the presence of roughly two groups of scales, or levels, according to the type of theme assessed: The interaction level, where production, consumption, and access can be analysed. It can be studied from a bottom-up perspective and appears typical of buildings and blocks; The distribution level, where infrastructure, networks, and supply systems can be analysed. It can be studied from a top-down perspective and appears typical of districts and cities. The NewTREND project, in keeping with the current multi-scale sustainability approach, will thus consider environmental, social and economic themes to analyse the sustainability performance of a building within its neighbourhood, and the overall performance of the neighbourhood (or district) itself. (excerpt from: Deliverable D2.2 Definition of sustainable Key Performance Indicators)

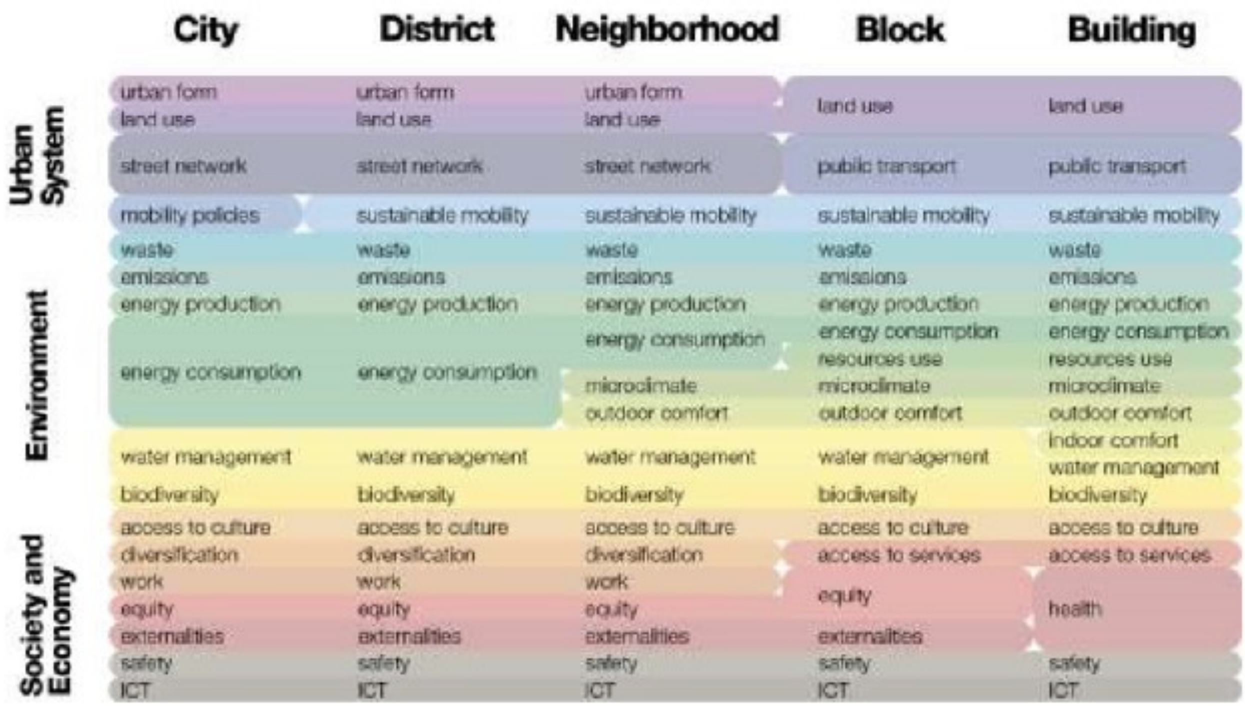

FIGURE 2.1 SUSTAINABILITY THEMES AT URBAN SCALES (SOURCE: IISBE ITALIA AND POLYTECHNIC OF TURIN)

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NewTREND

Consortium

1. INTEGRATED ENVIRONMENTAL SOLUTIONS LIMITED, UK
2. ABUD MERNOKIRODA KFT, Hungary
3. ULI JAKOB, Germany
4. INTERNATIONAL INIZIATIVE FOR A SUSTAINABLE BUILT ENVIRONMENT ITALIA RESEARCH AND DEVELOPMENT SRL, Italy
5. REGENERA LEVANTE SL, Spain
6. GRANLUND OY, Finland
7. UNIVERSITY COLLEGE CORK, NATIONAL UNIVERSITY OF IRELAND, CORK, Ireland
8. UNIVERSITY COLLEGE DUBLIN, NATIONAL UNIVERSITY OF IRELAND, DUBLIN, Ireland
9. HOCHSCHULE FUR ANGEWANDTE WISSENSCHAFTEN MUNCHEN, Germany
10. LONDON BUSINESS SCHOOL, UK
11. STAM SRL, Italy
12. AJUNTAMIENTO DE SANT CUGAT DEL VALLES, Spain
13. UNIVERSITA POLITECNICA DELLE MARCHE, Italy
14. DR. JAKOB ENERGY RESEARCH GMBH & CO. KG, Germany

Ecodistr-ICT: Integrated decision support tool for retrofit and renewal towards sustainable districts [www.ecodistr-ict.eu]

Project Introduction

The ECODISTR-ICT project is funded by the European Union through the Seventh Framework Programme. It is coordinated by VITO and involves Arup, Bipolaire Arquitectos, CSTB, Omgeving, Sigma Orionis, SP, Strusoft, TNO, VABI and White.

The ECODISTR-ICT project aims at developing an integrated decision-support tool that facilitates decision making on the retrofitting and renewal of existing districts and their composing buildings.

It will connect the main decision makers in urban district transformation programmes, acting from different perspectives, with different time scales, to reach a coordinated approach that joins building retrofitting with district renovation.

It will provide trustworthy insights on (i) retrofitting and renewal projects, (ii) the associated costs and benefits over the life cycle of the buildings, and (iii) the impacts on resource efficiency, social aspects, indoor and outdoor quality of buildings and districts, and other environmental concerns.

The ECODISTR-ICT tool will be tested in five demonstration sites located in Belgium, Sweden, Spain, the Netherlands and Poland.

WS-4: "**DISTRICT RENEWAL:** INNOVATIVE TOOLS AND SYSTEMS FOR INCREASED PARTICIPATION IN DISTRICT RETROFIT & RENOVATION"

Ecodistr-ICT

Intended Outcomes

ECODISTR-ICT will develop an innovative decision support tool to assist district renovation planning, integrating the needs of different stakeholders: inhabitants, local authorities and business investors. The tool will give the opportunity to select stakeholders' highest priorities and report building renovation scenarios. The tool will specifically assess related costs & benefits, as well as environmental & social impacts at a district level. Although energy efficiency is a major focus, the software environment will include as many aspects as possible in its modular platform structure.

Case Studies

The case studies are mainly initiated by local architecture, design and planning firms with extensive experience in the local context and everyday practice. In the case studies, we provide a close cooperation with the research institutions and a broad range of local stakeholders.

A geographical distribution of the case studies will reveal contextual differences regarding culture, climate and policies in relation with energy-use and energy efficiency. These differences will be incorporated in the development of the tool.

Learn more about the demo sites: Antwerp, Rotterdam, Valencia, Warsaw & Stockholm.

WS-4: "**DISTRICT RENEWAL:** INNOVATIVE TOOLS AND SYSTEMS FOR INCREASED PARTICIPATION IN DISTRICT RETROFIT & RENOVATION"

Ecodistr-ICT

ECODISTR-ICT project coordinator – M. Han Vandevyvere – han.vandevyvere@vito.be **VITO (Flemish Institute for Technological Research)** is a leading European independent research and consultancy centre in the areas of cleantech and sustainable development, elaborating solutions for the large societal challenges of today. http://www.vito.be/english

ARUP is an independent firm of designers, planners, engineers, consultants and technical specialists offering a broad range of professional services. **ARUP b.v.** in Amsterdam is a consultancy, which brings together broad-minded individuals from a wide range of disciplines and encourages them to look beyond the constraints of their own specialisms. http://www.arup.com/

Bipolaire is a group of professionals in the fields of architecture and urban design who are involved in a broad range of international research projects tackling environmental sustainable design guidelines and tools as well as they apply the research results on sustainable building projects. http://www.bipolaire.net/

CSTB is a public organization for innovation in the building sector. With about 900 employees, **CSTB** performs four key activities: research, expertise, evaluation and dissemination of knowledge, organized to satisfy sustainable development challenges. http://www.cstb.fr/

OMGEVING is an independent and multifaceted design bureau with a passion for improving our everyday living environment. Our integrated approach and critical attitude allow us to offer creative and well-founded solutions for complex spatial questions and challenges. http://omgeving.be/en/

SP Technical Research Institute of Sweden AB belongs to the RISE group, which is owned by the Swedish Government. SP is the national institute for technical evaluation, research, testing, certification, metrology and calibration and is co-operating globally with large and small companies, universities, institutes of technology and other organisations. http://www.sp.se/en/Sidor/default.aspx

StruSoft is a Swedish software company offering a unique, high-quality selection of computer software for structural design, for the design and production of prefabricated building elements and for accurate simulation of energy use in buildings. http://www.strusoft.com/

TNO is an independent research organisation whose expertise and research make an important contribution to the competitiveness of companies and organisations, to the economy and to the quality of society as a whole. TNO's unique position is attributable to its versatility and capacity to integrate this knowledge. https://www.tno.nl/

Vabi is a Dutch company with its main office in Delft. Vabi delivers decision-making software to her customers (Engineering companies, installers, energy consultants and housing corporations). **Vabi** has currently a staff of 50 people. The mission of **Vabi** is "Optimal buildings optimal results". http://www.vabi.nl/

WHITE arkitekter is an independent Swedish based multidisciplinary partner owned firm with expertise covering all levels of urban development. With 11 offices in 3 countries and over 600 engaged professionals, covering a broad range of disciplines, **WHITE** takes a leading role in creating sustainable solutions for the built environment in Scandinavia. http://www.world-architects.com/en/white-arkitekter/

WS-5

"QUANTIFYING THE **BUSINESS VALUE OF DEMAND RESPONSE**: INITIATIVES FOR ENERGY SUPPLIERS & DSOS"

Chaired by:

DR-BoB, CityOpt, E2Diustrict, Sim4Blocks, and STORY

WORKSHOP-DEDICATED WEBPAGE:

http://sustainable-places.eu/sp-2016/programme/sp16-workshops/demand-response-blocks-buildings-2/

WS-5: "QUANTIFYING THE **BUSINESS VALUE OF DEMAND RESPONSE**: INITIATIVES FOR ENERGY SUPPLIERS & DSOS"

Workshop Leadership & Project-Dedicated Webpages on the SP'16 website

Context

"There is a lack of adequate analytical methods and data to quantify the benefits of different demand response initiatives for different players in electricity supply markets [Bird, J. (2015)]. This means it is often not possible to produce a meaningful estimate of the benefits of particular demand response initiatives for different types of energy companies i.e. Energy Suppliers and DSOs etc. [Bradley, P., Leach, M., & Torriti, J., (2011)]. As a result it's very difficult for the different players in the electricity supply chain to identify business models to underpin investments in the deployment of demand response projects. The workshop will strive to provide formulae to enable the quantification of the cost/benefit of DR initiatives to reduce electricity demand for Electricity Suppliers and DSOs. These formulae should account for the particular regulatory and market conditions which are often missing from the current generalised approaches to quantifying demand response initiatives [3].

The workshop will strive to provide formulae to enable the quantification of the cost/benefit of DR initiatives to reduce electricity demand for Electricity Suppliers and DSOs. These formulae should account for the particular regulatory and market conditions which are often missing from the current generalized approaches to quantifying demand response initiatives [Capgemini (2008)]

WS-5: "QUANTIFYING THE **BUSINESS VALUE OF DEMAND RESPONSE**: INITIATIVES FOR ENERGY SUPPLIERS & DSOS"

Workshop Agenda

SUSTAINABLE PLACES 2016 June 29-July 1, 2016 Anglet, France

Agenda

The key aim of the workshop is to facilitate an understanding of the ongoing demand response innovation and research in each of the participating projects. To address this aim the workshop will begin with an introduction to each of the participating projects which address the following questions:

- How demand response is defined in the context of each project
- How the impacts of the project in terms of demand response and energy saving are to be quantified
- The key regulatory barriers and drivers of demand response at each projects demonstration site

SIM4BLOCKS: Simulation Supported Real Time Energy Management in Building Blocks [www.sim4blocks.eu]

Introduction

The growing share of variable renewable energy necessitates flexibility in the electricity system, which flexible energy generation, demand side participation and energy storage systems can provide. SIMBLOCK will develop innovative demand response (DR) services for smaller residential and commercial customers, implement and test these services in three pilot sites and transfer successful DR models to customers of Project partners in further European countries. The pilot sites are blocks of highly energy efficient buildings with a diverse range of renewable and cogeneration supply systems and requisite ICT infrastructure that allows direct testing of DR strategies. SIMBLOCK's main objectives are to specify the technical characteristics of the demand flexibility that will enable dynamic DR; to study the optimal use of the DR capability in the context of market tariffs and RES supply fluctuations; and to develop and implement market access and business models for DR models offered by blocks of buildings with a focus on shifting power to heat applications and optimization of the available energy vectors in buildings. Actions toward achieving these objectives include: quantifying the reliability of bundled flexibility of smaller buildings via pilot site monitoring schemes; combining innovative automated modelling and optimization services with big data analytics to deliver the best real time DR actions, including motivational user interfaces and activation programs; and developing new DR services that take into account the role of pricing, cost effectiveness, data policies, regulations, and market barriers to attain the critical mass needed to effectively access electricity markets. SIMBLOCK's approach supports the Work Program by maximizing the contribution of buildings and occupants and combining decentralized energy management technology at the blocks of building scale to enable DR, thereby illustrating the benefits achievable (e.g. efficiency, user engagement, cost).

Consortium

1. HOCHSCHULE FUR TECHNIK STUTTGART
2. CENTRE INTERNACIONAL DE METODES NUMERICS EN ENGINYERIA
3. ENERGEA INGENIERIA EN EFICIENCIA ENERGETICA SL
4. S.P.M. PROMOCIONS MUNICIPALS DE SANT CUGAT DEL VALLÈS S.A.
5. GEMEINDE WUESTENROT
6. STADTWERKE SCHWABISCH HALL GMBH
7. ENISYST GMBH
8. HAUTE ECOLE SPECIALISEE DE SUISSE OCCIDENTALE
9. NEUROBAT AG
10. ELIMES AG
11. UNIVERSITY COLLEGE DUBLIN, NATIONAL UNIVERSITY OF IRELAND, DUBLIN
12. AIT Austrian Institute of Technology GmbH
13. RESTORE NV, Belgium
14. WATTGO, France
15. EIFER EUROPAISCHES INSTITUT FUR ENERGIEFORSCHUNG EDF-KIT EWIV, Germany
16. EIFER EUROPAISCHES INSTITUT FUR ENERGIEFORSCHUNG EDF-KIT EWIV, UK
17. INSIGHT PUBLISHERS LIMITED, UK

DR-BOB: “Demand Response in Block of Buildings” [www.dr-bob.eu]

The problem

Utility companies have to generate enough energy to meet large peaks in demand, caused by lots of people using energy at the same time. Energy networks must also have the capacity to meet this demand. Energy systems are inefficient and expensive as most of the time, demand runs far below capacity.

As electric energy cannot be easily stored the problem is most acute in the electricity sector. Utilities have traditionally matched electricity demand and supply by controlling the rate of electricity generation. Therefore things are further complicated when we connect renewables to energy networks which produce energy when the sun shines or the wind blows, rather than when we need it.

The increasing popularity of electric cars may also increase peak demand as commuters plug them into electricity networks at the same time.

Blocks of buildings offer more flexibility in the timing of energy use, local energy generation and energy storage than single buildings. But a lack of suitable products and technologies make this problematic.

WS-5: "QUANTIFYING THE **BUSINESS VALUE OF DEMAND RESPONSE**: INITIATIVES FOR ENERGY SUPPLIERS & DSOS"

DR-BoB

The solution

Demand response programmes which encourage consumers to change when they use electricity or reduce their total energy use can help keep energy bills low and help integrate renewables into our existing energy networks.

- Peak electricity demand can be reduced by;
- shifting when some electrical equipment is used,
- using electrical equipment more efficiently,
- using other types of energy;
- storing locally generated renewable electricity and using it during times of peak demand.

If we can reduce peak electricity demand we can reduce the investments required in electricity production and electricity networks. These savings can then be passed onto consumers in the form of lower energy bills. The DR-BOB project will pilot the tools and techniques required for demand response in blocks of buildings with differing patterns of ownership, use and occupation at;

- Teesside University campus in Middlesbrough in the UK,
- A business and technology park in Anglet in France,
- A hospital complex in Brescia in Italy,
- The campus of the Technical University of Cluj Napoca in Romania.

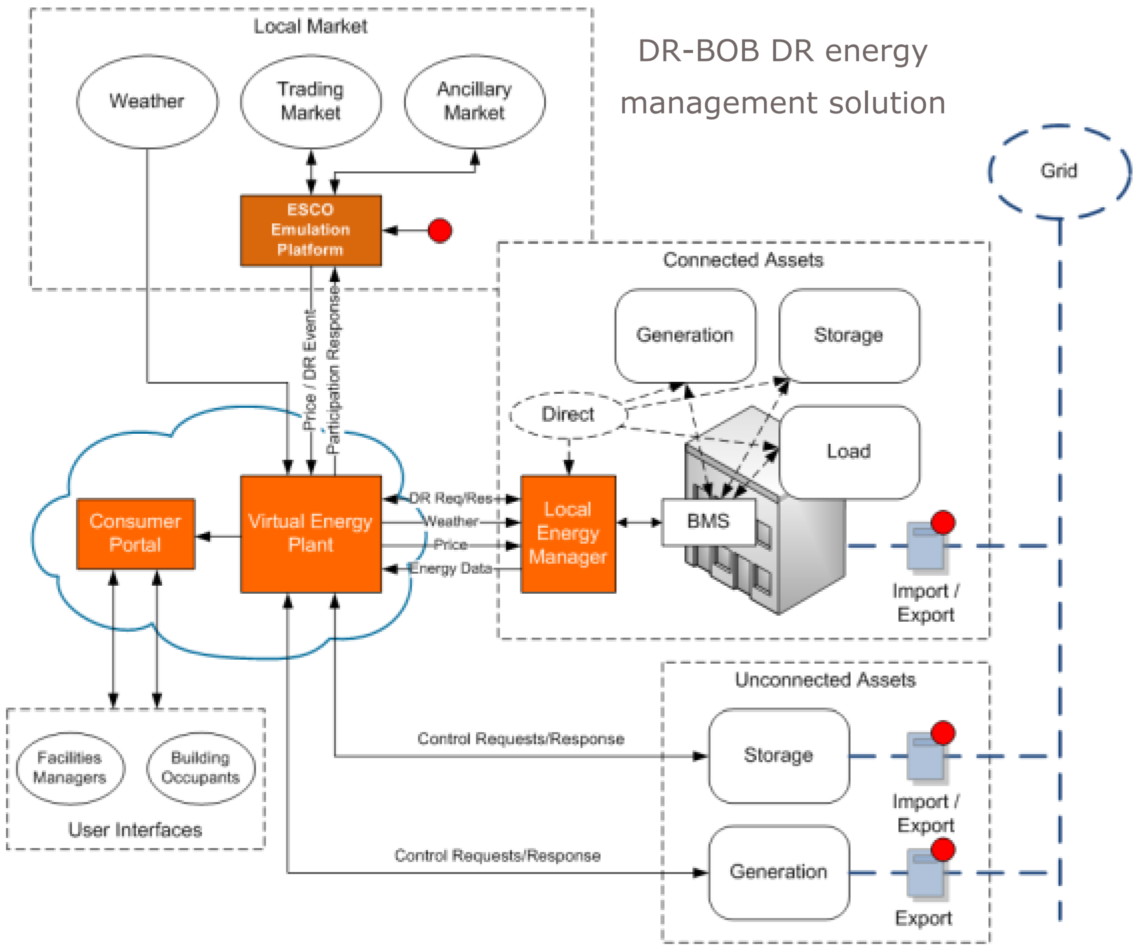
The DRBOB Demand Response Energy Management Solution

The DR-BOB solution will be implemented by integrating the following tools and technologies to provide an innovative scalable cloud based central management system, supported by a local real-time energy management solution which communicates with individual building management systems and generation / storage solutions within a block-of-buildings.

- Virtual Energy Plant (VEP) – Siemens DEMS® & Siemens DRMS
- Local Energy Manager (LEM) –Teesside University IDEAS project Product
- Consumer Portal – GridPocket EcoTroks™

The configuration of the DR-BOB energy management solution will allow energy management companies to provide varying levels of control from the centralised macro-view, through to localised complete control of the energy systems at the building level, the micro-view. The solution will utilise existing standards such as IEC60870-5-104 and OpenADR, and an architecture that will enable new adaptors to be added to support new standards in the future. These standards allow access to most generation, storage and load assets. It is expected that any new interfaces between the platform and the ESCO could form the basis for new standards. In combination, DR-BOB solution will provide open connectivity to both SCADA/utility communications and customer side AMIs. The decentralised approach – allowing both supply side and demand response to be hierarchically optimised between blocks of buildings and other infrastructures, with automatic distribution of results via building management systems – removes some of the burden and alleviates the complexities involved in individual customer or resident participation.

DR-BoB



DR-BOB DR energy management solution

The key functionality of the DR-BOB Demand Response energy management solution is based on the real-time optimisation of the local energy production, consumption and storage. The optimisation will be adjusted to either maximise economic profit or to minimise CO_2 emissions according to user requirements. The solution will be intelligent in the sense that it is automated and can adapt to fluctuations in the energy demand or production, subject to dynamic price tariffs and changing weather conditions.

STORY: “Added value of STORage in distribution sYs-tems“ [www.horizon2020-story.eu]

Introduction

STORY is a European project demonstrating new energy storage technologies and their benefits in distribution systems, involving 18 Partner Institutions in 8 different European countries.

With the development of our society, the demand for energy, in particular electricity, is ever-increasing. To be able to produce electricity when the renewable sources are available and to use electricity when we need it, improved energy storage solutions are needed.

Our challenge is to demonstrate and evaluate innovative approaches for thermal and electrical energy storage systems and to find affordable and reliable solutions that lead to an increased electricity self-supply. STORY consists of eight demonstration cases each with different local / small-scale storage concepts and technologies, covering industrial and residential environments. These demonstrations feed into a large-scale impact assessment, with the central question being:

“What could be the added value of storage in the electricity distribution grid?“

We, the STORY team, apply the state-of-the-art storage and ICT technologies and demonstrate them on a number of field trial sites. We use the data from the field trials to calibrate the simulation models of the small-scale storage technologies.

Using simulation models, we analyse the large-scale rollout of these storage technologies and evaluate the impact of large storage penetration.

Additionally we establish various business model archetypes, and determine the required policy and regulatory frameworks supporting them.

In order to continue the dialogue with the growing number of other ‘Low Carbon Energy’ (LCE) Horizon2020 projects, we maintain an overarching LCE 6-10 website, where we are able to envision and share recommendations relevant to storage and smart grid technologies.

WS-5: "QUANTIFYING THE **BUSINESS VALUE OF DEMAND RESPONSE**: INITIATIVES FOR ENERGY SUPPLIERS & DSOS"

STORY

STORY is about showing the added value storage can bring for a flexible, secure and sustainable energy system. The demonstrations therefore compose the key activity on which all further analysis builds. Each of the demonstrations brings a different technology, context or business case. Together they provide a profound basis to feed into the large scale impact analysis. In order to research and demonstrate the impact of introducing more storage capacity into the grid, 18 institutions from 8 countries have teamed up to create STORY, which is funded by the Horizon 2020 Framework Programme for Research and Innovation of the European Union.

Demo Sites

Among multiple STORY demonstrations, EG will provide two demo sites. Demonstration of flexible and robust use of medium scale storage unit connected to low voltage residential grid and industrial grid is the main purpose of EG project activities. A variety of project goals will be tested as follows:

- Demonstration of the flexibility and robustness of the large scale storage unit
- Ease of integration in existing infrastructure (including interoperability)
- Control and battery management system and its cooperation with the devices in the system
- A high degree of transformer station self sufficiency
- Ensuring maximum efficiency in decentralised energy production
- Potential in supporting the regime of the PV production
- Impact on efficiency (and thus return of investment) of complete system
- High degree of self-sufficiency of battery combination and PV production could deliver
- Reliability in the event of blackouts
- Peak demand control within the daily load diagram
- Reduction of line congestion
- Voltage control

Besides above mentioned activities, EG will additionally take an active part in different WP, contributing mostly in improvement of flexibility and robustness of large scale battery, ICT definitions and others.

WS-5: "QUANTIFYING THE **BUSINESS VALUE OF DEMAND RESPONSE**: INITIATIVES FOR ENERGY SUPPLIERS & DSOS"

STORY

Consortium

STORY is a joint project of 18 international partners involved in 8 demonstrations in 6 European countries and is funded under the Horizon 2020 program of the European Commission.

STORY shows the added value of storage in the distribution grid. STORY demonstrates and evaluates innovative approaches for energy storage systems in residential and industrial environments. Through a large scale impact analysis and in an open dialogue with all stakeholders, STORY formulates the policy and regulatory changes that are required to create a promising future for energy storage.

1. Teknologian tutkimuskeskus VTT Oy, Finland
2. TH!NK E BVBA, Belgium
3. VLAAMSE INSTELLING VOOR TECHNOLOGISCH ONDERZOEK N.V., Belgium
4. VLERICK BUSINESS SCHOOL, Belgium
5. BASEN OY, Finland
6. UNIVERZA V LJUBLJANI, Slovenia
7. BENEENS JOZEF EN ZONEN BVBA, Belgium
8. ELEKTRO GORENJSKA PODJETJE ZA DISTRIBUCIJO ELEKTRICNE ENERGIJE DD, Slovenia
9. VIESSMANN-BELGIUM, Belgium
10. HAWKER GMBH, Germany
11. B9 ENERGY STORAGE LTD, UK
12. LOPTA FILM GMBH, Germany
13. JOANNEUM RESEARCH FORSCHUNGSGESELLSCHAFT MBH, Austria
14. ACTILITY SAS, France
15. PROSPEX INSTITUTE VZW, Belgium
16. FUNDACION CENER-CIEMAT, Spain
17. EXPOSICION Y CONSERVACION DE ALIMENTOS Sa, Spain
18. UC Leuven, Belgium

CITYOPT: "Holistic simulation and optimisation of energy systems in Smart Cities" [www.cityopt.eu]

CITYOPT mission is to improve sustainability by enabling more energy-efficient built environments. The specific target is to engage users with the new CITYOPT applications, create new partnerships connecting city leaders and stakeholders and create new business models for decision support systems for energy efficient neighbourhoods.The project will create a set of applications and related guidelines that support planning, detailed design and operation of energy systems in urban districts. The project will address energy system optimization in different life cycle phases considering specific optimization potentials and user & stakeholder involvement characteristics. The building of CITYOPT applications will rely on many re-usable component models that are available from existing simulation software libraries.The expected results are applications that bring together information and guidelines for designing scenarios of energy systems or parts of them. These will be supported by a user-centred design approach and analysis of people's attitudes, behaviours and mental models. Simulation results of scenarios used in the projects case studies will be presented, as well as operational results from field tests in real-life environments. These outputs will show how to prioritise alternative energy solution scenarios based on social, economic and environmental criteria

WS-5: "QUANTIFYING THE **BUSINESS VALUE OF DEMAND RESPONSE**: INITIATIVES FOR ENERGY SUPPLIERS & DSOS"

CityOpt

CITYOPT

OBJECTIVES

CITYOPT will create a set of applications and guidelines supporting efficient planning, detailed design and operation of energy systems in urban districts. It will consider appropriate service business models, privacy and trust and will involve users in all project phases.

	Planning	Detailed design	Operational
Users and stakeholders	- Urban planners - Energy providers - Public authorities / municipalities	· Office workers · Building owners · Facility managers	- Dwellers - Energy providers - Public authorities / municipalities
CITYOPT app simulation layer	- Decision support for city planning alternatives - Local balancing	· Decision support for energy systems upgrade alternatives · Local balancing	- Simulation of demand-response (load shedding) scenarios
CITYOPT app real-time layer		Real-time monitoring and visualisation of case study energy consumptions	Management & control of demand-response actions: communication system & visualisation interfaces
	Helsinki case study	Vienna case study	NCA case study
Topics	- District electricity storage - CHP - Solar thermal - Thermal storage	· District heating and cooling · Thermal storage	- Electricity - Behavioral change - Energy social network & community

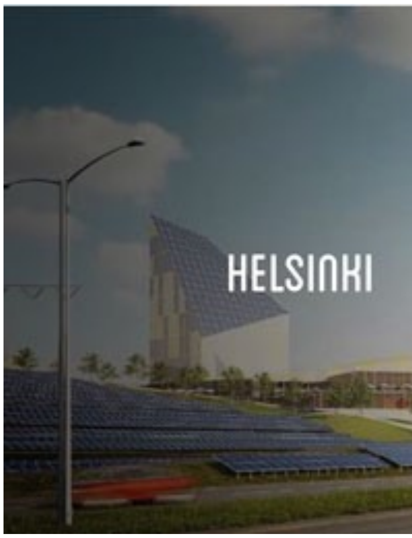
Evaluation and benchmarking

Credits:
Helsinki / photo by Tengbom Architects
Vienna / photo by Miroslav Petrasko (CC BY-NC-ND 2.0)
Nice - Vue Générale Aérienne / photo by A. Issock

WS-5: "QUANTIFYING THE **BUSINESS VALUE OF DEMAND RESPONSE**: INITIATIVES FOR ENERGY SUPPLIERS & DSOS"

CityOpt

CityOpt Demo Sites



Helsinki, Finland

Vienna, Austria

Nice Côte d'Azur, France

The Helsinki case study evaluates electricity storage solutions and business models in the new residential districts of Kalasatama and Östersundom. In the planning phase of the new districts, CITYOPT applications will examine technologies, sizing, placement and steering of electric and heat storage solutions, to find the optimal storage solutions.

CITYOPT investigates the optimal design and possible implementation (including cost assessment and business model development) of integrating the buildings, their existing energy supply and storage systems, and the cooling system of RTA's climatic tunnel into a site-wide energy system that uses the waste heat to heat office buildings. The expected impact will be to maximise the utilisation of waste heat to increase the energy performance and reduce CO2 emissions of the overall urban area modelled in the study case.

PACA – Provence Alpes Côte d'Azur - is one of France's most fragile regions for electricity supply. CITYOPT will develop and demonstrate innovative demand-response services in Nice Côte d'Azur, to reinforce the continuity of service of the electricity supply network. Families will be recruited to participate in the experiment. CITYOPT will analyse the conditions for which the customers will agree to modify their behaviours, within a CITYOPT energy community.

WS-5: "QUANTIFYING THE **BUSINESS VALUE OF DEMAND RESPONSE**: INITIATIVES FOR ENERGY SUPPLIERS & DSOS"

CityOpt

CityOpt Consortium

1. TEKNOLOGIAN TUTKIMUSKESKUS VTT, Finland
2. AIT Austrian Institute of Technology GmbH, Austria
3. HELSINGIN KAUPUNKI, Finland
4. METROPOLE NICE COTE D'AZUR, France
5. CENTRE SCIENTIFIQUE ET TECHNIQUE DU BATIMENT, France
6. ELECTRICITE DE FRANCE, France
7. EXPERIENTIA SRL, Italy

CITYOPT D1.1 General and demo case description (deliverable image)

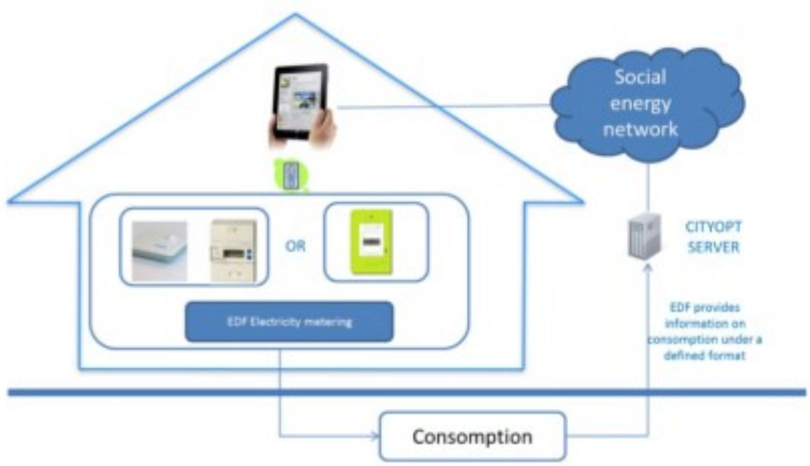


Figure 1. Concept of the Nice study case

E2-DISTRICT: "Energy Efficient District Heating and Cooling" [www.e2district.eu]

Introduction

Intelligent Energy Europe expects district heating to double its share of the European heat market by 2020 while district cooling will grow to 25%. While this expansion will translate into 2.6% reduction in the European primary energy need and 9.3% of all carbon emissions, it will not be achieved through modernization and expansion alone but requires fundamental technological innovation to make the next generation of district heating and cooling (DHC) systems highly efficient and cost effective to design, operate and maintain. E2District aims to develop, deploy, and demonstrate a novel cloud enabled management framework for DHC systems, which will deliver compound energy cost savings of 30% through development of a District Simulation Platform to optimise DHC asset configuration targeting >5% energy reduction, development of intelligent adaptive DHC control and optimisation methods targeting an energy cost reduction between 10 and 20%, including flexible production, storage and demand assets, and system-level fault detection and diagnostics, development of behaviour analytics and prosumer engagement tools to keep the end user in the loop, targeting overall energy savings of 5%. Development of a flexible District Operation System for the efficient, replicable and scalable deployment of DHC monitoring, intelligent control, FDD and prosumer engagement, development of novel business models for DHC Operators, Integrators and Designers, validation, evaluation, and demonstration of the E2District platform, and development of strong and rigorous dissemination, exploitation and path-to-market strategies to ensure project outcomes are communicated to all DHC stakeholders. E2District addresses specifically the call's objective related to the development of optimisation, control, metering, planning and modelling tools including consumer engagement and behaviour analytics and supports the integration of multiple generation sources, including renewable energy and storage.

E2District Objectives

E2District aims to develop, deploy, validate, and demonstrate a novel cloud enabled District Management and Decision Support framework for DHC systems, which will deliver compound energy cost savings of 30%

1) Development of District Simulation Platform, which will be used as an Asset Portfolio Decision Support tool to optimise DHC asset configuration and utilisation targeting >5% energy reduction.
2) Development of intelligent adaptive DHC control and optimisation methods targeting an energy cost reduction between 10 and 20%, including flexible production, storage and demand (prosumer) assets, and system-level fault detection and diagnostics algorithms for physical and operational fault root cause identification and analysis supporting cost-effective DHC maintenance.
3) Development of a behaviour analytics tool for learning and continuously refining the demand behaviour models, and to develop prosumer engagement tools and user interfaces that keep the human end user in the loop, targeting overall energy savings of 5%.
4) Development of a flexible District Operation System for the efficient, replicable and scalable deployment of DHC monitoring, intelligent control, FDD and prosumer engagement & analytics tool.
5) Development of novel business models for district heating and cooling Operators, Integrators and Designers, including lessons learned and guidelines for achieving energy efficient districts.
6) Validation, evaluation, and demonstration of E2District platform benefits based on selected key performance indicators in 3 different demonstration sites.
7) Development of strong and rigorous dissemination, exploitation and path-to-market strategies to ensure project outcomes are communicated to all DHC stakeholders and the scientific community as well as all of the relevant DHC associations (such as E2BA and DHC+).

WS-5: "QUANTIFYING THE **BUSINESS VALUE OF DEMAND RESPONSE**: INITIATIVES FOR ENERGY SUPPLIERS & DSOS"

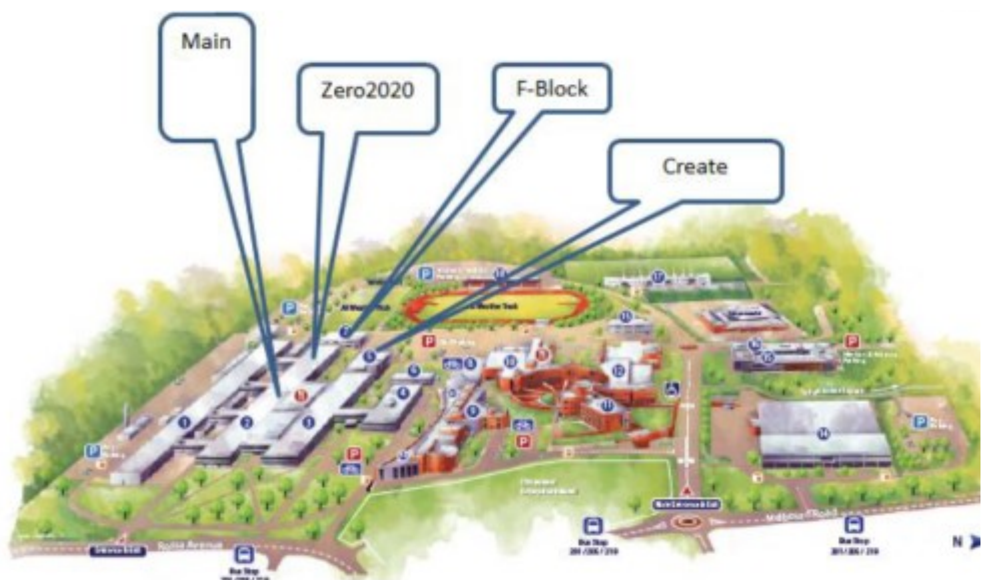
E2District

Demo SItes

In order to assess whether the research outputs of E2District are replicable beyond the CIT campus district, Veolia have identified possible district heating system sites from their portfolio that the project can utilise to assess transferability of results and approaches.

The selected Demonstration District is part of the CIT Bishopstown campus district in Cork, Ireland. The district is a third level institute, hosting about 800 full-time staff, 650 part-time staff, 7800 full time students and 3200 part time students. As such, it is primarily used for education (main building block) and research (CREATE). This makes the district research friendly and ready, facilitating a living lab environment in which research experiments and demonstrations can be carried out across the whole operating envelope of the DHC system, which would typically not be possible in a commercial DHC system.

Occupancy is mostly during office hours and varies with the academic year. It dips in Dec-Jan (60, 20% occupancy), April (60% occupancy), and July-Sept (20, 20, 30% occupancy). The research strategy for CIT is to create a campus wide research infrastructure for energy research.



WS-5: "QUANTIFYING THE **BUSINESS VALUE OF DEMAND RESPONSE**: INITIATIVES FOR ENERGY SUPPLIERS & DSOS"

E2District

Consortium

In order to achieve the objectives of the E2District project, a well-balanced consortium has been assembled representing key stakeholders within the DHC value chain from equipment manufacturers (UTC/UTRC), DHC operators (VEOLIA/VERI) to building systems integrators (ACCIONA), as well as centres of excellence in the area of building modelling and simulation (CSTB), and information and communication technologies (CIT). At an industrial level, the partners represent the whole value chain from construction to operation to end user of district heating and cooling systems.

To maximize the project impact, the consortium will engage regularly with the Stakeholder Advisory Board to ensure the successful deployment of all technical activities and the proper validation and demonstration of the project outcomes. The E2District project will build on a number of related on-going projects such as FP7 COOPERATE, Energy-in-Time, RESILIENT and Tribute, where the partners CIT, UTRC, ACC and CSTB are already involved and collaborating.

WS-6

"NEW TOOLS TO REDUCE THE **ENERGY PERFORMANCE GAP**"

Chaired by:

Hit2Gap, TOPAs, QUANTUM, & MOEEBIUS

WORKSHOP-DEDICATED WEBPAGE:

http://sustainable-places.eu/sp-2016/programme/sp16-workshops/new-tools-reduce-energy-performances-gap/

WS-6: “NEW TOOLS TO REDUCE THE **ENERGY PERFORMANCE GAP**“

Workshop Leadership & Project-Dedicated Webpages on the SP’16 website

WS-6: "NEW TOOLS TO REDUCE THE **ENERGY PERFORMANCE GAP**"

Workshop Context

At the ***"New tools to reduce the energy performance gap" workshop at SP'2016, five EU projects*** aim at providing new services, tools and methodologies narrowing the lacks and the inconveniences of current solutions will present their interrelated solutions. The proposed solutions target a large audience of customers (ESCO, facility managers, energy managers, maintenance managers, building management system providers, technology or services providers, building owner and building occupants). They are all based on the linkage between building performance models and measured data coming from operational Building Management Systems. National regulations on construction in Europe are designed to support the Energy Performance of Buildings Directive, by leading to improved energy performance in new buildings, extensions to buildings and refurbishments, and the revisions to building regulations have indeed led to higher levels of insulation and more efficient HVAC systems. In practice, however, the improvements to efficiency on paper have not been fully achieved in practice. There is a gap between the performance that is sought and the performance that is realised. Errors in the construction and commissioning of the building fabric and services have had an impact, but occupiers are also using buildings in ways that differ from what was originally envisaged. The result is that energy consumptions of buildings often exceed design energy requirements. The performance gap can often lie in the range 150%-250%. This has implications for running costs, national energy supply and climate change. Five European H2020 funded projects, HIT2GAP, TOPAs, QUANTUM, MOEEBIUS, and TRIBUTE will work to provide new tools and methodologies to minimise the gap between the predicted and the actual energy usage in buildings and blocks of buildings. The workshop aims at initiating clustering around this topic and discussing the solutions developed as part of the projects.

WS-6: “NEW TOOLS TO REDUCE THE **ENERGY PERFORMANCE GAP**“

Workshop Agenda

- **Introduction (5’)**
- **Projects’ presentations (15’ each): objectives and means developed as part of the projects to answer to the EU Call issues**
    - **Round table 1: dissemination, exploitation plans and specific ways of collaboration to maximise impact (eg standardisation) (45’)**
    - **Round table 2: implementation of the project (User driven, validation procedures for TRLs…) (45’)**
    - **Conclusions and closure (10’)**

BIOS OF PRESENTING AUTHORS

HIT2GAP – Pascale BRASSIER, NOBATEK, FR

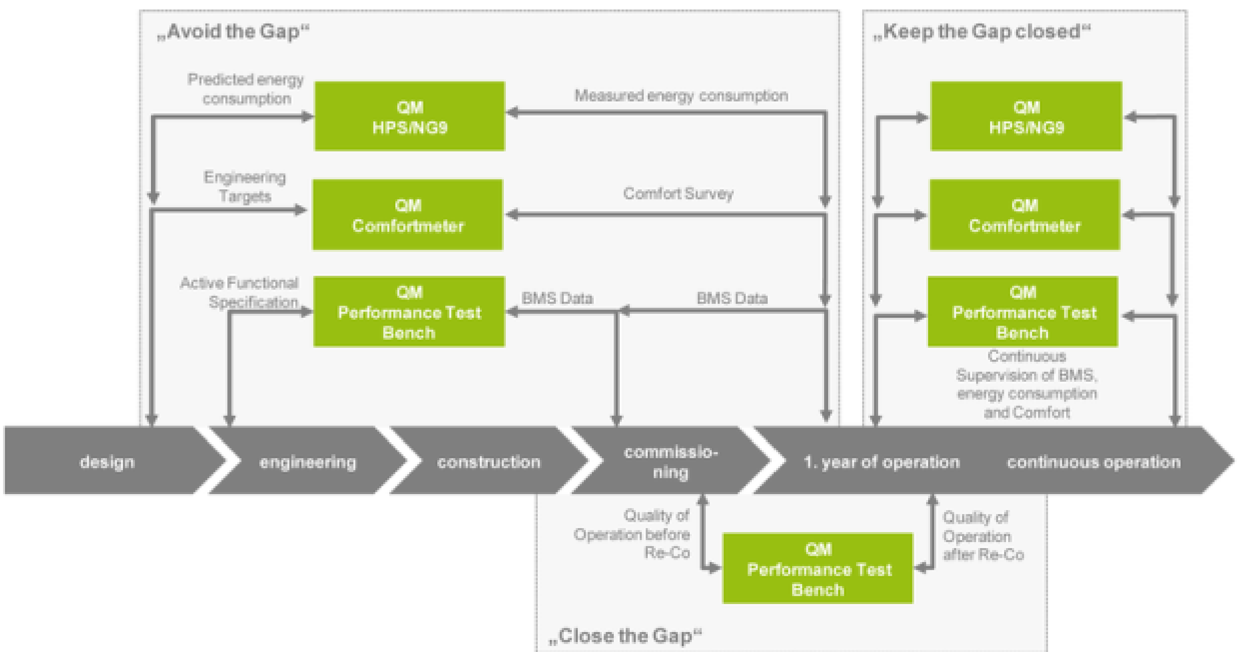
Graduated as engineer from the MATMECA Magistère in Bordeaux (Fr) in 1997, Pascale received her PhD in Mechanics from the University of Bordeaux 1 in 2000. After an 8 years’ experience in the non-destructive testing domain in the aerospace industry, she joined NOBATEK in 2012 as project manager in the field of building monitoring after a professional training on energy efficiency and techniques for building performances assessment. She is in charge of projects related to building monitoring and energy performance assessment of buildings and particularly involved in European and research projects.

MOEEBIUS – Ander Romero Amorrortu, TECNALIA, ES

MASc in Thermal Engineering (2010). MSc Industrial Engineer (2005). He joined TECNALIA in 2007 as a researcher in the field of energy efficiency building design and retrofitting, focusing on energy simulation and thermal performance of building envelope, dealing with sustainable and low energy buildings and integration of innovative and sustainable solutions. He currently holds the posi-

QUANTUM: "Quality management for building performance" [www.quantum-project.eu]

QUANTUM – The objective of QUANTUM is to develop and demonstrate pragmatic services and appropriate tools supporting quality management in the design, construction, commissioning and operation phase as a means to close the gap between predicted and measured energy consumption in European buildings. The project will integrate different innovative ICT-driven tools supporting the quality management process into building and energy services, and will apply them to a representative set of European buildings. The result of this project will be a comprehensive QUANTUM quality management platform integrating tools, services and processes.



WS-6: "NEW TOOLS TO REDUCE THE **ENERGY PERFORMANCE GAP**"

QUANTUM

The estimated average gap between calculated and actual energy performance of the European building stock is 25% for energy performance and 1,5% for comfort performance (as scored by building occupants).

Comprehensive research has shown that faultily commissioned and operated building management systems are a main cause for this gap mainly caused by the lack of appropriate and coherent quality management systems for building performance.
The objective of this project is therefore to develop and demonstrate pragmatic services and appropriate tools supporting quality management in the design, construction, commissioning and operation phase as a means to close this gap in European buildings. The project will integrate different innovative ICT-driven tools supporting the quality management process into building and energy services, and will apply them to a representative set of European buildings (taking into account different climate zones and different energy services).

The result of this project will be a comprehensive QUANTUM quality management platform integrating tools, services and processes. The partners will implement EU-wide dissemination activities to inform the stakeholders about the advantages of comprehensive quality management systems for the building industry, and to promote the tools validated in the project. Stakeholders that will benefit from the results of this project include building owners, tenants, ESCOs, developers, architects, engineering and consulting firms, students and public authorities.

Aside from savings on the energy costs CO_2 emissions will be reduced and employee productivity in buildings equipped with the tools and services will increase as well due to increased occupant comfort. From previous preliminary data and own estimations, the QUANTUM partners expect that the reduction in energy consumption achieved by coherent quality management for building performance to be more than 10%.

WS-6: "NEW TOOLS TO REDUCE THE **ENERGY PERFORMANCE GAP**"

QUANTUM

Demo SItes

Within the duration of the QUANTUM project demo buildings will be analysed in two phases. The first three demo buildings are in Germany, Austria and in the Czech Republic. To generate an empiric data base 120 buildings will be also examined with the Comfortmeter in the first 12 months of the project.

Phase 1: Small-scale tools demonstration in relevant environment: In Phase 1 three buildings will be selected for testing of tools ENA and CM (both on TRL6). The main goal is to test their applicability, technical interfaces, successful target definition, measurement and validation and ensure their readiness for the large scale demonstration that will follow in Phase 2. Important part of this phase will be detail building energy system analysis and definition of AFSs and KPIs and their subsequent implementation in ENA. 12 months will be dedicated to data collection and continuous monitoring and validation of implementation. Based on this data and gained experiences a helpful feedback will be provided to the tools developers, so that they can improved and adjust them before the beginning of Phase 2.

Phase 2: System prototype demonstration in operational environment: Phase 2 will focus on testing the previously defined process of QM for building performance and application of tools for usability in QM. Apart from the 3 buildings from Phase 1, at least 12 additional buildings will be selected to undergo the process of analysis, tools implementation and 12 months of operation. This time all described steps will be made in accordance with the definition of process of QM and a particular type of service provided by a partner. Tools ENA and CM are expected to be on TRL7 in this phase. The goal is to obtain sufficient amount of verified data to be able to provide recommendations for future use and feedback to other WPs. According to the areas of expertise of the partners and their position in the building industry, the demo buildings will be grouped according to tools and services applied. Within the project consortium there are companies (i.e. EA, E7, COWI, BRE) from different occupational groups like engineers, contractors or consultants. These companies want to include or already have included QM for building performance into their portfolio of service, which are: Commissioning in new construction and comprehensive refurbishment of nearly zero energy buildings (Partners involved: COWI, E7); Retrofitting of building systems (Partners involved: partially ENESA); Energy performance contracting (EPC) (Partners involved: ENESA); Recommissioning (Partners involved: E7); Facility Management; Environmental certification for buildings (Partners involved: BRE, E7).

Experiences gained during the Phase 2 will be exchanged and discussed among partners and finally transformed into best-practices recommendations. This output will be used as a base material for development of business plans for QM implementation and further improvement of tools and services.

WS-6: "NEW TOOLS TO REDUCE THE **ENERGY PERFORMANCE GAP**"

QUANTUM

quantum
Quality management for building performance

Tools

The consortium strives to reduce the gap between predicted and monitored performance by applying a coherent quality management system (QMS) for buildings supported by three tools. Although the three tools are different elements in the project they work best together doing quality assurance. Different combinations of tools in buildings permit a flexible application in various project situations.

"Energie Navigator" Tool for functional specifications of Building Services; Link between the description of individual BMS functions and an automated statistical analysis and evaluation of the corresponding operation data; Clear metrics for system performance

"Comfortmeter" Web based survey tool; Questions related to different comfort, productivity and user related aspects; Cost-effective, reliable and clear insight in the comfort performance of the building

"HPS/NG9" Application on electrical energy low cost sub-metering; Development of energy management indicators; Detection of unexpected energy consumption
Real-time local analysis

Consortium

1. TECHNISCHE UNIVERSITAT BRAUNSCHWEIG, Germany
2. FACTOR 4 BVBA, Belgium
3. ENESA a.s., Czech Republic
4. E7 ENERGIE MARKT ANALYSE, Austria
5. COWI A/S, Denmark
6. SYNAVISION GMBH, Germany
7. NORGES TEKNISK-NATURVITENSKAPELIGE UNIVERSITET NTNU, Norway
8. CESKE VYSOKE UCENI TECHNICKE V PRAZE, Czech Republic
9. ETHNIKO KAI KAPODISTRIAKO PANEPISTIMIO ATHINON, Greece
10. FEDERATIE VAN VERENIGINGEN VOOR VERWARMING EN LUCHTBEHANDELING IN EUROPA VERENIGING, The Netherlands
11. EKODOMA, Latvia
12. BUILDING RESEARCH ESTABLISHMENT LTD, UK
13. ENERGY TEAM SPA, Italy
14. POLITECNICO DI MILANO, Italy

MOEEBIUS: "Modelling Optimisation of Energy Efficiency in Buildings for Urban Sustainability" [www.moeebius.eu]

Consortium

MOEEBIUS introduces a Holistic Energy Performance Optimization Framework that enhances current modelling approaches and delivers innovative simulation tools which deeply grasp and describe real-life building operation complexities in accurate simulation predictions that significantly reduce the "performance gap" and enhance multi-fold, continuous optimization of building energy performance as a means to further mitigate and reduce the identified "performance gap" in real-time or through retrofitting.

MOEEBIUS introduces a Holistic Energy Performance Optimization Framework that enhances current (passive and active building elements) modelling approaches and delivers innovative simulation tools which (i) deeply grasp and describe real-life building operation complexities in accurate simulation predictions that significantly reduce the "performance gap" and, (ii) enhance multi-fold, continuous optimization of building energy performance as a means to further mitigate and reduce the identified "performance gap" in real-time or through retrofitting.
The MOEEBIUS Framework comprises the configuration and integration of an innovative suite of end-user tools and applications enabling (i) Improved Building Energy Performance Assessment on the basis of enhanced BEPS models that allow for more accurate representation of the real-life complexities of the building, (ii) Precise allocation of detailed performance contributions of critical building components, for directly assessing actual performance against predicted values and easily identifying performance deviations and further optimization needs, (iii) Real-time building performance optimization (during the operation and maintenance phase) including advanced simulation-based control and real-time self-diagnosis features, (iv) Optimized retrofitting decision making on the basis of improved and accurate LCA/ LCC-based performance predictions, and (v) Real-time peak-load management optimization at the district level.

Through the provision of a robust technological framework MOEEBIUS will enable the creation of attractive business opportunities for the MOEEBIUS end-users (ESCOs, Aggregators, Maintenance Companies and Facility Managers) in evolving and highly competitive energy services markets. The MOEEBIUS framework will be validated in 3 large-scale pilot sites, located in Portugal, UK and Serbia, incorporating diverse building typologies, heterogeneous energy systems and spanning diverse climatic conditions.

WS-6: "NEW TOOLS TO REDUCE THE **ENERGY PERFORMANCE GAP**"

MOEEBIUS

Consortium

1. FUNDACION TECNALIA RESEARCH & INNOVATION
2. HONEYWELL, SPOL. S.R.O
3. HYPERTECH (CHAIPERTEK) ANONYMOS VIOMICHANIKI EMPORIKI ETAIREIA PLIROFORIKIS KAI NEON TECHNOLOGION
4. CORK INSTITUTE OF TECHNOLOGY
5. SOLINTEL M&P SL
6. UNIVERSITY COLLEGE CORK - NATIONAL UNIVERSITY OF IRELAND, CORK
7. ALMENDE B.V.
8. FRAUNHOFER GESELLSCHAFT ZUR FORDERUNG DER ANGEWANDTEN FORSCHUNG EV
9. PREDUZECE ZA INFORMACIONE TEHNOLOGIJE I ELEKTRONSKO TRGOVANJE BELIT DOO
10. KIWI POWER LTD
11. INSTITUTO DE SOLDADURA E QUALIDADE
12. GRINDROP LTD
13. BEOGRADSKE ELEKTRANE
14. MUNICIPIO DE MAFRA
15. ASM CENTRUM BADAN I ANALIZ RYNKU SP. Z O O
16. TECHNISCHE HOCHSCHULE NURNBERG GEORG SIMON OHM

HIT2GAP: “Highly Innovative building control Tools Tackling the energy performance gap” [www.hit2gap.eu]

HIT2GAP was established to develop an energy management platform which aims to reduce or eliminate the energy gap by providing, firstly, a data platform, to collect and store data about a building, and secondly, by modelling, to predict energy requirements with the aim of forecasting or benchmarking buildings, and thirdly, by the provision of modules to interpret data and present it in a user-friendly style, tailored for a range of audiences. The platform will also welcome third-party modules, provided by small innovative companies for example, which can analyse or display data in an innovative way.

Project Introduction

The actual energy consumption of buildings in Europe often significantly exceeds the expected energy requirements. This gap in energy performance can arise from construction errors but it can also result from differences between the way a building is actually used and how it was intended to be used. An energy management platform could help to reduce this energy gap.

Achieving energy efficiency targets will be made much easier thanks to a new and innovative energy reporting platform.

To meet this ambitious objective, the HIT2GAP project will deliver:

1. A generic information platform with protocols for communication with devices and user interfaces

2. Building energy modelling, to establish energy consumption benchmarks

3. A variety of tailored modules to inform users, energy managers and engineer.

WS-6: “NEW TOOLS TO REDUCE THE **ENERGY PERFORMANCE GAP**“

Hit2Gap

The aims of the HIT2GAP project are:

1. to reduce the energy gap, focusing on the operation phase of buildings

2. to propose a new paradigm for the development of energy management platforms in buildings, integrating existing expertise and resources

to provide a smart platform which is marketable.

The partners of HIT2GAP are working together to provide a platform which is both generic and modular, which could be used in a wide variety of buildings and groups of buildings. It will include plug-and-play modules that are designed to inform users about the operational performance of their building(s), based on data collected at building level.

MOVING FORWARD:

HIT2GAP modules will provide information to users of buildings to help them to reduce energy consumption. The information could be provided in various formats, and those formats could be tailored to specific needs of building users. For some users, simple or engaging displays might provide the greatest impact on energy saving. For other users, more detailed information could be provided, to enable a strategic approach to be taken by those who are responsible for saving energy. Provision of information to users, in the right format, could help to close the gap between actual energy performance and expected performance.

WS-6: "NEW TOOLS TO REDUCE THE **ENERGY PERFORMANCE GAP**"

Hit2Gap

Pilot Studies

Four pilot studies will be carried out as part of the HIT2GAP Project. These are in Spain, France, Ireland and Poland. For more information regarding the HIT2GAP demonstration buildings, contact Tomasz Matejczuk, Mostostal.

WS-6: "NEW TOOLS TO REDUCE THE **ENERGY PERFORMANCE GAP**"

Hit2Gap

PROJECT PLAN:

The HIT2GAP Project is divided into a number of Work Packages (WPs), each led by a partner organisation:

- WP1 – Requirements, framework and methodology to perform energy savings from data treatment (APINTECH)
- WP2 – Data acquisition solutions and software architecture (EURECAT)
- WP3 – Design, integration and test of data treatment bricks (FISE)
- WP4- Design, integration and test of the software platform (NOBATEK)
- WP5 – Demonstration in pilot site (MOSTOSTAL)
- WP6 – Innovative services definition and market exploitation (R2M)
- WP7 – Dissemination and communication (BRE)
- WP8 – Organisation & Management strategy (NOBATEK)

TOPAs: “Tools for Continuous Building Performance Auditing” [www.topas-eeb.eu]

Project Introduction

TOPAs open, cloud based platform of decision support tools for building and facilities managers, owners and ESCOs will provide a holistic performance audit process through supporting tools and methodologies that minimise the gap between predicted and actual energy use. TOPAs’s framework for continuous performance auditing will allow the better understanding of the actual energy performance in and across existing buildings and facilitate continuous performance improvement based on real operational use.

Consortium

1. MOTOROLA SOLUTIONS ISRAEL LTD
2. CORK INSTITUTE OF TECHNOLOGY
3. COMMISSARIAT A L ENERGIE ATOMIQUE ET AUX ENERGIES ALTERNATIVES
4. AZIMUT MONITORING
5. ARDEN ENERGY LIMITED
6. FRAUNHOFER GESELLSCHAFT ZUR FOERDERUNG DER ANGEWANDTEN FORSCHUNG E.V., Germany
7. IBM IRELAND LIMITED, Ireland
8. TECHNISCHE UNIVERSITAET DRESDEN, Germany
9. EMBIX SAS, France

WS-6: “NEW TOOLS TO REDUCE THE ENERGY PERFORMANCE GAP“

TOPAs

Intended Outcomes

TOPAs will develop an open, cloud based platform of analytic tools to minimise the gap between the predicted and the actual energy usage in blocks of buildings. TOPAs is targeting to reduce the existing gap to 10% and approach additional energy savings in the pilot regions up to 20%.

According to the World Energy Outlook reports, buildings are the largest energy consumers in the western world with approximately 40% of total energy consumption contributing 30% to the total CO2 emissions. TOPAs will focus on reducing the gap from an operational perspective, hence supporting Post Occupancy Evaluation (POE). TOPAs adopts the principle of continuous performance auditing and considers not only energy use but also an understanding of how buildings are used and their climatic state (environmental & air quality), thus providing a holistic performance audit process through supporting tools and methodologies that minimise the gap between predicted and actual energy use.

TOPAs open platform will efficiently analyse large amounts of data from building to blocks of buildings, including existing building management and metering systems to optimise energy performance and identify areas for improvement. TOPAs will link building performance (prediction) models with operational Building Management Systems (BMSs) and measuring technologies to improve both the accuracy of the prediction models and the in-use performance of the buildings.

TOPAs’s framework for continuous performance auditing will allow the better understanding of the actual energy performance in and across existing buildings and facilitate continuous performance improvement based on real operational use. TOPAs will provide decision support tools for building and facilities managers, owners and ESCOs to more effectively manage their site, providing visibility on how energy related decisions impact cost, occupant comfort and health and general management process. TOPAs will demonstrate the benefits of continuous auditing process through the use of the TOPAs solution under real operating conditions and scenarios in private and public commercial building blocks.

WS-6: “NEW TOOLS TO REDUCE THE **ENERGY PERFORMANCE GAP**“

TOPAs

The TOPAs business offering contains four categories: Building System Integration, Real time Energy Optimisation, Energy Performance Diagnosis and Energy Management Services. These categories are detailed in D1.3, Section 2. Under these four categories were defined the following twelve use cases:

 Building Systems Integration o BSI-1 Neighbourhood Information Model Configuration o BSI-2 Building System Abstraction o BSI-3 BMS Policy Configuration Real time Energy Optimisation o REO-1 Thermal Regulation driven by Occupancy & Comfort o REO-2 Cost Aware Energy Regulation o REO-3 Thermal & Electrical Regulation for Blocks of Building Energy Performance Diagnosis o EPD-1 Fault Detection & Diagnosis o EPD-2 System Reconfiguration Energy Management Services o EMS-1 Energy Prediction Modelling o EMS -2 Occupancy Modelling o EMS -3 Air Quality Analysis o EMS-4 Monitoring and Management of Energy Flows (excertpt from: D7.1: Validation Methodology Description)

Table 1 Mapping of Use Cases with project objectives

	#1	#2	#3	#4	#6	#7	#8
Use Case ID	Open BMS	Energy Prediction	Model Predictive Control	Decision Support Tools & Services	KPIs, EE metrics, methodologies	Gap Reduction	Energy Savings
BSI-1	X						
BSI-2	X						
BSI-3	X			X			
REO-1			X				X
REO-2			X				X
REO-3			X				X
EPD-1				X	X	X	X
EPD-2				X			
EMS-1		X			X	X	X
EMS-2		X	X	X	X	X	X
EMS-3			X	X	X		X
EMS-4				X	X	X	X

WS-6: “NEW TOOLS TO REDUCE THE **ENERGY PERFORMANCE GAP**“

TOPAs

TOPAs will enhance traditional energy performance related data sources (e.g. energy meters, temperature, humidity, weather etc.) with contextual sources such as occupancy models, equipment performance and air quality models to better quantify the performance gap. TOPAs technological objectives include:

KPIs - Enhance current common performance metrics and performance auditing processes for building and blocks of buildings to enable experience and knowledge sharing among stakeholders to firstly improve the replicability of energy savings for similar building typologies through a better base model and secondly investigate the most appropriate business models to foster growth in the energy services sector.

Open BMS approach - the integration of existing technologies to develop an open BMS platform that will efficiently analyse large amounts of data from building to blocks of buildings, including existing building management and metering systems to optimise energy performance and identify areas for improvement.

Energy Prediction - The refinement and fine tuning of building performance modeling approaches to accurately predict energy usage and close the gap between this and actual energy use through enhanced machine-learning approaches. It is envisaged that such models will assist in the identification of energy saving potentials, fault detection, and control optimisation within energy performance contracts by providing an independent and accurate measurement and verification tool for Post Occupancy Evaluation (POE).

Model Predictive Control - Integrate enhanced building models with a continuous auditing methodology encapsulating live building performance measurements enabling a measurement based performance evaluation. Improving control and energy consumption at all levels of building operation using Distributed Model Predictive Control (DMPC) approaches at building and district level that utilize the occupancy, air quality monitoring and energy prediction model).

Decision Support Tools - Provide decision support tools for building and facilities managers, owners and ESCOs to more effectively manage their site, providing visibility on how energy related decisions impact cost, occupant comfort and health and general management process.

Gap Reduction - Target a reduction in the gap to 10% as an initial benchmark and to progressively challenge this target throughout the project.

Energy Savings - Target additional energy savings in the pilot regions of 15% – 20%

WS-7

"ADAPTABLE INDUSTRIALISED ENVELOPES: MODULES INTEGRATING SYSTEMS FOR THE RENOVATION OF EXISTING BUILDINGS"

Chaired by:

BERTIM, E2Vent, BRESAER, and SymBiofacades

WORKSHOP-DEDICATED WEBPAGE:

http://sustainable-places.eu/sp-2016/programme/sp16-workshops/adaptive-building-envelopes/

WS-7: “**ADAPTABLE INDUSTRIALISED ENVELOPES:** MODULES INTEGRATING SYSTEMS FOR THE RENOVATION OF EXISTING BUILDINGS”

Workshop Leadership & Project-Dedicated Webpages on the SP’16 website

On the need of industrialised solutions for the renovation of existing buildings:

The main objective (the renovation of the building stock, of which in Europe, a large share (approximately 34%[1]) of the suburban multi-storey residential buildings is built between the 60's and the 80's, when there were only few or no requirements for energy efficiency. Such a big figure should represent a consequent sizeable market, though the amount and the innovative aspects of technologies are limited. These limitations can be explained as coming from different barriers (source: LEAF project)

- ROI usually quite high
- Difficulty to test the solutions on real buildings due to regulations, insurances…
- Funding: no easy way to obtain funds to renovate
- High numbers of stakeholders that exacerbate the retrofit challenge

Split incentives to appropriate the benefits of the savings

The session will then allow an open discussion on the topic of the innovation for the energy efficient renovation of existing residential buildings by means of prefabricated modules in Europe and especially social housing. The objective will be to determine how to improve the capacity to innovate with prefabricated elements for the energy renovation of existing building. The debate will tackle the following issues:

- European regulations
- The necessity of testing on real cases
- Stakeholders involvement and acceptance
- From innovation to business

WS-7: "**ADAPTABLE INDUSTRIALISED ENVELOPES:**
MODULES INTEGRATING SYSTEMS FOR THE
RENOVATION OF EXISTING BUILDINGS"

Workshop Agenda

SUSTAINABLE PLACES 2016 June 29-July 1, 2016 Anglet, France

- Presentation of each technologies (E2VENT, BRESAER, BERTIM, BIOFACADE)

o Concept, Progress, Challenges

- Open discussions with the room on the concepts (20')

- Discussion*** : "how to improve the capacity to innovate with prefabricated elements for the energy renovation of existing building"

o European regulations, The necessity of testing on real cases, Stakeholders involvement and acceptance

o From innovation to business

.

Outcomes

This workshop proposes to cluster some EU funded projects to present and discuss market characteristics surrounding FOUR innovative technologies that represent potential breakthroughs in the field of prefabricated façade modules for the renovation of existing buildings. This workshop will also produce a subsequent report on the barriers to the innovation in the field of modules for the façade renovation of existing buildings. Finally, knowledge transfer from the project workshop speakers the to the attendees of the Sustainable Places 2016 international conference will facilitate the broadening of construction stakeholder views and opinions into the user requirements process ongoing in the projects.

BERTIM: Building Energy Renovation Through Timber Prefabricated [www.bertim.eu]"

Project Introduction

BERTIM will develop a prefabricated solution which will provide the opportunity to renovate improving energy performance, air quality, aesthetics, comfort, and property value at the same time, while ensuring low intrusiveness during renovation works. BERTIM project wants to contribute to increased energy efficient building renovation rates in Europe by means of developing energy efficient and cost-effective products for the wood industry.

BERTIM partners will analyse the possibility of increasing the density of existing urban structures by means of adding roof floors. The increase of density is already an urban strategy for sustainability of resources, and to foster this trend the model will allow to building owners to have at their disposal new dwellings to be sold. An investor could also be interested in investing in the renovation in exchange of the new dwellings. The technical social and economic barriers will be analysed, and a technical solution to increase one floor with timber 3D prefabricated modules will be proposed

Intended Outcomes

BERTIM will develop a prefabricated solution which will provide the opportunity to renovate improving energy performance, air quality, aesthetics, comfort, and property value at the same time, while ensuring low intrusiveness during renovation works.

WS-7: "ADAPTABLE INDUSTRIALISED ENVELOPES: MODULES INTEGRATING SYSTEMS FOR THE RENOVATION

BERTIM

BERTIM is an H2020 project that will develop a timber-based prefabricated solution which will be self-supporting. The solution will embed building components but also HVAC technologies. A platform will facilitate and improve the renovation process. 3D scanning coupled with BIM models will allow mass manufacturing. It will provide the opportunity to renovate improving energy performance, air quality, aesthetics, comfort, and property value at the same time, while ensuring low intrusiveness during renovation works.

HIGH ENERGY PERFORMANCE PREFABRICATED MODULES

for deep renovation, integrating windows, insulation materials, collective HVAC systems, renewable energy systems and energy supply systems. The modules will be based in timber and recyclable materials for a low carbon foot print. The assembly system with the existing building will guarantee a very little time in the installation and low disturbance to tenants.

AN INNOVATIVE HOLISTIC RENOVATION PROCESS METHODOLOGY

from data gathering to installation that will improve the current processes of the wood manufacturing and installation industry. A digital workflow for the whole process will be defined to improve efficiency and accuracy of the mass manufacturing process. In order to support the renovation process a renovation project design tool oriented to SME integrating BIM with CAD/CAM tools and assuring the interoperability with CNC machines for mass manufacturing processes will be developed.

AFFORDABLE BUSINESS OPPORTUNITY

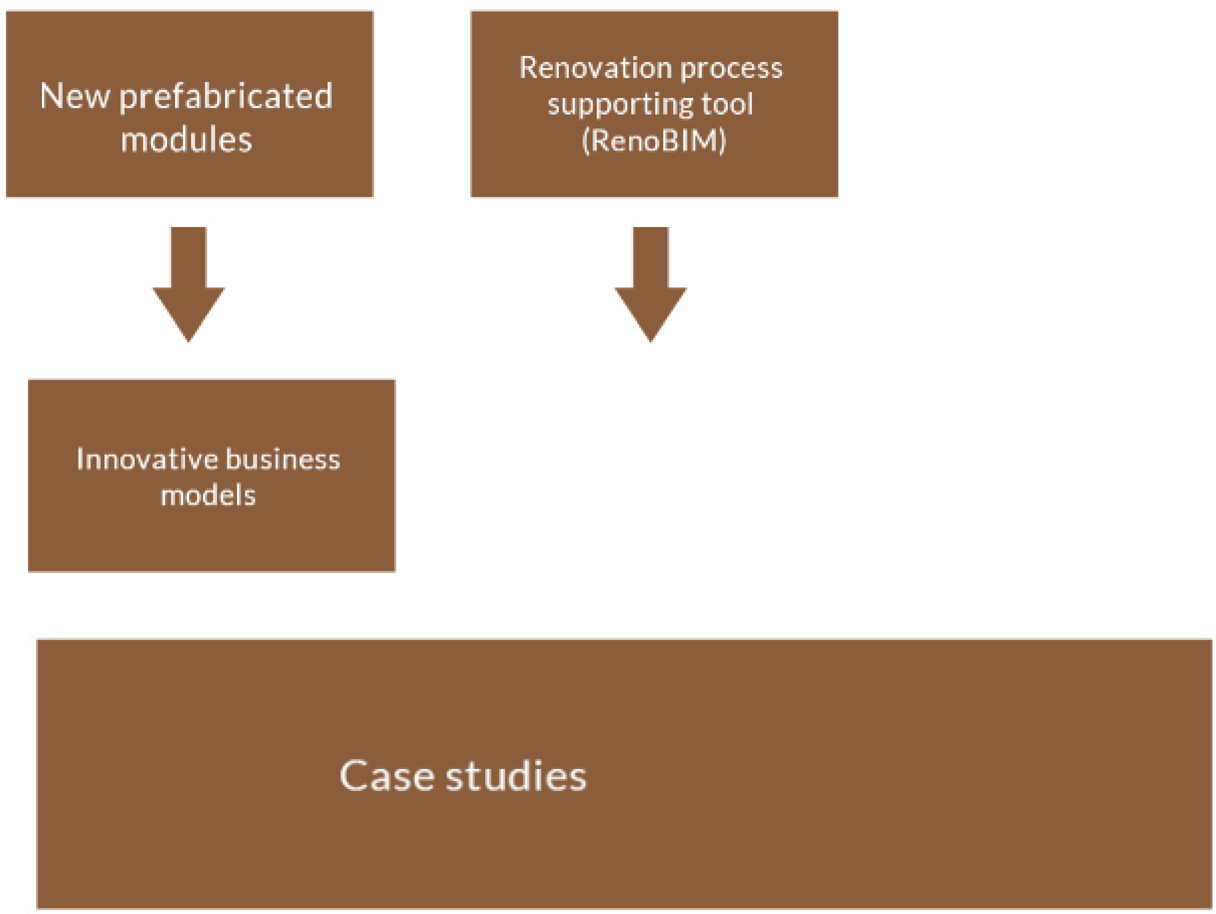
for different stakeholders that could take the lead in the launching of the renovation process.

WS-7: "ADAPTABLE INDUSTRIALISED ENVELOPES: MODULES INTEGRATING SYSTEMS FOR THE RENOVATION

BERTIM

BERTIM project wants to contribute to increased energy efficient building renovation rates in Europe by means of developing energy efficient and cost-effective products for the wood industry.

The activities to be carried out along the project include design, development and introduction of following solutions:



Consortium Members

1. TECNALIA - Tecnalia Corporación Tecnológica www.tecnalia.es
2. EGOIN - www.egoin.com
3. EMVS - Empresa Municipal de la Vivienda y Suelo de Madrid, S.A. www.emvs.es
4. FCBA - Institut Technologique FCBA www.pobi.fr
5. POBI - POBI Industrie www.pobi.fr
6. COLLAGE - Collage Arkitekter AB www.collagearkitekter.se
7. SP Technical Research Institute of Sweden - www.sp.se
8. MARTINSONS - www.martinsons.se
9. BBBO - Brabrand Boligforening www.bbbo.dk
10. DIETRICHS - Dietrich's France www.dietrichs.com/fr
11. TUM - Technische Universität München
12. ASM - Centrum Badań i Analiz Rynku www.asm-poland.com.pl

E2VENT: "Energy Efficient Ventilated Facades for Optimal Adaptability and Heat Exchange enabling novel NZEB architectural concepts for the refurbishment of existing buildings" [www.e2vent.eu]

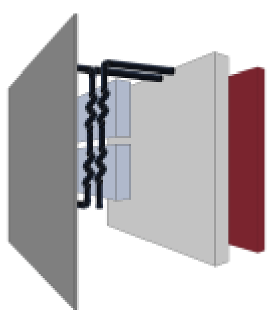
E2VENT will develop, demonstrate and validate a cost effective, high energy effcient, low CO2 emissions, replicable, low intrusive, systemic approach for retrofitting of residential buildings, able to achieve remarkable energy savings, through the integration of an innovative adaptive ventilated façade system, including:

- Smart modular heat recovery units which improves Indoor Air Quality while minimizing energy losses
- A latent system using PCM that allows thermal storage mode for the reduction of energy peaks
- A smart building management system enhancing the user experience and allowing future adaptability
- Cost-effective, easy to install, high performance adapted products for external thermal insulation

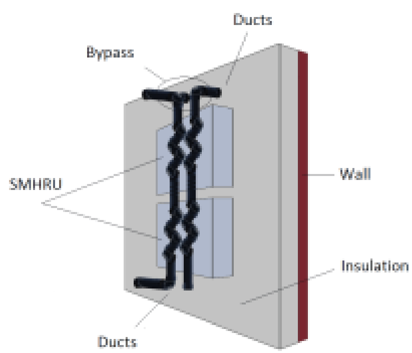
The developed technologies will be integrated in the ventilated facade, and a real time intelligent façade management system will control operation of the system based on meteorological prediction methods for forecasting in advance the decentralised electricity production and the energy (electrical and thermal) demand of the building enabling maximum RE usage. It will inter-operate with existing or latest state-of-the-art Building Energy Management System, to achieve optimum energy efficiency by reducing primary energy needs, CO_2 emissions and peak loads, assuring at least the same comfort levels required by Member States Building Codes, at an affordable price.

E2Vent

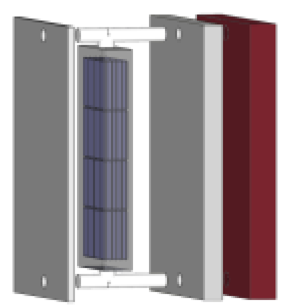
The E2VENT system that we will develop is an external thermal refurbishment solution with external cladding and air cavity (fig.1). The distinctive feature of this system is the Smart Modular Heat Recovery Unit allowing us to recover energy from the extracted air while performing the air renewal using double flux heat exchanger in the air cavity (fig.2). This way the E2VENT system enhances the energetic performance of the building and fresh air renewal does not decrease it. Aiming at providing a heat storage system for the reduction of peak of electricity consumption and/or for cooling in summer, a Latent Heat Thermal Energy Storage based on phase change materials properties may be implemented if needed.



E2VENT system



SMHRU Smart Modular Heat Recovery Unit



LHTES Latent Heat Thermal Energy Storage

WS-7: "**ADAPTABLE INDUSTRIALISED ENVELOPES:** MODULES INTEGRATING SYSTEMS FOR THE RENOVATION

E2Vent

View of the demo
building in Gdansk, Poland

Overview of the façade
test bench of Nobatek with the
E2VENT system

View of the demo
building in Burgos, Spain

WS-7: “ADAPTABLE INDUSTRIALISED ENVELOPES: MODULES INTEGRATING SYSTEMS FOR THE RENOVATION

E2Vent

NOBATEK, France - Private technological center which purpose is to promote and contribute to innovation in sustainable development in the field of construction.

FUNDACION TECNALIA RESEARCH & INNOVATION, Spain - Private, independent, non-profit research organization resulting from the merger (1st January 2011) of eight Spanish research centers.

D'APPOLONIA S.P.A., Italy - The largest fully independent Italian firm providing consulting & engineering services to Clients belonging both to the public and the private sector.

ACCIONA INFRAESTRUCTURAS S.A., Spain - Leading European construction company constructing and managing buildings and civil infrastructures under the sustainability principles.

ARISTOTELIO PANEPISTIMIO THESSALONIKIS, Greece - The Laboratory of Building Construction and Building Physics (LBCP) belongs to the School of Civil Engineering and covers the areas of building construction methodology and details, industrialized building systems etc.

EUROPEAN ALUMINIUM ASSOCIATION AISBL, Belgium - Represents the aluminium industry in Europe. Its members are the European primary aluminium producers, the national associations representing the manufacturers of rolled and extruded products, OEA and EAFA.

FUNDACION CARTIF, Spain - Leading Spanish Applied Research Centre in terms of R&D and technology transfer activities.

HELLENIC ALUMINIUM INDUSTRY S.A., Greece - The aluminium processing and trading division of VIOHALCO. Now is one of the most important aluminium rolling industries in the world. It is the only Group in Greece that focuses on this activity.

FENIX TNT S.R.O., Czech Republic - Developer of commercial, residential, retail, hospitality and mixed-use properties.

UNIVERSIDAD DE BURGOS, Spain - There are 67 research groups classified in four main research fields: Scientific-Biotechnology, Engineer and Construction, Law, Economic and Business and Humanities and Education.

PRZEDSIEBIORSTWO ROBOT ELEWACYJNYCH "FASADA" SPOLKA Z OGRANICZONA ODPOWIEDZIALNOSCIA, Poland - SME construction company. The company is active in facade works, insulation works, renovation and restoration of the buildings and assembly of different envelope systems.

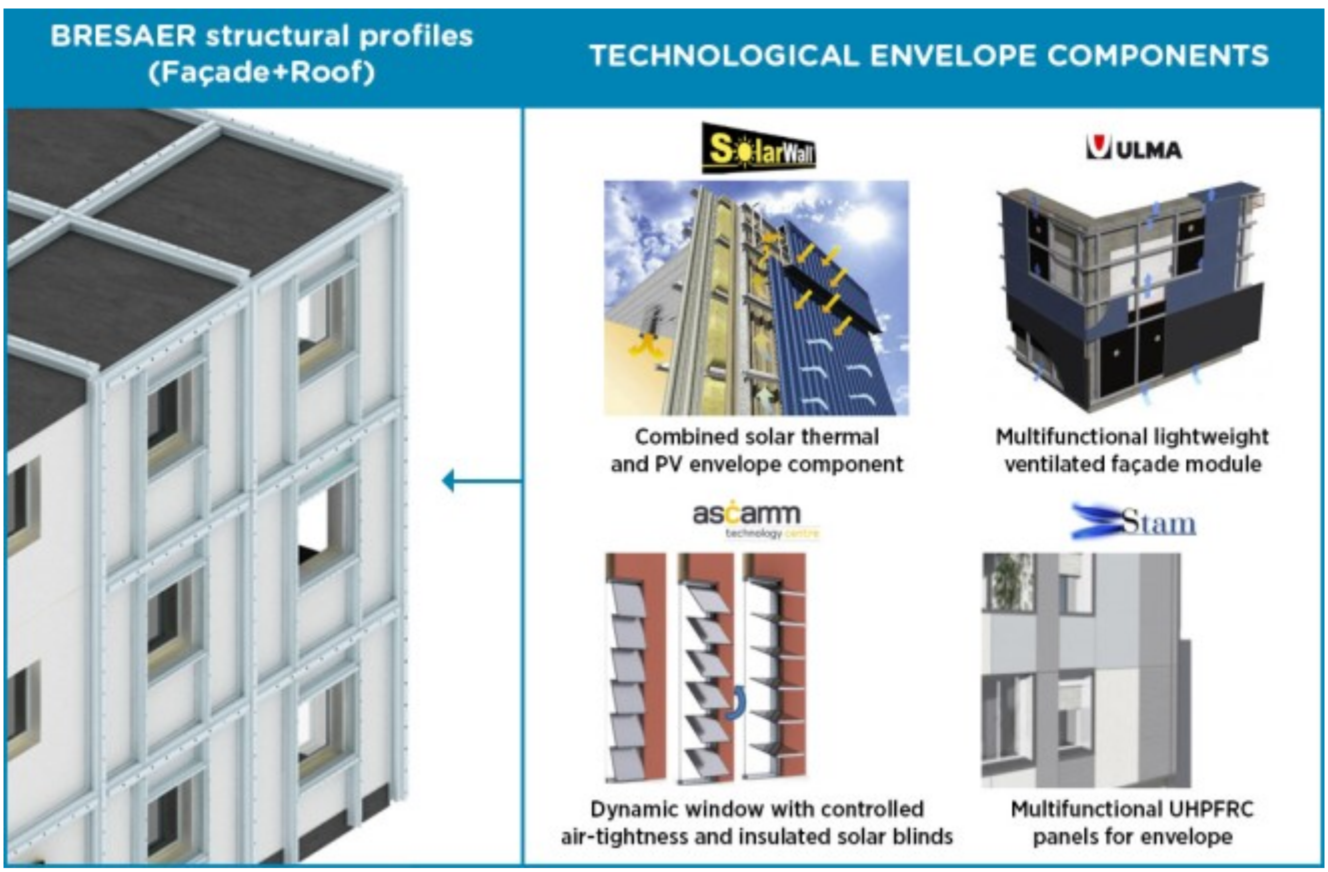
PICH-AGUILERA ARQUITECTOS S.L.P., Spain - Architect company. The company is ISO 9001 Quality Certified reflecting the quality and professionalism of the projects, building control and other tasks that characterize the work of the company.

UNIVERSITY OF HULL, UK - Has enjoyed a prominent reputation as a research-engaged institution since its establishment in 1927. It has placed research and enterprise as the core academic endeavors.

BRESAER: "BREakthrough solutions for adaptable envelopes for building refurbishment" [www.bresaer.eu]

Project Introduction

BRESAER will develop a cost-effective, adaptable and industrialized "envelope system" for buildings refurbishment. The BRESAER's envelope (for façades and roofs) will include a combination of active and passive pre-fabricated solutions which will be integrated in a versatile lightweight structural mesh. This new technology is expected to significantly **reduce the building's primary energy consumption** and the Greenhouse emissions while improving indoor environment quality through thermal, acoustic, lighting comfort and air quality at the same time. With the BRESAER system the whole building will be governed by an **innovative Building Energy Management System**, which will manage all the different envelope functions, the energy facilities of the building and monitor the energy generated by the BRESAER system.



Solutions

The innovative solutions developed by the project include:

- **Structural metallic profiles** to achieve a standardized constructive system configurable, easy to assemble and able to support different envelope components. Such components will be fixed to the profiles with a common standardised solution allowing easy and fast installation as well as removal in case of maintenance or replacement.

- **Multifunctional and multilayer insulation panels** made of Ultra High Performance Fibre Reinforced Concrete used as rigid shells for building envelope applications. Thanks to an enhanced manufacturing process they will provide insulating capacity, lightness and ease of anchoring. These can be combined with several finishes providing di-fferent functionalities: e.g. integrated PV, thermo-reflective and self-cleaning properties.

- **Combined solar thermal air and PV envelope component** for indoor space heating and ventilation, thermal insulation and electricity generation. A PV film can be integrated on the air solar thermal envelop panel whilst preheated air can be used for indoor space heating and dehumidification.

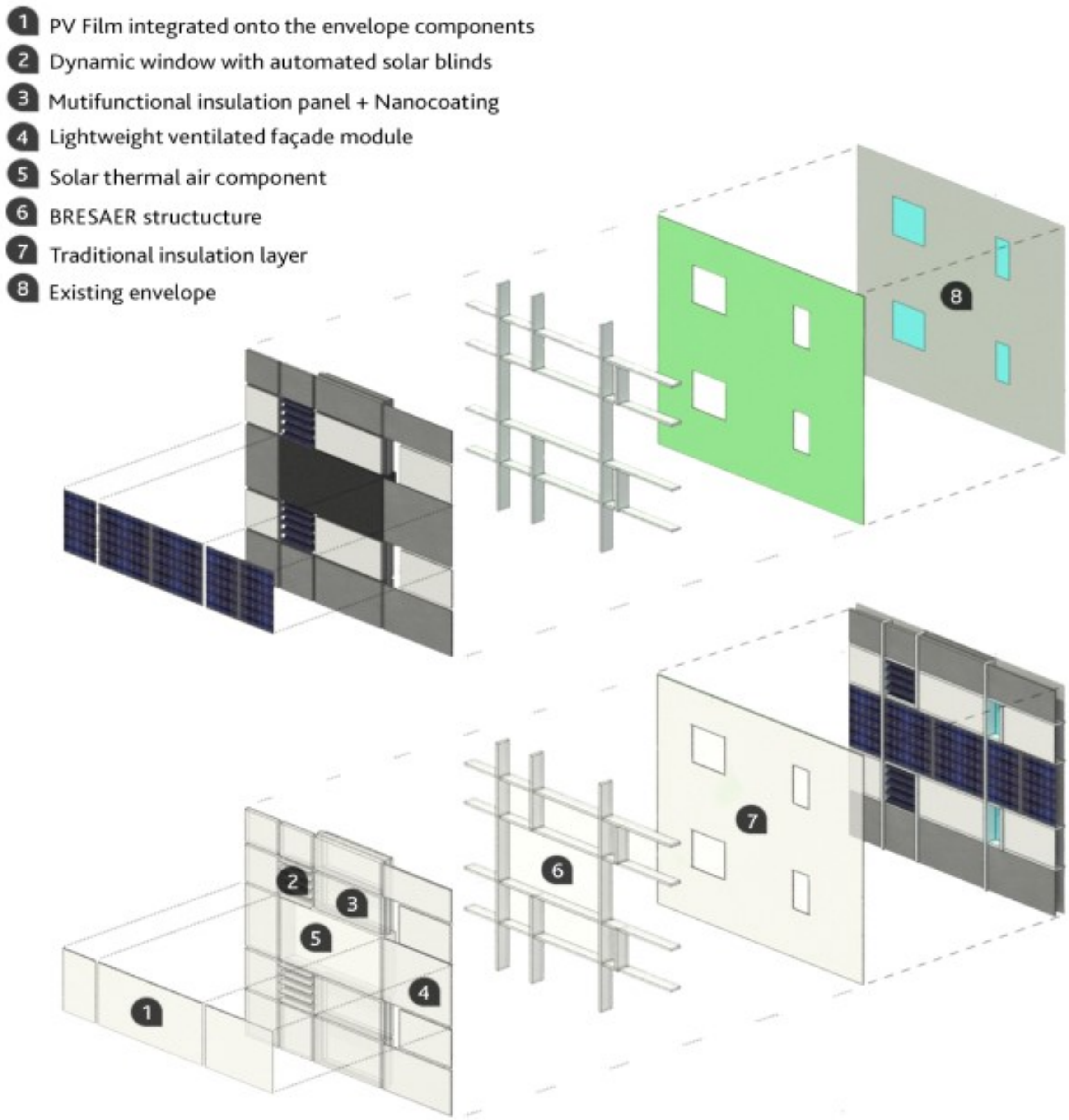
- **Multifunctional lightweight ventilated façade module**, with integrated photovoltaic system for electricity generation, and thermo-reflective and self-cleaning coating.

Dynamic windows with automated and controlled air-tightness and insulated solar blinds. They complement energy saving and visual comfort strategies: solar blinds can automatically adjust according to the position of the sun and occupant's comfort.

A cutting-edge **Building Energy Management System** will be developed to measure and control both the envelope and the building's energy consumption trough integrated simulation-based control techniques for automated the establishment of optimal operational plans.

WS-7: "**ADAPTABLE INDUSTRIALISED ENVELOPES:**
MODULES INTEGRATING SYSTEMS FOR THE RENOVATION

BRESAER



WS-7: "**ADAPTABLE INDUSTRIALISED ENVELOPES:**
MODULES INTEGRATING SYSTEMS FOR THE RENOVATION

BRESAER

The Demo Site

A real demonstration is being performed in an education building in Ankara, Turkey. It consists of one building block with a gross area around 1.800 m2 (4 storeys with 450 m2 each). The BRESAER's expected impact is to reach a near zero energy building (total primary energy consumption below 60 kWh/ m2 per year) through the reduction of the energy demand for space heating and cooling around 30%, a contribution of solar thermal energy for space conditioning around 35%, and a contribution of RES for electricity generation around 10%. The estimated payback time is expected to be 7 years.

Additionally, 4 **virtual demonstrations will be performed in buildings** located in 4 other European countries covering complementary climatic zones, constructed before the Energy Performance of Buildings Directive (EU) requirements were enforced.

Bresaer's impacts

Total (primary) energy consumption reduction by a factor 2 to 4 compared to the values registered before the installation of the adaptable envelope
The primary energy consumption reduction will come from the integration of all the components into the BRESAER envelope solution. Through the implementation of the BRESAER system, we expect to record a reduction by at least 60% of the total primary building's energy consumption and a consumption of less than 60 kWh/m²

Improved indoor environment
The BRESAER system will improve indoor environment quality by increasing thermal, acoustics, lighting comfort and air quality (IAQ).

Demonstration of the replicability potential in a real case-study
The BRESAER solution will be demonstrated in a real case study in an educational building in Ankara, Turkey. The building is owned by the Turkish Ministry of National Education (NME), who is also involved in the project as partner.

Provide solutions with a return on investment below 7 years
The payback generated by the BRESAER system will be based on energy saving simulations taking into account future expectations on market prices as well as the cost of the BRESAER envelope elements.

Validation and market uptake of active building elements
Besides being validated in a real building in Turkey, the BRESAER system will be tested in 4 additional virtual demo sites. Such virtual demo sites are based on buildings existing in 4 different European climate zones (Spain, France, Poland and Norway) with different building use. According to our estimates, paybacks of about 7 years are expected in these countries and – by extension – in the rest of Europe.

SymBIO2 Biofacades: Microalgae production in symbiosis with the building [press kit]”

Invented by the architecture firm XTU Architects, the SymBIO2 biofacade aims to provide an innovative symbiosis between microalgae and buildings. Through a controlled microalgae culture system directly integrated in specially designed facades, thermal and chemical exchanges between microalgae culture and the host building are fully optimized. The main objectives of this project are to improve the building’s green credentials and offer an alternative and cost-effective solution to algae culture farmers.

A pilote biofacade, developped under a French governement funding scheme (FUI15) by the SymBIO2 consortium, has just been released near Paris, and a first commercial project led by BPD-Marignan and XTU architects, together with the SymBIO2 consortium, was the winner last February of the Reinventer. Paris competition for a 14.000 m² housing program hosting a 900 m² biofaçade for medical research applications.

WS-7: "**ADAPTABLE INDUSTRIALISED ENVELOPES:**
MODULES INTEGRATING SYSTEMS FOR THE RENOVATION

SymBIO2 Biofacades

https://drive.google.com/file/d/0B2OMBos7phUBQXBGRzNyNzVIY0U/view

WS-8:

FASUDIR RESULTS: TOWARDS FRIENDLY AND AFFORDABLE SUSTAINABLE URBAN DISTRICT RETROFITTING”

Chaired by:

FASUDIR

WORKSHOP-DEDICATED WEBPAGE:

http://sustainable-places.eu/sp-2016/programme/sp16-workshops/fasudir-results/

WS-8: **FASUDIR RESULTS**: TOWARDS FRIENDLY AND AFFORDABLE SUSTAINABLE URBAN DISTRICT RETROFITTING”

Workshop Leadership & Project-Dedicated Webpage on the SP’16 website

“FASUDIR Results: Towards Friendly and Affordable Sustainable Urban District Retrofitting” [www.fasudir.eu]

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WS-8: **FASUDIR RESULTS**: TOWARDS FRIENDLY AND AFFORDABLE SUSTAINABLE URBAN DISTRICT RETROFITTING”

Workshop Context

The FASUDIR project was born to develop new business models and financial supporting tools, to support the necessary building-retrofitting market mobilization in Europe to fulfill EU-targets in 2020 and 2050. The key instrument is the Integrated Decision Support Tool (IDST), developed to help decision makers to select the best energy retrofitting strategy to increase the sustainability of the whole district. With stakeholder feedback loops, training, and validation in three diverse urban areas, the IDST ensures robustness and applicability in the entire value chain. As the project reaches its end in August 2016, the Consortium would like to present the key results and achievements to the SP2016 participants.

- 10’ General overview, Ander Romero Amorrortu, TECNALIA, Project Coordinator
- 10’ IDST Baseline, Ewa Alicja Zukowska, ACCIONA
- 10’ Technologies and Solutions Repository, Ander Romero Amorrortu, TECNALIA
- 30’ Decision Making Methodology, Paul Mittermeier, MUAS
- 10’ Local Project Committees, Andrea Moro, iiSBE Italia R&D
- 10’ Link to other projects and initatives, Andrea Moro, iiSBE Italia R&D
- 10’ Exploitation items and avenues, Alessandra Masini, D’Appolonia

WS-8: **FASUDIR RESULTS**: TOWARDS FRIENDLY AND AFFORDABLE SUSTAINABLE URBAN DISTRICT RETROFITTING”

Workshop Agenda

Part 1

The first section will introduce the FASUDIR project and present the R&D developments: it will start with the baseline definition of buildings and districts, the scoping of the European context, the existing methodologies and tools, and the definition of Key Performance indicators to support decision making; then a discussion will follow of the repository approach, aimed at the definition of best practices, and the selection of existing technologies, systems and architectural solutions suitable for buildings and districts; the methodological framework will then be described, starting from user requirements, defining the interconnection between building and district scales, and presenting the developed decision making methodology to support the selection and prioritisation of interventions at building and urban scales; finally the involvement of key stakeholders in all steps of the process will be presented through a discussion of the Local Project Committees approach. A first Q&A moment with the audience closes the section.

Part 2

The second section will present the developed IDST tool and its application in the FASUDIR Case Studies: it will start with an overview of the three diverse urban areas selected for the FASUDIR IDST testing, in Budapest, Frankfurt and Santiago de Compostela, covering various climatic regions, construction typology, occupant profiles, and policy contexts; then the IDST application to the demo sites will be presented through a video, showcasing some of the key developed features of the software; finally the results of the case studies activity will be presented to wrap up the presentation of the development and testing of the IDST. A second Q&A moment with the audience closes the section and the workshop.

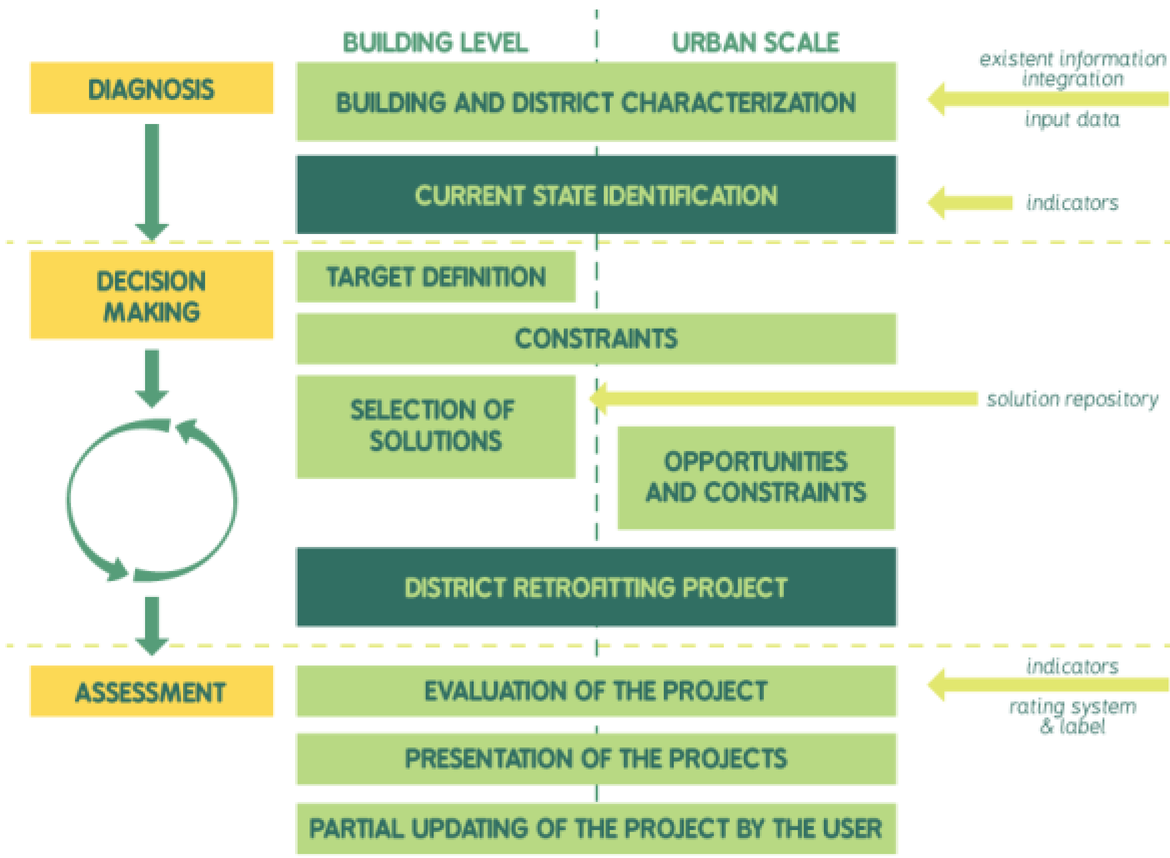
The expected outcomes are to transfer lessons learnt and key project outcomes, and to identify opportunities for future exploitation and networking activities through the exchange with the audience.

<u>WS-8:</u> **FASUDIR RESULTS**: TOWARDS FRIENDLY AND AFFORDABLE SUSTAINABLE URBAN DISTRICT RETROFITTING”

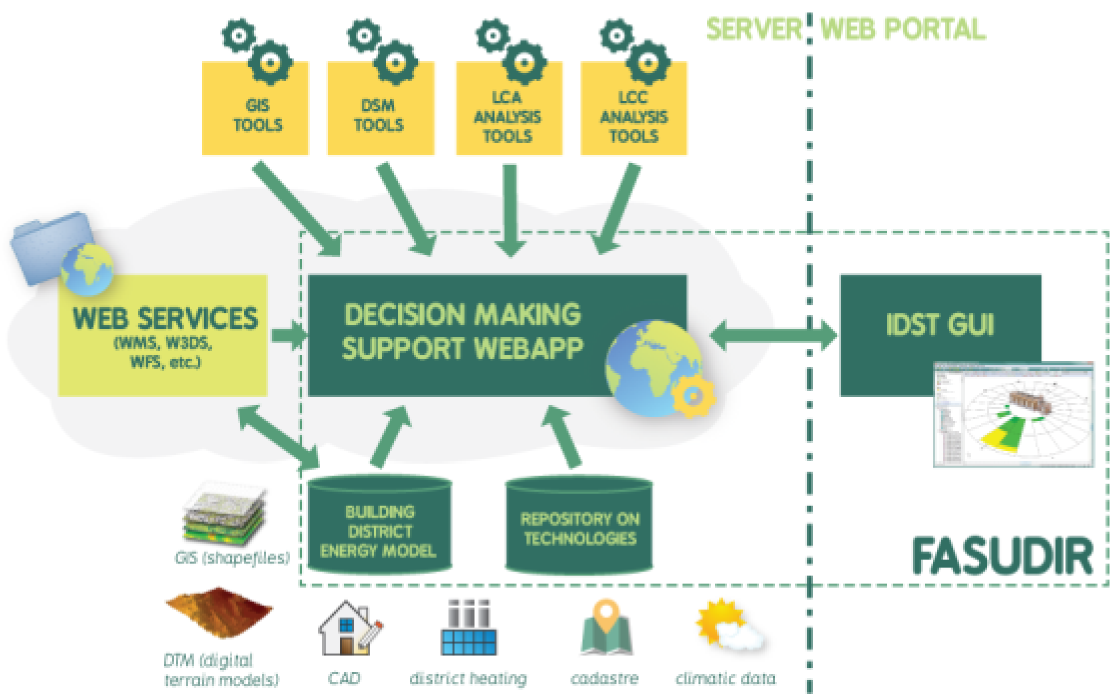
FASUDIR

The IDST Decision making

The IDST will be based on a decision making methodology, designed to select and prioritise energy efficiency retrofitting interventions. It will implement existing and new cost-effective solutions, for significant sustainable improvements in the rehabilitation of urban districts. Taking into account the different European urban typologies and the priorities of the decision makers, the methodology will support retrofitting actions that are deployed as a unique intervention, but also scheduling sequential interventions in the most cost-effective way. This methodology will focus on the initial stage of the retrofitting process at district level, in which the retrofitting framework is established, with the definition of strategies and technological solutions.



Ultimately, the IDST will allow selecting the optimal, off-the-shelf technologies and strategies for each specific energy retrofitting project in terms of sustainability as a whole (environmental, economic and social). To ensure usability and effectiveness, the IDST will contain a collection of sustainable retrofitting strategies and technical solutions at building and district level. Each strategy will be characterized according to different aspects, such as adequacy, costs, technical properties, environmental parameters, and so on. The software will enable modelling the district and building with an adequate level of definition, in such a way that evaluation results will be precise enough, but the input data to define the retrofitting project will be easily supplied. The IDST will feature a 3D graphical user interface, in order to facilitate the interaction between the multiple stakeholders involved in the decision making process. The users will be able to select the most promising sustainable retrofitting strategies and technical solutions at building and district level, by choosing from a ranked list of possible scenarios proposed by the IDST.



WS-9:

COMMUNICATIONS INFRASTRUCTURE – STRATEGIES FOR SMART GRID APPLICATIONS”

Chaired by:

ENERGISE

WORKSHOP-DEDICATED WEBPAGE:

http://sustainable-places.eu/sp-2016/programme/sp16-workshops/energise-workshop/

WS-9: **COMMUNICATIONS INFRASTRUCTURE** – STRATEGIES FOR SMART GRID APPLICATIONS"

Workshop Leadership & Project-Dedicated Webpage on the SP'16 website

energise

ENERGISE: ICT-based ENERgy Grid Implementation – Smart and Efficient http://project-energise.eu

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WS-9: **COMMUNICATIONS INFRASTRUCTURE –**
STRATEGIES FOR SMART GRID APPLICATIONS”

Workshop Context

energise

Context:

The European ENERGISE study is conducting an analysis of various options for establishing ICT infrastructures for smart grids. It focuses on the core question of whether the modern energy systems of the future should be based on own or third-party communication infrastructures.

This question is viable for an extensive deployment of smart grids and smart infrastructures in general. Especially considering the context of the European directive to reduce the cost of deploying high-speed electronic communications networks, the need for joint infrastructure usage and deployment is of rising importance.

Within the 3rd ENERGISE workshop, stakeholders from the telecommunication and energy industry from all over Europe will come together to discuss the future cooperation modes of ICT infrastructure for smart grids among all involved sectors. The workshop will offer a unique opportunity for exchange between the energy and telecommunications sectors, which so far have remained mostly separate and developed their respective positions and strategies on smart grids in parallel. The ENERGISE project was assigned by the European Commission to bridge this apparent gap.

Objectives:

- Assess ways in which both sectors may co-operate in future communications infrastructure deployment for smart grids

- Describe possible scenarios for joint future communications infrastructure deployment

- Map the processes & needs to overcome the barriers that hinder joint usage of existing infrastructure

WS-9: **COMMUNICATIONS INFRASTRUCTURE –**
STRATEGIES FOR SMART GRID APPLICATIONS”

Workshop Agenda

energise

Agenda

Strategic aspects of cooperation between telecommunication and the energy sector – perspectives from an energy company

Co-operation in critical operation status?

The European societies are becoming extremely dependent on electricity. Within those systems of increased complexity, the question arises, whether co-operation in general or jointly used infrastructures lead to an increased robustness or an increased vulnerability in the power and communications sector?

Is the implementation of the cost saving directive fostering cross-sectoral co-operation?

The implementation of the “cost saving directive” aims to foster deployment of NGA networks with a substantial decrease in costs. Does this directive and its national implementations really help to foster cross-sectoral co-operation or are the economically viable potentials of co-operation used anyway?

WS-9: **COMMUNICATIONS INFRASTRUCTURE –**
STRATEGIES FOR SMART GRID APPLICATIONS"

ENERGISE

ENERGISE: Efficient smart grid energy technologies for tomorrow

Context / Background- One of the major challenges Europe will face in the coming decades is to make its energy system clean, secure and efficient, while ensuring EU industrial leadership in low-carbon energy technologies. Achieving such ambitious objectives requires affordable, cost-effective and resource-efficient technology solutions to decarbonise the energy system in a sustainable way, to secure energy supply and to develop the energy internal market in line with the objectives of the Strategic Energy Technology Plan (SET-Plan) and the related energy legislation (notably the Renewable Energy and CCS Directives) – the energy policies designed to deliver the 2020 targets and to shape energy market frameworks for 2030 and 2050.

The backbone of the future energy system—Solutions that will be developed and rolled out to the market in the next years will form the backbone of the energy system for many years ahead. Scale and ambition of this challenge require enhanced co-operation between all stakeholders, including the European Commission, Member State administrations at national, regional and local level, the industry, the research community and society at large. It is essential that energy market stakeholders from both the public and private sectors understand, accept and implement market up-take measures and procedures cost-effectively at national, regional and local levels. It is also important for the society to understand existing challenges and the implications of their possible solutions, so as to build confidence amongst investors and to ensure sustained public acceptance.

Modernising the European electricity grid— The fast growing share of variable and decentralised renewable generation requires a fast adaptation of the grid, both on a European and local level. The new grid needs to be more flexible, increase capacity, include demand response and active user involvement (managing the complex interactions among millions of active consumers and micro-generation) whilst minimizing environmental impacts.

Development of new business models- The new integrated energy market will be achieved through the integration of balancing opportunities offered by generation, demand response and storage at different levels and scales. New business models will be needed to develop new market architectures and rules and provide the information, services, and privacy guarantees. They should support open markets for energy products and services and activate the participation of consumers and new market actors, e.g. aggregators, while ensuring a fair sharing of the newly generated benefits, including to the citizens. SET-Plan priorities together with the derived technology roadmap from the European Industrial Grid Initiative and the foreseen Integrated Roadmap provide further guidance for the development of the potential of grid technologies and their integration.

WS-9: **COMMUNICATIONS INFRASTRUCTURE –** STRATEGIES FOR SMART GRID APPLICATIONS”

ENERGISE

Consortium

1. TUEV RHEINLAND CONSULTING GMBH, Germany
2. WIK WISSENSCHAFTLICHES INSTITUT FUER INFRASTRUKTUR UND KOMMUNIKATIONSDIENSTE GMBH, Germany

WS-10:

HOW TO GET ENERGY AND COST SAVINGS DURING **BUILDING OPERATIONS & MAINTENANCE**

Chaired by:

Energy IN TIME

WORKSHOP-DEDICATED WEBPAGE:

http://sustainable-places.eu/sp-2016/programme/sp16-workshops/building-operation-maintenance-workshop/

WS-10: HOW TO GET ENERGY AND COST SAVINGS DURING **BUILDING OPERATIONS & MAINTENANCE**

Workshop Leadership & Project-Dedicated Webpage on the SP’16 website

Energy IN TIME: Simulation-based control for Energy Efficiency building operation and maintenance[www.energyintime.eu]

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Context

Up to 90% of the buildings' life cycle carbon emissions occur during their operational phase, mainly as consequence of the HVAC, lighting and appliances' energy use. This phase also represents 80% of building's life-cycle cost of which 50% is consequence of the energy use. Therefore, energy and cost saving strategies addressing the building operation phase have a major impact in the building life cycle cost. During the session, the innovations of the European project Energy IN TIME (EiT) that contribute to reduce costs and energy consumption during building operation will be presented, assessing their future relevance and performance, considering the maturity and needs of the market

During the session, the speakers will address the question from viewpoints of different actors in the building sector, such as representatives from industrial companies, RTD performers, specialised SMEs in the field of consultancy, building maintenance, or technology providers.

They will report about the solutions investigated in EiT project and their application in four demo buildings with different typologies, uses and expected user behavior that have been selected to serve as testing places for the project by implementing innovative simulation-based control techniques aiming to reduce energy consumption and energy bill during their operation phase. Different climatic zones are also addressed as the buildings are located in Bucharest (Romania), Faro (Portugal), Helsinki and Levi (Finland).

The session will show real ways forward from demonstrations and lessons learnt into replication of the experience in non-residential buildings in Europe, which present the building typologies that guaranties higher impact and room for improvement due to the variety and quantity of facilities and equipment covered and the operational management model used. Design, energy management offices, investors and professionals form the building sector are targets of the session.

WS-10: HOW TO GET ENERGY AND COST SAVINGS DURING **BUILDING OPERATIONS & MAINTENANCE**

Workshop Agenda

SUSTAINABLE PLACES 2016 June 29-July 1, 2016 Anglet, France

Agenda

- Energy IN TIME (EiT) project presentation: Filling the gap between actual and predicting assumptions
- EiT integrated solution for building control:
- Automatic operational plans generation
- Building HVAC Fault Detection & Diagnostics
- Fault-adaptive control for VAV damper stuck in a multizone building
- Decision support method for building mid-long term analysis
- Data mining for improving building operation
- Lessons learnt from the four EiT demo sites in Faro, Bucarest, Levi and Helsinki
- Open discussion and questions

Energy IN TIME: Simulation-based control for Energy Efficiency building operation and maintenance [www.energyintime.eu]

Project Introduction

Energy IN TIME is a Large-scale integrating project within the 7th Framework Programme FP7-NMP, Sub-programme EeB.NMP.2013-4, which brings together a total of 13 partners from 8 different European countries. The aim of the project is to develop a Smart Energy Simulation Based Control method which will reduce the energy consumption in the operational stage of existing non-residential buildings, resulting in energy savings of up to 20%.

Intended Outcomes

Buildings Operational stage represents 80% of building's life-cycle cost of which 50% is consequence of the energy use. Up to 90% of the buildings' life cycle carbon emissions occur during their operational phase, mainly as consequence of the HVAC, lighting and appliances' energy use. Therefore, energy and cost saving strategies addressing this building operation phase will have a major impact in the building life cycle cost.

Energy IN TIME (EiT) project goes beyond existing building control techniques, developing an integrated control & operation approach, that will combine state of the art modelling techniques with the development of an innovative simulation-based control technique with the overarching objective of automating the generation of optimal operational plans tailored to the actual building and users requirements. This approach will allow reducing system inefficiencies and contributing to improve building energy efficiency and comfort.

The target for Energy IN TIME solution will be existing non-residential buildings, which present the building typologies that guaranties higher impact and room for improvement due to the variety and quantity of facilities and equipment covered and the operational management model used in them. A control tool will be implemented in the building energy management systems to be automatically and remotely operated. The methodology for the enhancing solution implementation will be defined for existing buildings and for its implementation in new buildings since its initial commissioning.

WS-10: HOW TO GET ENERGY AND COST SAVINGS DURING **BUILDING OPERATIONS & MAINTENANCE**

Energy IN TIME

Consortium Members

The Energy IN TIME consortium is made up of 13 partners from 8 different EU countries. EiT project, started in October 2013 and funded by European Commission, is developing a Smart Energy Simulation-Based Control method to reduce the energy consumption and energy bill in the operational stage of existing non-residential buildings. The new techniques are based on the prediction of indoor comfort conditions and user behavior performance to improve the lifetime and efficiency of energy equipment and installations through continuous commissioning and predictive maintenance. A control tool will be implemented in the building energy management systems to be automatically and remotely operated. During the session, four demo sites will give credible evidence of the benefits of the application of this innovative approach for buildings operation and maintenance.

1. ACCIONA, Spain
2. ANA Aeroportos de Portugal, Portugal
3. CIRCE, FUNDACION CIRCE CENTRO DE INVESTIGACION DE RECURSOS Y CONSUMOS ENERGETICOS, Spain
4. Cork Institute for Technology, Ireland
5. Université de Lorraine, France
6. CSTB, Centre Scientifique et Technique de Batiment, France
7. FUNIBER, FUNDACIÓN UNIVERSITARIA IBEROAMERICANA, Spain
8. Institutul de Cercetari Electrotehnice, Romania
9. Integrated Environmental Solutions
10. STAM SRL, Italy
11. Universidad de Granada, Spain
12. United Technologies Research Center Ireland, Ireland
13. Caverion Suomi Oy, YIT Kiinteistötekniikka Oy, Finland

WS 11:

"**BUILT AS DESIGNED**: NEW TECHNOLOGIES FOR SELF-INSPECTION AND QUALITY CHECKS ON THE CONSTRUCTION SITE"

Chaired by:

ACCEPT, Built2Spec, and INSITER

WORKSHOP-DEDICATED WEBPAGE:

http://sustainable-places.eu/sp-2016/programme/sp16-workshops/built-designed-workshop/

WS 11: "**BUILT AS DESIGNED**: NEW TECHNOLOGIES FOR SELF-INSPECTION AND QUALITY CHECKS ON THE CONSTRUCTION SITE"

Workshop Leadership & Project-Dedicated Webpages on the SP'16 website

WS 11: "**BUILT AS DESIGNED**: NEW TECHNOLOGIES FOR SELF-INSPECTION AND QUALITY CHECKS ON THE CONSTRUCTION SITE"

Workshop Context

SUSTAINABLE PLACES 2016 June 29-July 1, 2016 Anglet, France

Over the last years, most of the research and development efforts in terms of energy and environmental efficiency of buildings concerned design support technologies, construction products, or exploitation tools. ACCEPT, BUILT2SPEC, INSITER tackle the construction process itself and how we can improve the performance by ensuring that the building "as built" fits with the building "as designed". Funded simultaneously in the same technical and economic context, these projects propose three original approaches, making the most of connected tools and innovative ICTs, which may present several complementarities.

ACCEPT, BUILT2SPEC and INSITER are three H2020 projects started in 2015, and funded from the topic "EeB-03-2014: Development of new self-inspection techniques and quality check methodologies for efficient construction processes". All three projects originated from the statement that constructed buildings generally do not perform in agreement with what their design stage allowed to expect. Each of these projects aims at providing a technological answer for self-inspection and quality check improvements to reduce the gap between the planned performance and the actual one.

WS 11: "**BUILT AS DESIGNED**: NEW TECHNOLOGIES FOR SELF-INSPECTION AND QUALITY CHECKS ON THE CONSTRUCTION SITE"

Workshop Agenda

SUSTAINABLE PLACES 2016
June 29-July 1, 2016
Anglet, France

The 2-hour "BUILT AS DESIGNED…" workshop addressed the differences and complementarities of the respective approaches of ACCEPT, BUILT2SPEC, and INSITER, from the expected exploitation point of view.

The workshop will have 3 phases:

1. a quick presentation of each project (main objectives, consortium, development activities),
2. then a presentation of the main expected exploitable results (type of results, main innovation, description of the market),
3. and finally an open discussion between the projects representatives and the public about the contexts of application and the complementarity of the presented exploitable results.

Outcomes: Discussion on the best opportunities for the exploitable results of the 3 projects, who will propose new technological solutions to be applied for the self-inspection of construction processes.

Workshop Co-Chairs

ACCEPT project: Jason Page & Edward Godden, Ingleton Wood LLP

BUILT2SPEC project*:* Aurélien Henon, Nobatek

INSITER project: Andre Van Delft, DEMO Consultants

ACCEPT: "Assistant for quality check during construction execution processes for energy-efficient buildings" [www.accept-project.com]

Project Introduction

The better energy-efficient building components of today have one major flaw: The loss of efficiency through improper usage during the building process can be dramatic. ACCEPT will ensure the proper usage of the components during the building process with the help of Smart Glasses (Optical Head Mounted Displays, e.g. Google Glass or Epson Moverio).

The Smart Glasses will unobtrusively provide the workers on site with guidelines exactly when needed, while common methodologies - defined by the site manager - for all workers can be incorporated to standardize and coordinate the overall working activities. The execution details brought to the construction site by ACCEPT can be customized for the working site, the building components and the different contractors to even bridge language barriers with ease. In this way it is possible not only to minimize the loss of efficiency due to thermal bridges or bad air-tightness, but also to increase the overall efficiency, reliability and productivity of the construction processes.

WS 11: "**BUILT AS DESIGNED**: NEW TECHNOLOGIES FOR SELF-INSPECTION AND QUALITY CHECKS ON THE CONSTRUCTION SITE"

ACCEPT

Knowledge transfer

Providing guidelines and methodologies during the construction process by transferring knowledge between the different stakeholders of the construction process

Project Coordination

Increasing the efficiency, reliability and productivity of a construction processes by providing workflows for the interaction between different entities on a construction site.

Quality Assurance

Improving the final thermal, acoustic and energy performance of buildings by providing sophisticated quality assurance tools, which will be used actively or passively by different stakeholders during the construction process and provide self-inspection capabilities.

WS 11: "**BUILT AS DESIGNED**: NEW TECHNOLOGIES FOR SELF-INSPECTION AND QUALITY CHECKS ON THE CONSTRUCTION SITE"

Chaired by:

Intended Outcomes

Relevant data will be aggregated passively on the construction site by workers wearing Smart Glasses as well as actively using different sensors accessed through a Smartphone operated by the site manager. In addition, visual annotations can be attached to objects in order to exchange context-based information between workers; bringing the Wiki idea to the construction site. The data is processed in a cloud environment with self-inspection methods to determine important characteristics (such as U-values) as well as to monitor the coordinated progress of different parties cooperating in the building process. Thereby a sophisticated tool for the quality control during the building process is provided which guarantees that the energy performance at commissioning stage will meet the one expected at design stage. ACCEPT will reach the following key objectives:

- Improving the final thermal, acoustic and energy performance of buildings by providing sophisticated quality assurance tools, which will be used actively or passively by different stakeholders during the construction process

- Reducing the mismatch of energy performance between design and commissioning stage by providing guidelines to apply the sophisticated quality assurance tools mentioned before

- Providing guidelines and methodologies during the construction process by transferring knowledge between the different stakeholders of the construction process

Increasing the efficiency, reliability and productivity of a construction processes

WS 11: "BUILT AS DESIGNED: NEW TECHNOLOGIES FOR SELF-INSPECTION AND QUALITY CHECKS ON THE CONSTRUCTION SITE"

Chaired by:

ACCEPT

3 key results expected

From a user perspective ACCEPT is focused on the following very clear main results:

1. **T**he **C**onstruction **O**perator Assistant **App** (CoOpApp) running on Smart Glasses, which passively collects data and actively provides guidance to the worker on site during the building process. (Pillar I: Advanced Knowledge Transfer for Energy-efficient Construction)

2. A **S**ite **M**anager **A**pp (SiMaApp) running on a mobile device, which allows to remotely coordinate the working process as well as collect additional data on site by different sensors. (Pillar II: Agile Project Coordination for Bridging Heterogeneity)

3. An interactive web-based **Dashboard** as a monitoring and quality assurance solution. The Dashboard will use self-inspection methods to determine important characteristics such as U-Values. (Pillar III: Adaptive Quality Assurance with Self-Inspection Features)

10 consortium members

1. Ascora GmbH
2. AnswareTech s.l -
3. CYPE SOFT, S.L. - -
4. University of Liege –
5. Ingleton Wood LLP -
6. Ferrovial Agroman -
7. TIE Nederland B.V. -
8. Entreprises Jacques Delens s.a. -
9. Fraunhofer Italia -
10. Fraunhofer-Gesellschaft

Built2Spec: “Built 2 Specifications: Self-Inspection, 3D Modelling, Management and Quality-Check Tools for the 21st Century Construction Worksite” [www.built2spec-project.eu]

Project Introduction

Meeting EU energy efficiency targets for both new builds and retrofits will be much easier to manage in the near future thanks to the development of new and innovative on-site quality assurance tools. In order to achieve this ambitious objective, the Built2Spec project will deliver a new set of breakthrough technological advances such as:

- 3D and Imagery Tools
- Building Information Modeling (BIM)
- Smart Building Components
- Energy Efficiency Quality Checks
- Indoor Air Quality Tools
- Airtightness Test Tools with air-pulse checks
- Thermal Imaging Tools
- Acoustic Tools

We begin with users and their requirements to set a common baseline across our project team. Our research and technological development activities interact with our pilot testings. In a second step, we will integrate the framework, technology and knowledge developments into the Virtual Construction Management Platform. We then run extensive and long duration pilot activities and deliberate pilot planning, assessment and management. We separate exploitation and training from communication and dissemination to allocate appropriate resources and leadership to each.

WS 11: "**BUILT AS DESIGNED**: NEW TECHNOLOGIES FOR SELF-INSPECTION AND QUALITY CHECKS ON THE CONSTRUCTION SITE"

Built2Spec

Tools Being Developed

- Quality Checks - Built2Spec will compile and further develop the know-how of various experts within and outside the consortium to achieve an easily usable expert tool and to guarantee high quality construction work.
- Indoor Air Quality Tool - Built2Spec will optimize the first analyzer dedicated to real-time measurement of indoor air quality by developing a truly portable version, designed and adapted for field operation.
- Thermal Imaging Tool - In the construction sector, the measurements from TIR devices are exploited in a mostly qualitative way. Built2Spec will propose methods to allow quantified assessment of thermal properties of buildings.
- Smart Building Components - Built2Spec will implement the novel use of embedded sensors in precast elements in order to continuously monitor both the thermal and structural performance of the building.
- Building Information Modelling - Built2Spec will use the information in BIM to check whether the as-built situation complies with the design – not just after the project is delivered, but also during the construction process.
- Airtightness Test Tools - A new device enables quick checks (<1min) by generating and analysing a low pressure pulse from an autonomous unit which does not penetrate the building envelope. A robust unit for construction sites, is being developed.
- Acoustic Tools - Built2Spec will develop a novel lightweight sound source for acoustic testing that provides a more diffuse field than standard loudspeakers and ensures easy portability and regulation compliance.
- 3D and Imagery Tools - 3D reconstruction aims to capture real objects. This process can be accomplished either by active or passive methods. The combination of these methods can be used to reconstruct a large variety of scenes in 3D!
- Virtual Construction Management Platform - All tools will be connected to a Virtual Construction Management Platform supporting the collection and sharing of all project data, from initial design to delivery.

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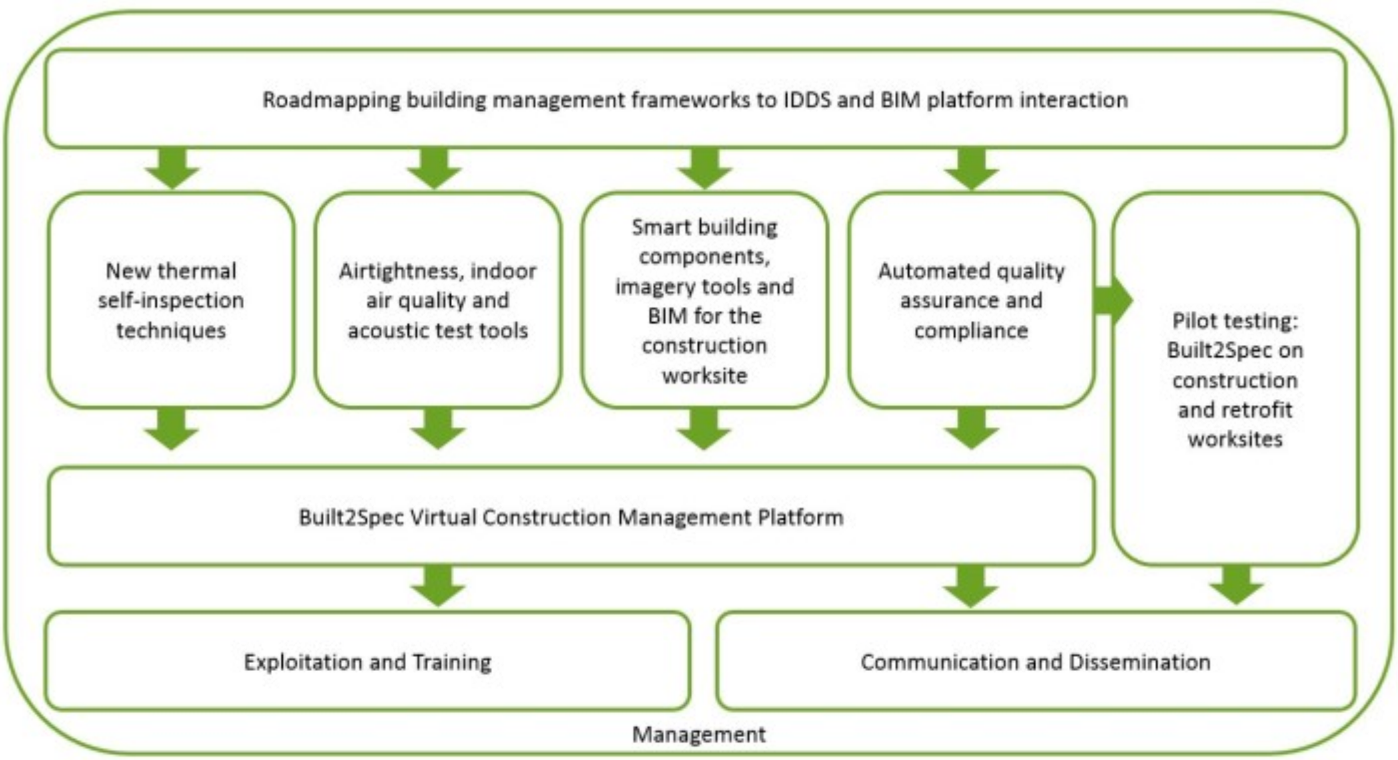
Built2Spec

Methodology

- **Level 1**: Assemble excellent science technologies and techniques
- **Level 2**: Create new knowledge for inspection, check processes, and determine how to automate them
- **Level 3**: Integrate level 1 and 2 into an IDDS framework and provide them as resource at the worksite
- **Level 4:** Create synergies and new functionalities through this integration



WS 11: “**BUILT AS DESIGNED**: NEW TECHNOLOGIES FOR SELF-INSPECTION AND QUALITY CHECKS ON THE CONSTRUCTION SITE”

Built2Spec

Consortium

1. NOBATEK, France
2. ECOLE NATIONALE SUPERIEURE D'ARCHITECTURE DE NANTES, France
3. UNIVERSITE DE BORDEAUX, France
4. BLUE INDUSTRY AND SCIENCE SAS, France
5. SOCIETE ANONYME D'HABITATIONS A LOYER MODERE LOGEMENT ET GESTION IMMOBILIERE POUR LA REGION PARISIENNE-LOGIREP, France
6. WOLFGANG FEIST, Germany
7. VRM TECHNOLOGY LTD, UK
8. LAKEHOUSE CONTRACTS LIMITED, UK
9. THE UNIVERSITY OF NOTTINGHAM, UK
10. BSRIA LIMITED, UK
11. NEDERLANDSE ORGANISATIE VOOR TOEGEPAST NATUURWETENSCHAPPELIJK ONDERZOEK - TNO, The Netherlands
12. Eidgenössische Technische Hochschule Zürich, Switzerland
13. OBRASCON HUARTE LAIN SA, Spain
14. FUNDACIO PRIVADA ASCAMM, Spain
15. FUNDACIO PRIVADA UNIVERSITAT I TECNOLOGIA, Spain
16. DE CINQUE LINEAR HOUSE SNC, Italy
17. R2M SOLUTION SRL, Italy
18. ECOFIX LIMITED, Ireland
19. ORAN PRE-CAST LIMITED, Ireland
20. NATIONAL UNIVERSITY OF IRELAND, GALWAY, Ireland

INSITER: "Intuitive self-inspection techniques using augmented reality for energy-efficient buildings made of prefabricated components" [www.insiter-project.eu]

Project Introduction

Energy-efficient buildings (EeB) have become a priority of the European Commission (EC) to promote and maintain sustainability in the construction sector. Within the recently launched EU research programme "Horizon 2020" (http://ec.europa.eu/programmes/horizon2020/), a particular attention is given to quality-gap and performance-loss between design and realization both in new construction as well as refurbishment of EeB. The construction sector is characterised by a segmented approach involving a variety of skills and expertise with different roles and responsibilities. During construction, each actor of the construction value-chain must ensure that his contribution fits into a quality framework defined collectively at the design level.

The critical mass of EeB in Europe by 2020 will be achieved through sustainable industrialisation of high-performance architectural, structural and building-service components. However, realising the targeted performance in design is hampered by critical shortcomings during on-site construction and refurbishment that cause a lower built-quality and sub-optimal energy-saving in the building lifecycle. Through new self-inspection techniques,

INSITER will fully leverage the energy-efficiency potentials of buildings based on prefab components, from design to construction, refurbishment and maintenance. It will scale-up the use of BIM for standardised inspection and commissioning protocols, involving all actors in the value-chain. The key innovation of INSITER is the intuitive and cost-effective Augmented Reality (AR) for self-inspection. The use of AR –that connects virtual and physical buildings in their environments at real-time– will ensure that the targeted performance in the design model is realised. INSITER will thus eliminate the gaps in quality and energy-performance between design and realisation of energy-efficient buildings made of prefabricated components.

The new concept of self-inspection that is performed simultaneously with on-site processes has a strong contrast with the traditional post-inspection approach. INSITER will develop a new methodology for self-inspection during construction, refurbishment, maintenance and commissioning, along with a dedicated toolset. INSITER will substantially enhance the functionalities and capabilities of measurement and diagnostic instruments (like portable 3D laser scanners, thermal imaging cameras, acoustic and vibration detectors, real-time sensors) by means of a smart Application Programming Interface (API) and data integration with a cloud-based Building Information Model (BIM). The triangulation of Geospatial Information, Global and Indoor Positioning Systems (GIS, GPS, IPS) will support accurate and comprehensive Virtual and Augmented Reality (VR and AR).

<u>WS 11:</u> "**BUILT AS DESIGNED**: NEW TECHNOLOGIES FOR SELF-INSPECTION AND QUALITY CHECKS ON THE CONSTRUCTION SITE"

INSITER

Intended Outcomes

The critical mass of Energy-efficient Buildings (EeB) in Europe by 2020 will be achieved through sustainable industrialisation of high-performance architectural, structural and building-service components. However, realising the targeted performance in design is hampered by critical shortcomings during on-site construction and refurbishment that cause a lower built-quality and sub-optimal energy-saving in the building lifecycle.

The key innovation of INSITER is the intuitive and cost-effective Augmented Reality (AR) for self-inspection. The use of AR –that connects virtual and physical buildings in their environments at real-time– will ensure that the targeted performance in the design model is realised. INSITER will thus eliminate the gaps in quality and energy-performance between design and realisation of energy-efficient buildings made of prefabricated components.

The new concept of self-inspection that is performed simultaneously with on-site processes has a strong contrast with the traditional post-inspection approach. INSITER will develop a new methodology for self-inspection during construction, refurbishment, maintenance and commissioning, along with a dedicated toolset.

INSITER will substantially enhance state-of-the-art measurement and diagnostic instruments with wireless and easy-operation facilities through users' mobile devices. Triangulation of Geospatial Information, Global and Indoor Positioning Systems (GIS, GPS and IPS) will support the 3D accuracy of these instruments. The data will be integrated in cloud-based Building Information Model (BIM) that evolves throughout the building's lifecycle.

WS 11: “**BUILT AS DESIGNED**: NEW TECHNOLOGIES FOR SELF-INSPECTION AND QUALITY CHECKS ON THE CONSTRUCTION SITE”

INSITER

Technical Objectives

Within the overall aim, there are a number of specific objectives that relate to the enhancement of the fucntionalities and capabilities of measurement and diagnostic instruments (like portable 3D laser scanners, thermal imaging cameras, acoustic and vibration detectors, real-time sensors) by means of a smart Application Programming Interface (API) and data integration with a cloud-based Building Information Model (BIM). The triangulation of Geospatial Information, Global and Indoor Positioning Systems (GIS, GPS, IPS) will support accurate and comprehensive Virtual and Augmented Reality (VR and AR). INSITER has 3 major scientific and technological (S/T) objectives:

Objective 1: To eliminiate the gaps in quality and energy-performance between design and realisation of energy-efficient buildings (EeB) made of prefabricated components, by connecting the virtual model and the physical building on site in real-time through Augmented Reality (AR) for self-inspection during construction, refurbishment and maintenance.

Objective 2: To develop innovative INSITER Systems- a set of intuitive, robust and cost-effective hardware and software- for self-inspection by workers and other stakeholders during off-site and on-site working processes.

Objective 3: To develop an innovative INSITER Methodology, which consists of protocols and guidelines for self-inspection and self-instruction that enable workers of general contractors and subcontractors, site supervisors, technical experts, quality auditors, clients and building occupants to use the methodology with the supporting INSITER Systems (hardware and software).

WS 11: "**BUILT AS DESIGNED**: NEW TECHNOLOGIES FOR SELF-INSPECTION AND QUALITY CHECKS ON THE CONSTRUCTION SITE"

INSITER

INSITER INTUITIVE SELF-INSPECTION TECHNIQUES

Consortium Members

The INSITER consortium consists of 14 partners: 10 industrial partners (3 large companies + 7 SMEs) and 4 research organisations. SMEs are the largest group in the consortium; they play a key role, both in leadership of the project as well as in research, demonstration and exploitation. The INSITER project is driven by the industrial partners that are active and successful in their market areas, and thus are able to mobilise their clients and business partners to ensure the market implementation of INSITER results. High-quality research will be guaranteed by the involvement of renown EU research organisations, as well as by the leadership and coordination of industrial/SME partners with extensive experience in performing EU research projects. Together they build the critical mass for sound research and real impacts.

All main geographical regions of Europe (Western, Central, Southern) with their climate-related, regional and cultural characteristics are covered by the INSITER partners that represent 6 EU countries (Netherlands, Belgium, Germany, Bulgaria, Italy, and Spain). Generalisation and wide dissemination of the knowledge and project results are thus guaranteed. Moreover, there is a strong and proven commitment for teamwork since all partners have been engaged in collaborative projects with each other previously, either in research projects (EU or national projects) or in relevant new construction and retrofitting projects.

1. DEMO Consultants (NL)
2. AICE Consulting (IT)
3. 3L (DE)
4. DWA (NL)
5. IPOSTUDIO ARCHITETTI (IT)
6. RDF (BG)
7. ISSO (NL)
8. SBRCURnet(NL)
9. UNIVPM (IT)
10. FGHIPA (DE)
11. DRAGADOS (ES)
12. HOCHTIEF VICON (DE)
13. SIEMENS INDUSTRY SOFTWARE (BE)
14. CARTIF(ES)

<u>WS-12:</u>

"CHALLENGES OF **PUBLIC BUILDING RETROFITTING** WITH INNOVATIVE TECHNOLOGIES – AN EXCHANGE OF EXPERIENCE"

Chaired by:

BRICKER, A2PBEER, & RESSEEPPE

WORKSHOP-DEDICATED WEBPAGE:

http://sustainable-places.eu/sp-2016/programme/sp16-workshops/public-building-retrofitting-workshop/

WS-12: "CHALLENGES OF **PUBLIC BUILDING RETROFITTING** WITH INNOVATIVE TECHNOLOGIES – AN EXCHANGE OF EXPERIENCE"

Workshop Leadership & Project-Dedicated Webpages on the SP'16 website

<u>WS-12:</u> “CHALLENGES OF **PUBLIC BUILDING RETROFITTING** WITH INNOVATIVE TECHNOLOGIES – AN EXCHANGE OF EXPERIENCE”

Workshop Context

This workshop is addressed to the Research Community, Industry, Building Designers, Facility Managers and Public Authorities, involved or planning energy efficient retrofitting projects of public building stock. The session is prepared and held in a joint action between the 3 FP7 projects BRICKER, A2PBEER and RESSEEPE with a total of 11 demonstration sites, five different uses (University, Hospital, Administration Building, School and Museum), in five different countries (BE, ES, TK, SE, UK).The workshop will focus on the innovative technologies selected for the different demo-sites and their installation process. The panel will aim at exchanging with the audience experiences and lessons learnt from real public buildings energy-efficient retrofitting in different case study buildings and climate conditions within the 3 FP7 projects. The contents of the event are in line with the EU sustainable energy policy agenda. The Energy Efficiency Directive sets a 3% annual renovation target for central government buildings and requires EU countries to establish national plans for renovating overall building stock. Central government buildings must be renovated to meet at least the national minimum energy performance requirement set in EPBD. Currently the EC is preparing a recast of the EPBD and regulation success is critical to achieve the ambitious targets in 2020. The panel discussion will contribute to raising awareness of the need to make public buildings energy-efficient and provide country specific details.Outcomes: The expected outcome is a joint publication of a Best Practice Guide for retrofitting public building stock, once the retrofitting in the three projects is finished. The best practice guide would not only include the lessons learnt from the installation phase but also throughout the whole process. The organisers of the panel will also explore ways of working together to develop a joint final conference for the three projects. bThe panel discussion will offer the opportunity to exchange experience retrofitting real public buildings. The proposed speakers are representatives involved in the work at the demo sites. That way, the barriers and engagement issues when retrofitting public buildings will be discussed by experts who have been involved in the selection of technologies and the installation process, and who have had to face challenges and have engaged with stakeholders and building users.

<u>WS-12:</u> “CHALLENGES OF **PUBLIC BUILDING RETROFITTING** WITH INNOVATIVE TECHNOLOGIES – AN EXCHANGE OF EXPERIENCE”

Workshop Agenda

SUSTAINABLE PLACES 2016 June 29-July 1, 2016 Anglet, France

The applied innovative technologies will be introduced, how they work, how they are combined for each climate zone, the concept of energy generating buildings etc. Moreover, key issues and challenges experienced related to their installation will be discussed (i.e. technical, health and safety risks, financial, coordination, planning and legislation barriers, etc.). Dialogue and engagement with the audience will foster the potential replication of concepts developed in the projects.

The duration of the workshop will be **120 minutes**. The structure and timeframe of the panel discussion is the following:

- **5’ Introduction – moderator**
- **25’ Topic 1: Presentation of the projects and technologies – panelists**
- **20’ Dialogue with audience**
- **45’ Topic 2: Challenges and lessons learnt – panelists**
- **20’ Dialogue with audience**
- **5’ Summary and conclusions – moderator**

The panel will be composed of representatives of each Project. Due to the panel format, the audience will have the opportunity to interact with the speakers, raise questions, make contributions and share their experience. Moreover the participants will receive follow-up information from the projects by having the chance to sign up for project newsletters and taking home project leaflets.

BRICKER: “Energy Reduction in Public Building Stock” [www.bricker-project.com]

Project Introduction

BRICKER aims to develop a **retrofitting solution package** for existing public-owned non-residential buildings in order to achieve a drastic reduction of the energy consumption (beyond 50%) and GHG emissions in this sector.

This retrofitting package is based on:

- **Envelope retrofitting solutions for demand reduction** through made-to-measure façades, innovative insulation materials and high performance windows.

- **Zero emissions energy production technologies** based on a cogeneration system fed with locally available and clean renewable sources.

Integration and operation strategies´ development for the BRICKER Technologies and guidance for design, commissioning and maintenance.

The retrofitting solution package will be implemented in **three real demonstration** multi-buildings complexes, located in different climate conditions in three different European Countries and with different end-uses: Sanitary, Educational and Administrative.

To maximize impact and replicability of the project, **technologies´ integration, guidance for implementation and technological transfer** to Social Housing will be developed. These should help public bodies on implementation of optimal building retrofitting strategies, taking into account economic and financial aspects in the framework of limited access to funding, breakthroughs and innovative business models and continuous operation strategies during renovation.

Intended Outcomes

The demonstration buildings are the real test cases of the innovative retrofitting solutions. The following values for energy consumption reduction, associated investments cost and return on investment are expected for the case studies.

WS-12: "CHALLENGES OF **PUBLIC BUILDING RETROFITTING** WITH INNOVATIVE TECHNOLOGIES – AN EXCHANGE OF EXPERIENCE"

BRICKER

Demo Sites

The demonstration buildings will be the showcases for the BRICKER project. They are real buildings that are in use and the goal is to demonstrate the performance of the technologies and systems developed. The overall objective of BRICKER is to develop and demonstrate a retrofitting solution package for existing non-residential public buildings. The project seeks to deliver state-of-the-art energy efficient renovation, demonstrating this in real buildings with different uses set in different countries and climates. Energy savings should go beyond 50% compared to values prior to BRICKER renovation.

BRICKER combines various active and passive technologies to achieve energy efficiency in innovative ways. It will pioneer a tri-generation system capable of providing power, heating and cooling simultaneously. Its power and thermal capacities will be around 150 kW and 600 kW respectively. The system's activation heat will be produced using roof mounted parabolic solar collectors working on a higher than usual temperature – between 250 to 270 °C.

The project will seek to draw on the renewable energy resources available in each region. Biomass boilers will be used, as well as geothermal districting heating and absorption chillers which use a heat source to drive the cooling system. This technology already exists but the installations planned under BRICKER will be tailor-made to meet the specificities of each demo site and its surroundings.

The passive technologies envisaged include new aerating windows, with an integrated, newly patented electronic heat exchanger, new PIR (PolyIsocyanurate)-based insulation foams with embedded phase-change materials (PCM's)— which are substances capable of storing and releasing large amounts of energy—and state of the art ventilated facades, commercial windows and insulation panels. The BRICKER demonstrations will pave the way towards a replication plan to ensure uptake across Europe and beyond.

WS-12: "CHALLENGES OF **PUBLIC BUILDING RETROFITTING** WITH INNOVATIVE TECHNOLOGIES – AN EXCHANGE OF EXPERIENCE"

BRICKER

Technologies

- **Organic Rankine Cycle** The Organic Rankine cycle (ORC) is named for its use of an organic, high molecular mass fluid with a liquid-vapor phase change, or boiling point, occurring at a lower temperature than the water-steam phase change.

- **Solar parabolic collectors**: By tracking the position of the sun, parabolic collectors can concentrate the solar radiation on a tube, thus heating the fluid which flows in the tube up to 250-300°C. The hot fluid can be used for many purposes. This technology is already used for large solar power stations.

- **Aerating windows** Heat recovery ventilation can be integrated into windows, walls, shutters, and heating and cooling units. HRV provides fresh air and improved climate control, while also saving energy. -

- **Ventilated façade** A sustainable lightweight ventilated façades constitutes a second skin outside the existing façade. A natural vented cavity is located between these two skins creating a void gap for "chimney effect".

- **Chillers:** thermally activated cooling technologies Thermally activated cooling involves harnessing waste heat and using it for cooling applications. There are various techniques for achieving this, that can be applied to different types of building.

- **Biomass boiler** Biomass CHP plants are commonly used in district heating systems as well as in industries with high heating and cooling demand.

- **PIR foams** with embedded Phase Changing Material PCMs are materials that can adsorb and store thermal energy while its structural phase changes.

WS-12: “CHALLENGES OF **PUBLIC BUILDING RETROFITTING** WITH INNOVATIVE TECHNOLOGIES – AN EXCHANGE OF EXPERIENCE”

BRICKER

BRICKER
ENERGY REDUCTION IN PUBLIC BUILDING STOCK

Consortium

The BRICKER consortium brings together **18 partners** from 5 **different EU-countries**: Spain, Belgium, Italy, Germany, Poland, and 1 associate member country, Turkey.

Public buildings owners from three different countries, provide three demo-buildings in different climatic zones, focusing on different uses such as the Regional Government of Extremadura in an administrative building in Cáceres (Spain), and the Province of Liège in an academic building in Liège (Belgium).

Acciona is a **large construction company** with research capabilities, private promoter and energy services provider. Acciona cooridinates the BRICKER project. **Technology specialised** SMEs with research capabilities provide the following input: Rank is a manufacturer of ORC machines, Greencom manufactures decentralized balanced ventilation systems integrated in building envelopes, Onur Enerji is an engineering company in the construction sector and an energy services provider, Purinova is the Polish producer of polyester polyols and polyurethane systems, and Soltigua is a developer and supplier of parabolic trough collectors. Cemosa is a specialized architecture and engineering company, experts in energy efficient building audit and design.

Research organizations are represented by CARTIF, EURAC, Fondazione Bruno Kessler, Ozyegin University, Tecnalia, University of Liège. The first three are technological centres dealing with energy efficient buildings and the universities of Ozyegin and Liège are expert universities in energy efficient building design and operation. **Exploitation and dissemination is taken care of by** professionals Steinbeis and youris.com. Steinbeis is a non-profit research organisation expert in dissemination and exploitation with special capacities in transnational technology transfer and supporting innovation focusing in SMEs. Youris.com EEIG is a non-profit media agency with special expertise in disseminating and promoting European innovation.

A2PBEER: “Affordable and Adaptable Public Buildings Through Energy Efficient Retrofitting” [www.a2pbeer.eu]

Project Introduction

A2PBEER is a four year research project partially financed by the Europeon Union 7th Framework Programme and seeks to develop a cost effective, “energy efficient retrofitting” methodology for public buildings, drawing on the expertise of over 21 partners from 11 European countries. The company Tecnalia are the lead partner for this project.

Buildings consume about 40% of total final energy in Europe. Energy efficient retrofitting plays an essential part in meeting the EU 20-20-20 targets. A greater impact on this can be achieved through interventions in non-residential buildings, as their energy consumption is 40% higher than residential buildings. 30% of non-residential buildings in Europe are public buildings. Therefore A2PBEER focuses on energy efficient retrofitting of public buildings.

In Europe, buildings consume about 40% of total final energy and are responsible for 36% of co2 emissions since 1990, and those buildings built before 1980 represent 95% of this energy consumption. The low renovation rate of building stock since 1990 (1% per year) means that boosting energy efficient buildings’ retrofitting is the only way to reach EU’s “20-20-20” targets. A higher impact will be achieved through interventions in non-residential buildings, as their energy consumption is 40% higher than in residential buildings. Public buildings represent more than 30% of the non-residential buildings in the EU.

A2PBEER partner, ABUD Ltd will develop an initial systemic energy efficient buildings’ retrofitting methodology for the three demonstration sites with the intention to provide a retrofitting methodology to be replicated into Public Buildings in Europe. This will take advantage of synergies derived from interventions at the district levels.

Three public buildings located in Bilbao Spain, Ankara Turkey and Malmo Sweden have been chosen to serve as demonstration districts. The chosen sites represent the three main climatic regions of Europe – Oceanic, Mediterranean and Continental. A range of innovative technologies will be developed and deployed at these sites with a view to achieving a highly efficient integrated retrofitting methodology that can be replicated throughout the European Union.

WS-12: "CHALLENGES OF **PUBLIC BUILDING RETROFITTING** WITH INNOVATIVE TECHNOLOGIES – AN EXCHANGE OF EXPERIENCE"

A2PBEER

Technologies

A2PBEER methodology will **include existing available building solutions and also advanced innovative ones** developed by the project. These include:

a "high performance envelope retrofitting", based on an external and internal super-insulated façade (VIP–Vacuum Insulated Panels) retrofit.

Smart windows.

"smart lighting systems" combining LED and natural light, and

the "Smart Dual Thermal Substation", a new approach to district heating based in smart grid functionality and integrating heating and cooling.

A "kit-concept" will be applied in the development of new solutions in order to deploy adaptable and affordable solutions.

Retrofitting Strategies

The methodology and developed kits will be demonstrated and validated by one of the partners Acciona-infraestructuras through three real retrofitting deployments, covering main climatic areas in Europe (Continental, Oceanic and Mediterranean), different types of Public districts and main Public end-users.

WS-12: “CHALLENGES OF **PUBLIC BUILDING RETROFITTING** WITH INNOVATIVE TECHNOLOGIES – AN EXCHANGE OF EXPERIENCE”

A2PBEER

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Aerial View of Bilbao


Aerial View of Malmo


Aerial View of Ankara

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A2PBEER

A 2 P B E E R
AFFORDABLE AND ADAPTABLE PUBLIC BUILDINGS THROUGH ENERGY EFFICIENT RETROFITTING

Consortium

1. FUNDACION TECNALIA RESEARCH & INNOVATION, Spain
2. D'APPOLONIA SPA, Italy
3. TOSHIBA TRANSMISSION & DISTRIBUTIONEUROPE SPA, Italy
4. CWS Comfort Window System AB , Sweden
5. PARANS SOLAR LIGHTNING AB, Sweden
6. CLIMATEWELL AB, Sweden
7. BERGAMO TECNOLOGIE SPZOO, Poland
8. ACCIONA INFRAESTRUCTURAS S.A., Spain
9. ISOLEIKA KOOP.ELK. S COOP, Spain
10. ABUD MERNOKIRODA KFT, Hungary
11. EKO DENGE CEVRESEL EKONOMIK SOSYAL ARASTIRMA DANISMANLIK MUHENDISLIK PROJE INSAAT TICARET VE MUMESSILLIK LIMITED SIRKETI, Turkey
12. AFLIVA DANISMANLIK VE EGITIM MERKEZI IKTISADI ISLETMESI, Turkey
13. HEP - ESCO DOO ZA VODENJE I FINANCIRANJE PROJEKATA ENERGETSKE UCINKOVITOSTI, Croatia
14. IVL SVENSKA MILJOEINSTITUTET AB, Sweden
15. LIMERICK INSTITUTE OF TECHNOLOGY, Ireland
16. UNIVERSIDAD DEL PAIS VASCO/ EUSKAL HERRIKO UNIBERTSITATEA, Spain
17. MALMO STAD, Sweden
18. NATIONAL MINISTRY OF EDUCATION, Turkey
19. OSLO KOMMUNE, Norway
20. ENTE VASCO DE LA ENERGIA, Spain
21. OFFICE PUBLIC D'AMENAGEMENT ET DE CONSTRUCTION DE L'ISERE, France

RESSEEPE: REtrofitting Solutions and Services for the enhancement of Energy Efficiency in Public Edification [www.resseepe-project.eu]”

Project Introduction

RESEEPPE will bring together design and decision making tools, innovative building fabric manufacturers and a strong demonstration program to demonstrate the improved building performance through retrofitting.

The core idea of the RESSEEPE project is to technically advance, adapt, demonstrate and assess a number of innovative retrofit technologies. Reductions in the area of 50% will be achieved in terms of energy consumption. A systemic process will be also implemented that will allow the selection of the best possible retrofitting mix, customized to the needs of the particular building. Several remarkable innovative technologies and materials will be integrated in the retrofitting process:

- Envelope Retrofitting: Ventilated Facades, Aerogel-based Super-insulating mortar, Wooden Insulating Wall Panel and VIP Panel
- Integration of RES: PV Energy, Thermal Collectors
- Energy Storage Systems: Thermal storage and PCMs
- Nanotechnologies and smart materials: EC/PV Windows
- ICT: Strategies at building and district level

Intelligent Building Controls, HVAC systems

The RESSEEPE technologies will be validated in three different demo-sites:

- Coventry (UK)

Skellefteå (SE)

WS-12: "CHALLENGES OF **PUBLIC BUILDING RETROFITTING** WITH INNOVATIVE TECHNOLOGIES – AN EXCHANGE OF EXPERIENCE"

BRICKER

Intended Outcomes

The **scientific and technological objectives** of RESSEEPE project are the following:

- To set up a diagnosis methodology for an integrated renovation of public edification at building and district level.

- Innovative development and enhancement of SoA retrofit technologies that will be able to achieve energy savings in the area of 50%.

- Development of a systemic view for selection of the most empowering retrofitting mix: Net-zero energy renovation of existing public districts.

To validate the RESSEEPE technologies in three different demo-sites.

Although the energy consumption in Europe is expected to rise only moderately in the next 20 years, the Energy Efficiency Buildings European Initiative has the objective to mitigate this problem aiming a reduction of 165 million tons of emissions (Mtoe) from the existing buildings (in 2005) and a contribution of 50 Mtoe from renewable energies during the period from now until 2020. Existing public buildings have a huge impact on the total energy use in Europe. For example, in France, the hospitals alone represent about 11% of the energy consumption in the service industry with an average of 225 kWh / m² per year 2. The potential for energy savings is thus particularly important at national and European level, where many facilities are very energy-intensive, and where the priorities are the functional quality of the buildings and the respect of optimal use conditions.

In particular, the project aims to achieve the following target values:

Associated investment costs to building renovation are expected to represent a maximum of 19% on average of the total costs of building an equivalent new building in the same location. On average, the return on investment will be around 7,6 years.

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RESSEEPE

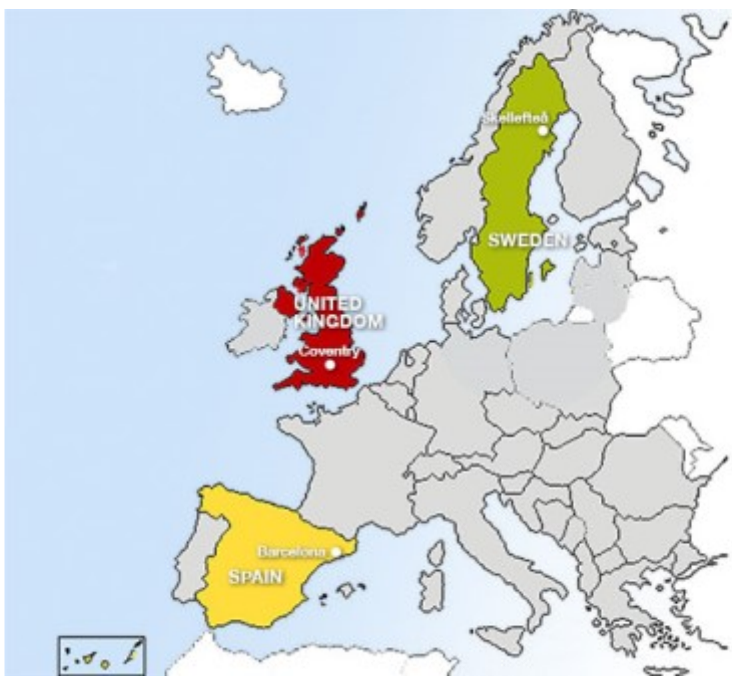
The consortium was planned according to principles of scientific, technical and operative complementarity and self-consistency. The consortium covers all the R&D aspects: from basic research on advanced materials and their properties to applied research on innovative devices for technology transfer to industry, from small enterprises to industrial exploitation. The coordinator along with the participants collectively constitutes an experienced consortium capable of achieving the RESSEEPE project objectives. The multidisciplinary consortium has been configured with a well-balanced share of consortium from different backgrounds.

The consortium comprises 25 partners in 10 different countries: United Kingdom, Spain, Austria, France, Italy, Greece, Germany, Switzerland, Slovenia and Sweden.

PRIORITIES	**TARGET VALUE**	**REDUCTION (Compared to current situation)**
Energy Consumption	66 kWh/m2•year	63%
CO2 Emissions	48,15 kg/m2•year	60 %

WS-12: "CHALLENGES OF **PUBLIC BUILDING RETROFITTING** WITH INNOVATIVE TECHNOLOGIES – AN EXCHANGE OF EXPERIENCE"

RESSEEPE



WS-13

“**TRIBUTE:** IMPROVEMENT OF THE PREDICTIVE CAPABILITY OF A STATE-OF-THE-ART COMMERCIAL BEPS”

Chaired by:

TRIBUTE project

WORKSHOP-DEDICATED WEBPAGE:

http://sustainable-places.eu/sp-2016/programme/sp16-workshops/tribute-workshop/

WS-13: "**TRIBUTE:** IMPROVEMENT OF THE PREDICTIVE CAPABILITY OF A STATE-OF-THE-ART COMMERCIAL BEPS"

Workshop Leadership & Project-Dedicated Webpage on the SP'16 website

TRIBUTE: "Take the energy bill back to the promised building performance" www.tribute-fp7.eu

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WS-13: “**TRIBUTE:** IMPROVEMENT OF THE PREDICTIVE CAPABILITY OF A STATE-OF-THE-ART COMMERCIAL BEPS”

Workshop Context & Agenda

Context

TRIBUTE project is aimed at minimising the gap between computed and measured energy performances through the improvement of the predictive capability of a state-of-the-art commercial BEPS

Agenda

- **Objective of the workshop – goals of TRIBUTE**

  (E. Onillon, CSEM)

- **Energy stakeholders context** –

  (O. Cottet, Schneider Electric)

- **Standards and IPMVP for TRIBUTE** –

  (H. Obara, Schneider Electric)

- **Advanced analytics to reduce the energy performance gap** –

  (C. Jimenez, TBC; P. Beguery, Schneider Electric; E. Onillon, CSEM)

- **Closure**

  (V. Smítka, Amires)

WS-13: "**TRIBUTE:** IMPROVEMENT OF THE PREDICTIVE CAPABILITY OF A STATE-OF-THE-ART COMMERCIAL BEPS"

TRIBUTE

About the TRIBUTE project

For existing buildings, measurement and verification techniques will be developed and deployed to connect the BEPS model in real time to the pivotal wireless sensing and control systems of a monitored building. This involves modelling building systems to a higher fidelity than done today, developing technology for on-line identification of building key parameters, and automatically adapting the on-line, real time BEPS to the actual building's state.

Today, Building Energy Performance Simulation (BEPS) analysis tends to show a large discrepancy with real energy performance. Most cases are due to gross mistakes rather than fundamental inadequacy of available technology and methods. The reasons are manifold. Highly simplified calculation methods are used far beyond their domain of validity. Assumed boundary conditions such as occupant behaviour are not in accordance with actual usage; gross malfunctions in control and HVAC systems are left undetected in the commissioning process, while thermal bridges and distribution system losses are left without attention. Moreover, metered and sub-metered data are not used efficiently in calculation tools and engineering based simulation models during the Measurement and Verification (M&V) phase.

In addition, BHM and EFM application will compare measured data to the then improved predicted metrics and will enable detecting building deviations. Advanced data mining methods will help evaluate these deviations. Subsequent Energy Efficiency Diagnostic Rules and optimization methods will provide cost effective and corrective retrofit actions accordingly. The methodology and tools will be evaluated in the context of three different building types and locations.

WS-13: "**TRIBUTE:** IMPROVEMENT OF THE PREDICTIVE CAPABILITY OF A STATE-OF-THE-ART COMMERCIAL BEPS"

TRIBUTE

TRIBUTE objectives

Healthcare buildings and districts are among the top EU priorities for Energy-efficient Buildings (EeB) since they play a key factor for a sustainable community, but their energy use and carbon emission are among the highest of all building types. A hospital – which is a part of a healthcare district– uses 2.5 times more energy than an office in average. There are some 15,000 hospitals in the EU responsible for at least 5% of the annual EU's carbon emission (~ 250 million tonnes). Healthcare accounts for nearly 10% of EU's GDP, and hospitals can take up to 60% of a country's health expenditure (source: WHO and European Hospital and Healthcare Federation, 2012 statistics). In order to cope with the energy, financial, political, societal and environmental crises, all healthcare districts in Europe are urgently seeking to substantially reduce their energy consumption and carbon emission by 30–50%. Therefore, they are planning new energy-efficient building projects as well as energy-efficiency retrofitting of the existing buildings. At present and in the near future, clients, architects, technical designers, contractors, and end-users really need a breakthrough in designing energy-efficiency buildings integrated in the healthcare districts.

WS-13: “**TRIBUTE:** IMPROVEMENT OF THE PREDICTIVE CAPABILITY OF A STATE-OF-THE-ART COMMERCIAL BEPS”

Workshop Context

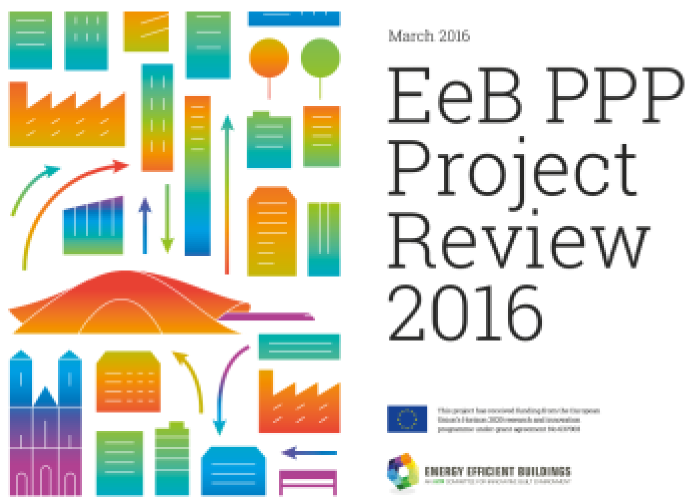
Consortium

1. SCHNEIDER ELECTRIC INDUSTRIES SAS, France
2. CORK INSTITUTE OF TECHNOLOGY, Ireland
3. IBM IRELAND LIMITED, Ireland
4. TECHNISCHE UNIVERSITAET DRESDEN, Germany
5. TBC INNOVATIONS, France
6. EQUA SIMULATION AB, Sweden
7. COMMUNAUTE D'AGGLOMERATION DE LA ROCHELLE, France
8. CITTA DI TORINO, Italy
9. POLITECNICO DI TORINO, Italy
10. ZEDFACTORY EUROPE LIMITED, UK
11. FUNDACIO INSTITUT DE RECERCA DE L'ENERGIA DE CATALUNYA, Spain
12. TEKEVER - TECNOLOGIAS DE INFORMACAO, S.A., Portugal
13. NXP SEMICONDUCTORS NETHERLANDS BV, The Netherlands
14. AMIRES SRO, Czech Republic
15. IBM IRELAND PRODUCT DISTRIBUTION LIMITED , Ireland
16. TBC générateurs d'innovation, France

POSTERS

There were scientific six posters displayed by their authors at SP’16, each available for download on the SP website.

Also, numerous additional flyers including a welcome to Anglet package and the new EeB report from ECTP that reviews projects of related subject matter, among other well-received initiatives of interest to the SP community were disseminated.



P-1: “VIP photovoltaic ventilated facade: design, simulation, production and installation”

Authors

Irene Rafols. Arch., Fundació Eurecat, Spain—Master of Architecture (Universitat Politecnica de Catalunya) specialized in development of new sustainable construction products with a deep knowledge in high performance concretes, sustainable materials and façade components. I also have a strong competence in construction and refurbishment processes focusing their improvement with IT technologies (BIM, IDDS, etc).

Daniel Cuiñas, Fundació Centre CIM, Spain - PhD in Physics (University of Santiago de Compostela). Experienced in structural simulations, numerical computation, data analysis and manufacturing techniques (subtractive and additive).

Kenny Rottenbacher, va-Q-tec AG, Germany - Master of Science in Materials Science and Engineering (Friedrich-Schiller Universität Jena). Experience with material properties, especially glass and ceramics. Currently working in several H2020-EEB research projects for building insulation with vacuum-insulation panels (VIP).

Joaquim Rigola, Universitat Politècnica de Catalunya (UPC), Spain—Professor Dr. Engineer at UPC and Ph. D. Researcher and Promoter of the Heat and Mass Transfer Technological Center (CTTC-UPC). More than 20 years working in heat and mass transfer phenomena analysis, numerical simulation models and experimental test facilities.

Asier Sanz, TECNALIA Research & Innovation, Spain - MSc degree in Automation Engineering by the Faculty of Engineering of University of Deusto. Currently he is pursuing the PhD degree in the Faculty of Engineering of the University of the Basque Country, Automatics and System Engineering Department, where he also works as an assistant professor.

Poster Explained

Three features of this development characterize the innovation brought: First, the utilization of vacuum insulated panels as the insulation element of the facade. The insulation layer in ventilated facades is typically formed by conventional insulation materials. Second, the non-invasive characteristic of the installation since the substructure minimizes its points of contact with inner wall preventing the thermal bridges. This characteristic implies less logistics, therefore expediting the installation activities. And third, the optimization of the air gap thickness to improve the PV panel performance.

VIP photovoltaic ventilated facade: design, simulation, production and installation

Contributors: Irene Ràfols (Eurecat), Daniel Cuiñas (Fundació Cim), Kenny Rottenbacher (Va-Q-Tech), Joaquim Rigola (UPC), Asier Sanz (Tecnalia)

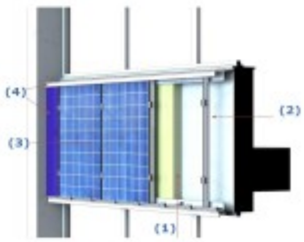
Abstract

The present study shows the application of Vacuum Insulated Panels and photovoltaic panels as the two layers of a ventilated facade. This ventilated façade is specially designed for energy refurbishment and was attached on the existing wall of the building considered as demonstrator with the minimum impact over the existing wall. One of the main characteristics of this photovoltaic ventilated façade is the integration of PV modules on the existing building. This integration is achieved in the prototype described by aligning the PV module mesh with the existing building windows. The principal elements that integrate the prototype are a substructure to provide the anchorage to the building and support, the interior layer composed by the Vacuum Insulated Panels used to provide thermal insulation to the building, the external layer of photovoltaic panels to generate power while closing the gap for the ventilation, and the finishing elements to provide water tightness.

Design and Simulation

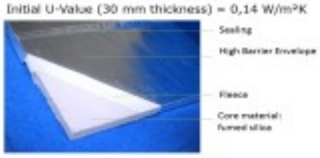
Ventilated façade is a construction system consisting on the attachment of an outer skin of ventilated cladding to a new or existing building. This system is made of an outer layer to keep out the rain and dissipates solar radiation, an air cavity to drain the minimal amount of water that may penetrate in extreme weather, an insulation layer to give thermal insulation and to avoid interstitial condensation and a continuous thermal break, and an inner layer to support all the façade loads (wind and self weight).

Within RESSEEPE project it has been designed a **ventilated façade for refurbishment** that combines an outer layer made of **PV modules**, an air cavity, an insulation layer made of **VIP** (vacuum insulation panels) and a substructure.



Insulation VIP panels (1)

Initial Thermal conductivity = < 4,3 mW/mK
Initial U-Value (30 mm thickness) = 0,14 W/m²K



Substructure (2)

Designed to minimize thermal bridges.
Made of following elements: Main structural profile. Fixed to anchorage plates. Guide profile, stainless steel anchors, Aluminium 6063 extruded profiles. Connection elements; stainless steel nuts and bolts.

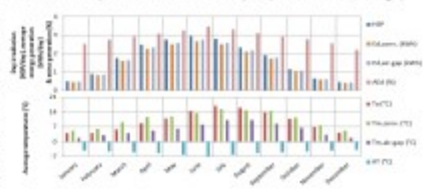
PV modules (3)

The ventilated façade prototype incorporates 5 modules of 300 274Wp each connected in series leading to a total installed power of 1.5 1.37kW.
The PV modules, manufactured by ONYX SOLAR, are dual tempered glass (4+4mm) frameless (1700x1000mm) 60 Cell monocristalline solar panels.

Other finishing elements (4)

Solar photovoltaic system yield

The energy simulation carried out for determining a complete year PV system yield is based on meteorological data (JRC) and self-developed PV system models for considering the refrigeration due to the ventilation air-gap. Thus, two identical PV systems have been analyzed, one with the air-gap and the other without it.
The ventilation channel reduces the PV module operation temperature, enhancing the energy yield. Although the refrigeration relative effect in the yield is similar for south and west orientations, the west choice for installing the system is not the best one in absolute terms of energy. The **annual energy generation for the system** to be installed in Coventry for west orientation is estimated in 579 kWh, **a 3.09% higher than a PV system without the ventilation channel.**

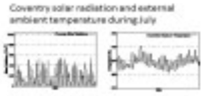


Improved channel width to maximize PV modules energy production

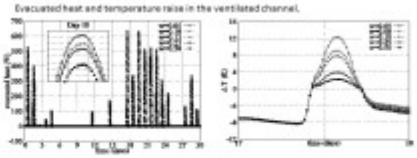
Fluid dynamic analysis

A numerical simulation tool for the thermal and fluid dynamic analysis of the air gap channel between PV module and the VIP panel taking into account external climate conditions and internal boundary conditions for optimization purposes has also been carried out. Some numerical results based on gap thickness is here presented.

Coventry solar radiation and external ambient temperature during July



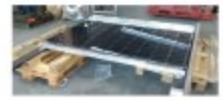
Evacuated heat and temperature raise in the ventilated channel.



Manufacturing and Installation

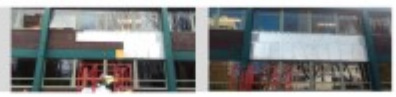
The ventilated facade was manufactured according to the design explained in the previous section of this poster. The structural simulations highlighted a set of minimum trust specifications that rely on the materials chosen for the different parts that integrate the ventilated facade substructure.

The substructure was manufactured and validated *in situ* as a first step before its installation in the demosite selected within the project. One of the photovoltaic panels was used during these validation activities to verify tolerances (figure 5).



The building selected for the installation of the ventilated facade was the John Laing Building, located in Coventry. The assembly process was split into the following steps:

STEP 1: attaching VIP panels to the original wall of the John Laing façade. This installation consists of 14 VIP panels with dimensions 1000 X 600 mm and 30 mm of thickness.



STEP 2: Fixing anchorages plates to concrete columns. These will be used to attach the structural profiles that will hold the weight of the whole ventilated façade.

STEP 3: Fixing structural L profiles to the anchorages previously installed in STEP 2. These steel profiles hold the entire weight of the façade.

STEP 4: Fixing aluminium vertical profiles. These are six extruded profiles 1660 mm length installed in vertical and used to anchor the photovoltaic panels.

STEP 5: Attaching PV modules fixed with aluminium clamps to vertical profiles.

STEP 6: Attaching the composite folded sheets in lateral gaps and the finishing plates (upper and lower).

Results

1. Utilization of vacuum insulated panels as the insulation element of the facade.
2. Utilization of PV modules as outer layer.
3. Optimization of the air gap thickness to improve the PV panel performance.
4. Non-invasive characteristic of the installation since the substructure minimizes its points of contact with inner wall preventing the thermal bridges. This characteristic implies less logistics, therefore expediting the installation activities.

Project partners involved in the poster:

eurecat Centre Tecnològic de Catalunya · Fundació CIM BarcelonaTech · CTTC Centre Tecnològic de Transferència de Calor, Universitat Politècnica de Catalunya · va-Q-tec · tecnalia Inspiring Business

Other project partners:

http://www.resseepe-project.eu/ Twitter: @RESSEEPE

The full poster can be downloaded at the following link: http://sustainable-places.eu/sp-2016/programme/poster-contributors/vip-photovoltaic-ventilated-facade-resseeppe/

P-2: “Building thermal model at an urban scale for defects integration”

Authors

Rodler Auline, Guernouti Sihem, Musy Marjorie, Bouyer Julien IRSTV / CRENAU/ CEREMA, France

Poster Explained

Today, energy-efficient buildings are designed according to results of energy performance simulation. Differences between simulation and measured data may have been the consequence of errors in, for example, occupancy scenarios, weather data or input data such as the materials or coating properties of the building envelope [1][2]. Spitz et al. [1] showed that among the most influential parameters there is the thermal resistance of the walls represented by the conductivity and the thickness.

In the context of energy efficiency and with the aim to reduce the performance gap between predicted and measured energy consumption rate, quality checks and self-inspection tools need to be developed. For both buildings retrofit and new buildings these tools can be useful to detect the structural defects or the contingencies. Once the defect is localized, its impact on the global energy performance of the building can be evaluated and compared to the energy performance estimated during the design process. In this work, we focus on the development of a tool able to simulate the thermal behavior of a building surrounded by a realistic environment.

The envelope model has the advantage to consider defects. The defects considered here are materials with different properties than the initially planned during the design stage or materials with different thicknesses. These defects can be just part of a wall and can be localized at any position of the envelope. Once the defect is detected, it will be taken into account in the whole thermal simulation process. Therefore, a dynamic building thermal model is presented. It is a direct model representing a whole building with several floors and can be of any shape. The wall model is a finite difference model and the mesher generates finer meshes at the regions were the defect is localized or where thermal stresses occur.

Building thermal model at an urban scale for defects integration

A. Rodler[1], S. Guernouti[2], M. Musy[1] , J. Bouyer[3]

1. Institut de Recherche en Sciences et Technique de la Ville, FR CNRS 2488, Nantes, France
2. Centre d'études et d'expertise sur les risques, l'environnement, la mobilité et l'aménagement de Nantes
3. Centre d'études et d'expertise sur les risques, l'environnement, la mobilité et l'aménagement de Nancy

BACKGROUND & AIMS

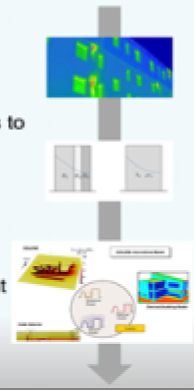
Background & project aims :

- Construction worksite
- Buildings retrofit and new buildings
- Reduce the energy performance gap between a building's designed and as-built energy performance
- Develop, adapt and validate quantitative analysis methods to apply to non-intrusive on-site measurements

Our work :

•Direct modelling of building and use of 'detailed' thermal models for external and internal conditions considering :

- the structural defects detected by thermal camera (different properties or thicknesses)
- the thermophysical properties by inverse modelling



CASE STUDY

- Building composed of a ground floor and two floors:
  30m large, 30m long, 9m high
  On each level 4 windows of 25m² each
- Simulations between the 1st and 10th April (Lyon)
- Materials (normal case T1):

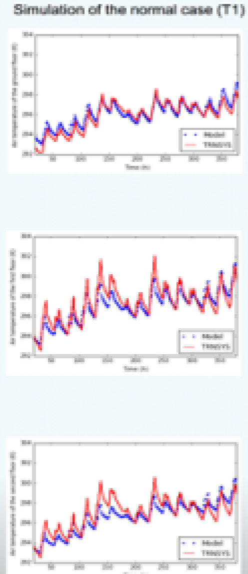
Type of element	Thermal properties (outside → inside)
Wall	Coating 2cm / λ= 0.75 W/mK C=1450 J/kg K Insulation 20cm / λ= 0.04 W/mKC=1000 J/kg K Concrete 20cm / λ= 1.75 W/mK C=1000 J/kg K Plaster 1.3cm / λ= 0.42 W/mK C=850 J/kg K
Roof	Coating 2cm / λ= 0.75 W/mK C=1450 J/kg K Insulation 20cm / λ= 0.04 W/mK C=1000 J/kg K Concrete 20cm / λ= 1.75 W/mK C=1000 J/kg K Plaster 1.3cm / λ= 0.42 W/mK C=850 J/kg K
Ground	Insulation 20cm / λ= 0.04 W/mK C=1000 J/kg K Concrete 20cm / λ= 1.75 W/mK C=1000 J/kg K
Floor	Concrete 20cm / λ= 1.75 W/mK C=1000 J/kg K Wood 2cm/ λ= 0.13 W/mK C=1880 J/kg K
Window	Double glazing 4mm/16mm/4mm

- Sensitivity study of the properties on the entire envelope

RESULTS

Comparison between the model and TRNSYS

Simulation of the normal case (T1)



Impact of the insulation thermal properties and its thickness

T1 : normal case

T2 : λ = 0.03 W/mK

T3 : 25 cm of insulation

T4 : 25 cm of insulation and λ = 0.03 W/mK

T5 : C = 2000 J/kg K

T6 : C = 2000 J/kg K and λ = 0.03 W/mK

T7 : 25 cm of insulation, C = 2000 J/kg K and λ = 0.03 W/mK

Impact of the concrete thermal properties and its thickness

T1 : normal case

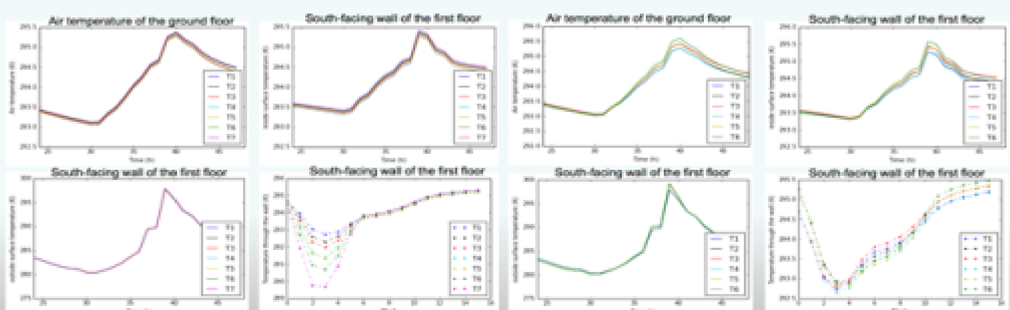
T2 : λ = 1.33 W/mK

T3 : C = 880 J/kg K

T4 : 25 cm of concrete

T5 : 25 cm of concrete and λ = 1.33 W/mK

T6 : 25 cm of concrete, λ = 1.33 W/mK and C = 880 J/kg K



CONCLUSION & FUTURE WORKS

- First validation of the model has been undertaken: differences between TRNSYS and the model are of 1-2 °C.
- Impact of the thermal properties of the insulation and concrete on the air, the surface temperatures and temperatures of the meshes in the wall are studied : low impact on the air temperature (~ 0.5K) and on the inside surface temperatures (~0.5K) but higher impact on the temperatures through the wall (0.5 – 3K) and on the outside surface temperatures (~2 K).
- Improvements and future works : Impact of the thermal properties of the layers at the surfaces of the walls, tests on other materials, inside and outside insulation, in situ validation & use of IR images.

This research work is carried out within the scope of the Built2Spec project, funded by European Union under Grant Agreement number: 637221 – H2020-EeB-2014-2015

Contact : auline.rodler@ec-nantes.fr

The full poster can be downloaded at the following link: http://sustainable-places.eu/sp-2016/programme/poster-contributors/building-thermal-model-irstvcrenaucerema/

P-3: “Strategies that influence performance of mixed-mode NZE buildings in Hawaii”

Authors

James Maskrey Title: Associate Specialist Email: maskrey2@hawaii.edu Company: Hawaii Natural Energy Institute (HNEI) Country: USA Short bio: James Maskrey (Master Environmental Planning, energy design focus from the College of Architecture, Arizona State University; MBA, University of Hawaii) brings over 30 years of experience in the energy efficiency and renewable energy field to HNEI. At HNEI he has focused on energy efficiency research, specifically in net-zero energy and naturally ventilated buildings.

"Dr. Sara Cerri Title: Renewable Energy Consultant cerri.sara@gmail.com SC Consulting Country: Italy - Dr. Sara Cerri (European PhD in Energy, M.Sc. in Aeronautical Engineer and B.Sc. in Aerospace Engineering at Politecnico di Milano, Italy) is currently working as energy consultant and project manager for the Hawaii Natural Energy Institute (HNEI) for the “Hawaii Energy and Environmental Technologies Initiative” and “Asia -Pacific Research Initiative for Sustainable Energy Systems” projects.

"Eileen Peppard Title: Sustainability Specialist epeppard@hawaii.edu Sea Grant University of Hawaii Country: USA - Eileen Peppard is a sustainability specialist working at the University of Hawaiʻi Manoa on energy conservation issues for the built environment. Her work has included managing a team of students conducting residential energy audits, collecting energy data on campus buildings, collecting environmental data to verify computational fluid dynamic models of natural ventilation in buildings, and monitoring net-zero energy classroom buildings.

Poster Explained

The contribution highlights the current research on energy efficiency in first generation FROG net zero energy mixed-mode buildings used as classrooms compared to standard buildings in the tropical climate of Hawaii. The buildings refer to specific target groups (teachers and students) and are located in two islands with different weather conditions. Both interior and exterior environmental conditions were monitored for a period of one year using several sensors in order to collect the internal environmental and energy data. From observations of user behavior and equipment operation, strategies are identified to optimize performance of this first generation of NZE buildings.

Strategies that influence performance of mixed-mode NZE buildings in Hawaii

A. James Maskrey,[1] Sara Cerri,[2] Eileen Peppard[3]

[1]Hawaii Natural Energy Institute (HNEI) [2]Energy Consulting [3]Environmental Research and Design Lab (ERDL)

Introduction

In 2008, Project FROG, the Office of Naval Research (ONR) and the Hawaii Natural Energy Institute (HNEI) of the University of Hawaii at Manoa began a research program on componentized energy efficient platforms tailored to the Pacific region with potential for mass deployment. The 1,280 ft² first generation of FROG net zero platforms are:

- Easily shipped in standard 40 foot shipping containers.
- Designed to maximize daylight autonomy and use mixed-mode passive and active cooling and ventilation systems.

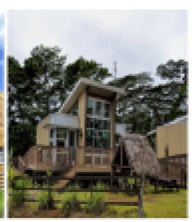
Project Consortium

- HNEI: Hawaii-based project host.
- Project FROG: Designer/builders of componentized structures.
- ERDL: Data management and analysis support.
- MKThink: Monitoring services and performance analytics.

FROG Buildings

Three FROG platforms are installed in two locations in two different microclimates on the islands of Oahu (Ilima) and Kauai (Kawaikini East and West), used as classrooms.

FROG building at Ilima Intermediate School on Oahu



Kawaikini East FROG building at Kawaikini New Century Public Charter School on Kauai

- R-24 walls; R-22 and R-30 roof decks.
- Operable louvers at the base of the solid wall panels for natural ventilation.
- High and low operable windows for natural ventilation.
- Low-e PPG Solarban 70XL glazing.
- Nine variable speed ceiling fans.

- High efficiency split system fan coil and condensing unit (EER/SEER: 11.0/13.5).
- A roof mounted exhaust fan for induced ventilation located at the highest point of the roof.
- Direct/indirect fluorescent T8 lighting with photosensor daylight control.
- PV systems: 5.24 kW per structure.

Research Objectives

The FROG platforms were instrumented for the purpose of providing valuable data on the performance of design and material component and measure comfort conditions in different tropical environments.

The actual energy performance was compared with another net zero building and two typically constructed classroom buildings located in the island of Oahu.

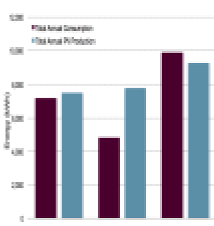
Data were collected for over two years. The study considers one school year (July 1, 2014-June 30, 2015) based on the Hawaii Dept. of Education official 2014-15 calendar (365 days).

Project Results

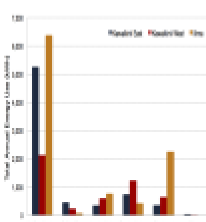
- The overall energy consumption among all the Hawaii classrooms compared favorably to nationwide and regional energy use intensity (EUI) benchmarks.
- Of the three FROG NZE buildings that were air conditioned, two had lower EUI than conventional built structures. The other NZE building built without air conditioning had the lowest EUI of the six.
- On average NZE buildings used 40% less energy per square foot, had 6% more time with comfortable interior conditions and delivered 15% more comfort per energy consumed than conventional classrooms.
- On average the NZE buildings had 15% less time within the thermal comfort zone, had 41% more time with acceptable air quality and 2% more time with acceptable lighting conditions compared to traditional classrooms.

	NZE building classrooms				Conventional classrooms	
Building	Kawaikini East	Kawaikini West	Ilima	P6	P1	D36
Total annual energy (kWh)	7,138	4,840	9,881	2,987	4,838	4,430
EUI (kWh/ft²/yr)	5.6	3.8	7.7	2.5	5.5	4.9
EUI (kWh/m²/yr)	60.8	40.7	83.1	27.4	58.4	53.0
PV size (kW)	5.24	5.24	5.24	12.32	N/A	N/A
Loads						
Ceiling fans	Yes	Yes	Yes	Yes	Yes	Yes
AC	Yes	Yes	Yes	No	No	Yes
Louvers (opening)	(Automatic)	(Automatic)	(Manually)	(Manually)	No	No
Interior lighting	Yes	Yes	Yes	Yes	Yes	Yes
Exterior lighting	Yes	Yes	Yes	No	Yes	No
Plugs	Yes	Yes	Yes	Yes	Yes	Yes

- Designed to meet the Net Zero Energy goals, generation for the two Kawaikini structures exceed consumption: Kawaikini East by over 4% (317 kWh), Kawaikini West by over 37% (2,952 kWh). The Ilima building fell slightly short of the NZE goal (-634 kWh). This was due to the anomalous 24/7 HVAC operation in June 2015.
- If HVAC consumption for June been at the average of the previous 11 months, Ilima would have been over 9% net positive (over 800 kWh).

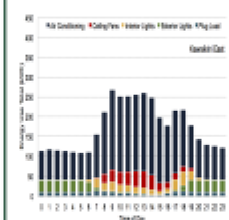


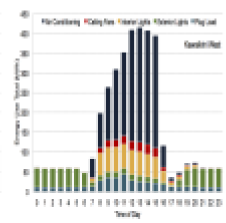
- Annual energy use disaggregates across end-uses for the FROG buildings: AC represents the highest energy consumption. Although three platforms are identical the end uses show a different pattern.
- Ilima's AC energy use was higher than the other FROG buildings. This was possibly due to the hotter microclimate and user behavior, including high AC utilization where the space was at times over-cooled.



Occupant Involvement

- A mixed-mode building is particularly sensitive to occupant involvement. Windows are to be opened and closed according to specific operating protocols; ceiling fans should operate during natural ventilation modes but not during mechanical cooling; HVAC temperature set point should be consistent with the design intent.
- A significant portion of the annual energy consumed can be attributed to building user-response to the environment, which can be driven by routine, habits, knowledge of equipment and their use, as well as unanticipated occupancy schedule and building utilization that falls outside of initial operating assumptions.





- Chief among the energy drivers in a net zero energy building is the ability to manage energy during the unoccupied periods: Kawaikini East building has been used as the preferred venue for extracurricular gatherings outside the school hours (8.00am-2.00pm).
- FROG buildings have been designed for natural daylighting but data show that the use of daylighting is discretionary and variable based on user habits, expectations or need.
- Ceiling fans were intended to be used in naturally ventilated conditions, but they were frequently used in parallel with the HVAC system.
- Exterior lighting was ON during daytime at Kawaikini West.

Strategies

- Training for occupants.
- A dashboard for occupant education and feedback.
- Address security concerns, such as using frosted window film so daylight harvesting is not diminished by covering windows for security.
- Use ceiling fans in order to raise thermostat setting.

- Maintenance or recommissioning – AC malfunctioned in one Kawaikini, using energy without providing comfort.
- Use automated louver controls (or easy to operate windows) to remove barriers to choosing natural ventilation.

Next Steps

Ongoing study of operational variables and the impact of net zero energy building's user behavior and motivation will continue in Hawaii with the construction of two new buildings on the University of Hawaii at Manoa campus.

- Buildings will be constructed with ICT-based solutions to inform users of real-time building operation, generation, and consumption.
- User education and awareness and the implementation of specific engagement actions will result in behavioral changes with little compromise in comfort.

Acknowledgments: The construction and monitoring of the NZE buildings was supported and funded by the Office of Naval Research in grant awards: N00014-10-0310, N00014-11-0391, N00014-12-0496.

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SUSTAINABLE PLACES 2016 June 29-July 1 2016 Anglet, France

The full poster can be downloaded at the following link: http://sustainable-places.eu/sp-2016/programme/poster-contributors/%ef%bb%bfimprove-skills-eeb-workers-formar/

P-4: “Performance Gap and how Built2spec project can contribute to address it” (EURECAT)

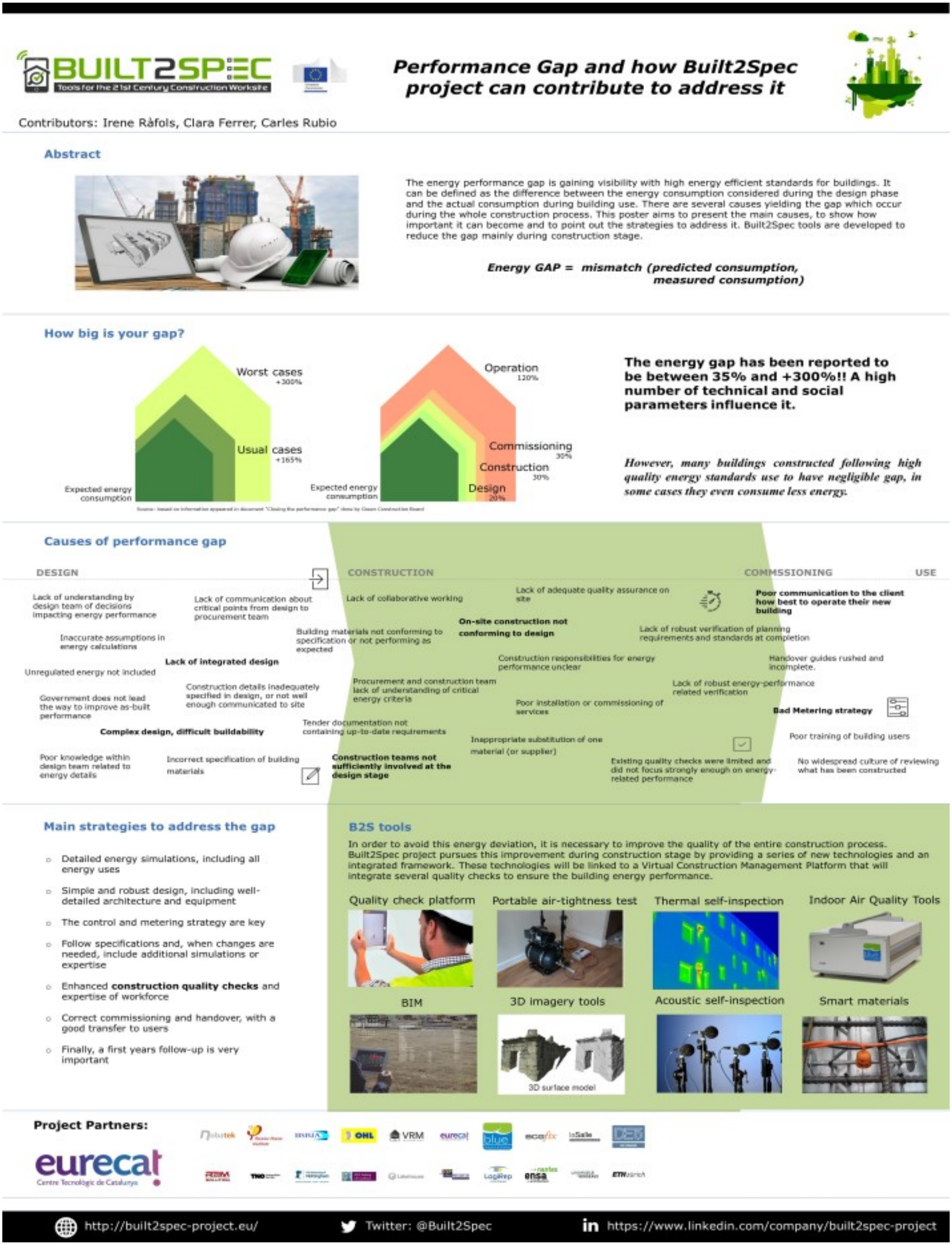
Authors

Irene Rafols, Fundació Eurecat, Spain

Master of Architecture (Universitat Politecnica de Catalunya) specialized in development of new sustainable construction products with a deep knowledge in high performance concretes, sustainable materials and façade components. I also have a strong competence in construction and refurbishment processes focusing their improvement with IT technologies (BIM, IDDS, etc). I have experience currently in H2020-EEB research projects and I contribute as inventor in three construction patents: EP2314790, EP2314789 and EP2314818

Poster Explained

Energy performance gap is arising importance. Most of professionals are not completely aware of this gap, its causes and how to address it. Built2spec project has reviewed main reliable data in Europe to point out and disseminate about this issue. In addition, it develops new tools to help reduce this energy variation when it applies to construction practices. Tools include innovative inspection techniques and friendly methodologies.



The full poster can be downloaded at the following link: http://sustainable-places.eu/sp-2016/programme/poster-contributors/performance-gap-poster-built2spec/

P-5: IMPROVE THE SKILLS OF WORKERS TO MAKE SUSTAINABLE AND ENERGY EFFICIENT BUILDING (FORMAR)

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- **Esther Rodríguez, FLC** – Fundación Laboral de la Construcción (Spain)
- **Denis Rouault, FCMB** – Fédération Compagnonnique des Métiers du Bâtiment (France)

Poster Explained

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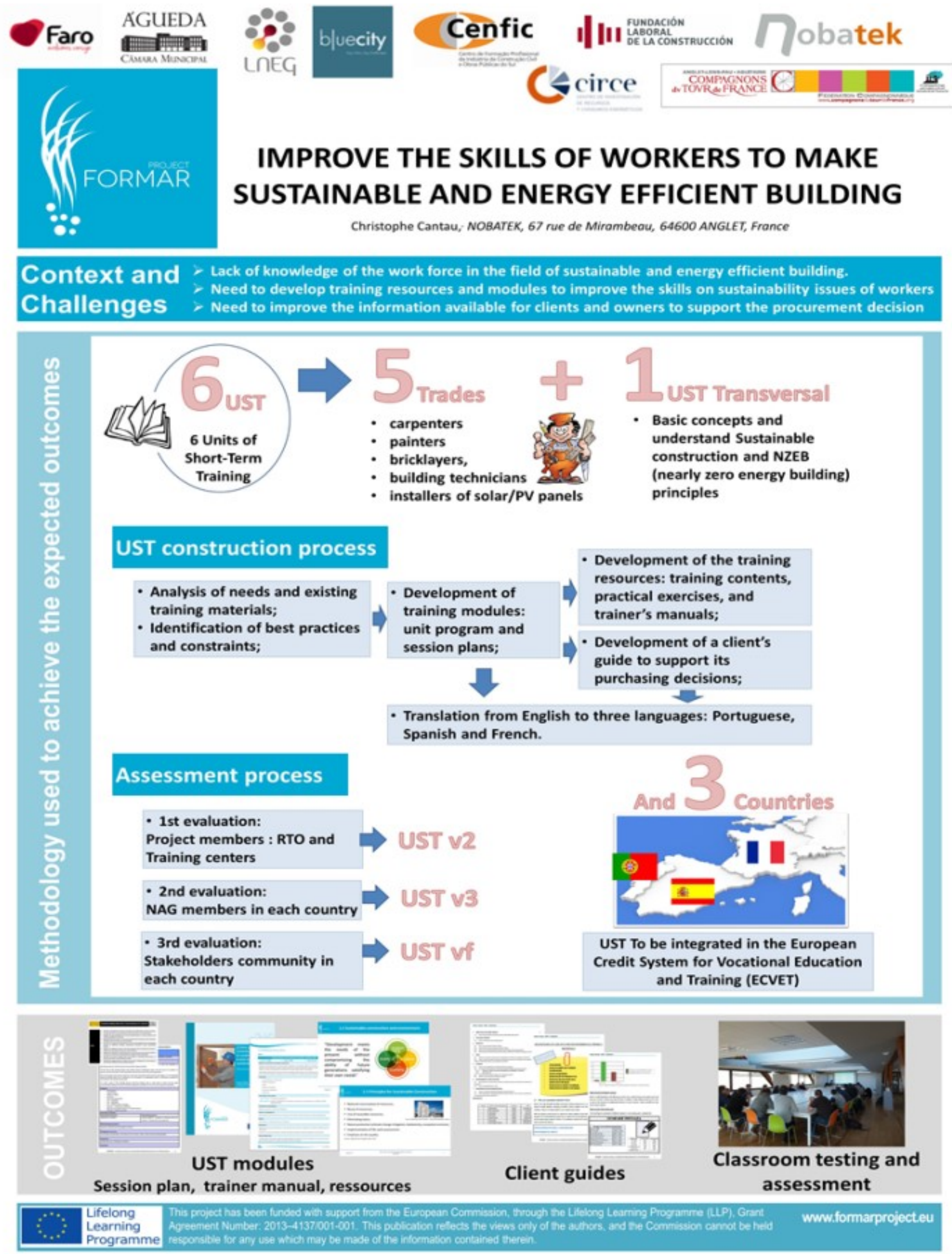

The full poster can be downloaded at the following link: http://sustainable-places.eu/sp-2016/programme/poster-contributors/%ef%bb%bfimprove-skills-eeb-workers-formar/

P-6: “Fostering public capacity to plan, finance and manage integrated urban REGeneration for sustainable energy uptake (FOSTERREG)”

Author

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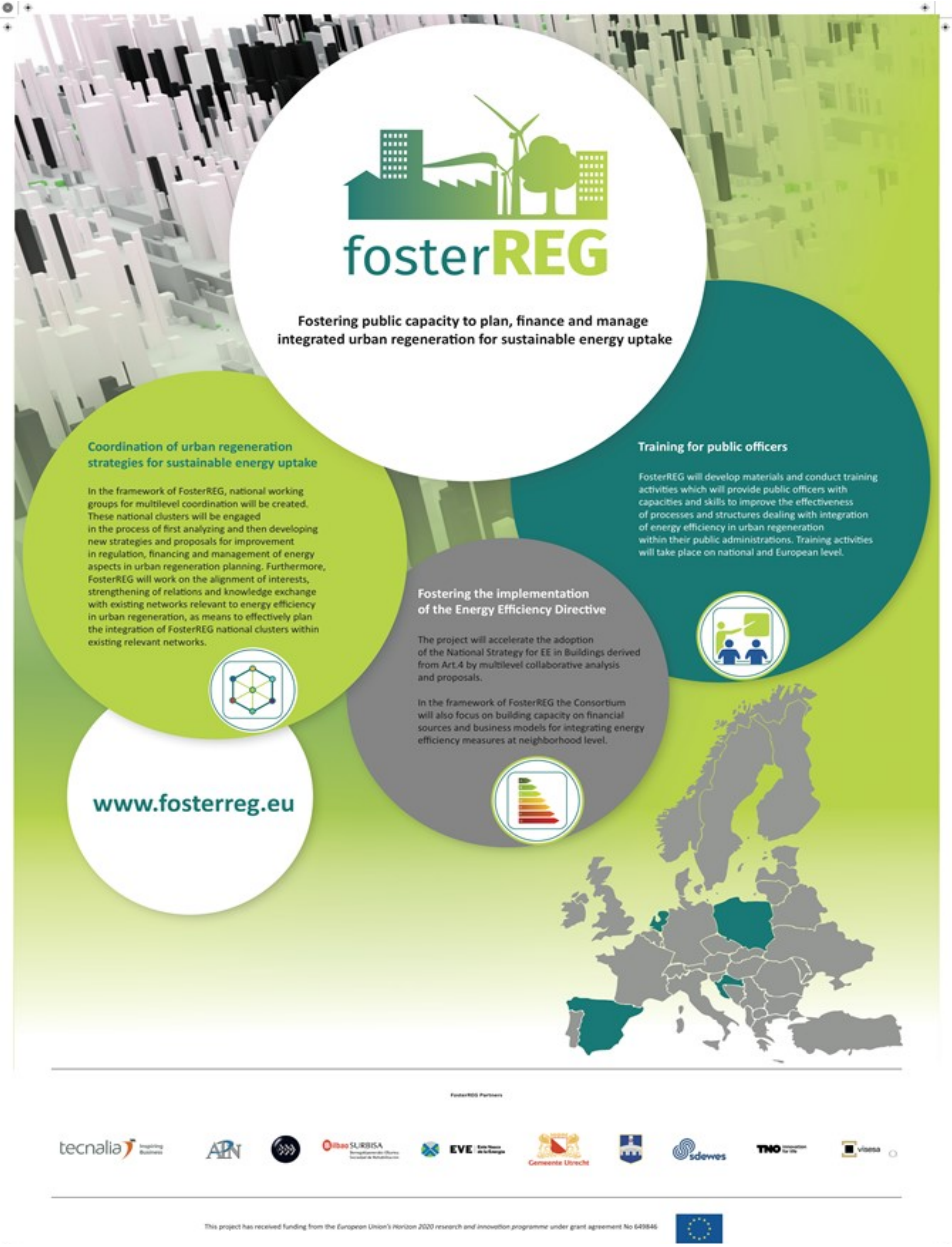
International PR Manager at ASM responsible for PR, communication & dissemination activities especially with regard to international markets. Diploma in International Relations, Mass Media & American studies, IV Certificate in Public Relations at Uniworld Business College Sydney. ASM Market Research and Analysis Centre is a Partner in HISER and BERTIM project specialised in a wide range of research and management consultancy with expertise in construction market research & analysis. ASM leads the market and exploitation tasks in the project as well as is responsible for dissemination and communication activities.

Poster Explained

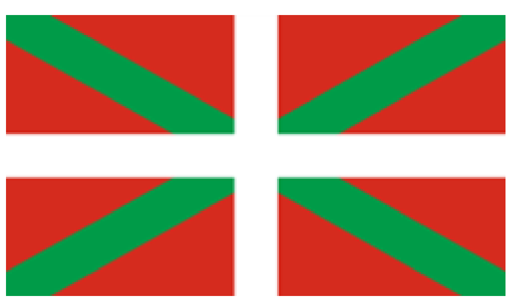
The lack of proper coordination of aspects related to regulation, financing and management of energy efficiency measures within urban regeneration initiatives, as well as the frequent misalignment of public stakeholders at different levels, are hindering the potential benefits of addressing these processes from an integrated perspective. FosterREG aims at enhancing public capacity at local, regional and national levels to plan, finance and manage integrated urban regeneration for sustainable energy uptake, through capacity building, promotion and articulation of effective multilevel coordination, and national as well as European network strengthening. These objectives will be achieved through public stakeholders’ engagement in joint analysis and knowledge development activities, as well as creation and dissemination of targeted training materials and activities across Europe.



The full poster can be downloaded at the following link: http://sustainable-places.eu/sp-2016/programme/poster-contributors/fostering-public-capacity-fosterreg/

DEMOS & PILOT SITE VISITS

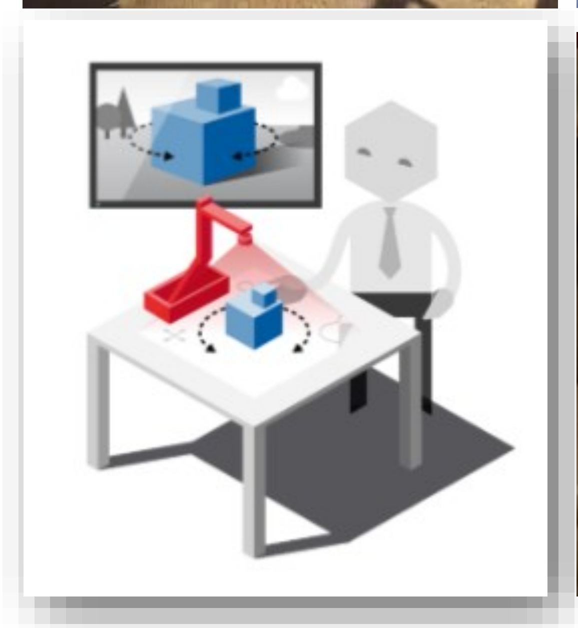
<u>Introduction</u>



Pilot Site Visit 1: Immersite tool

Demonstration of ventilated façade efficiency for achieving both energy and comfort performance. Mobile immersive tool installed in a refurbished container for supporting co-design processes of urban project.

- Easy to move, install.
- Easy to use
- Low cost technology but efficient


Pilot Site Visit 2: Office 64 headquarters

Demonstration of ventilated façade efficiency for achieving both energy and comfort performance.

Pilot Site Visit 3: Bilta Garbi headquarters

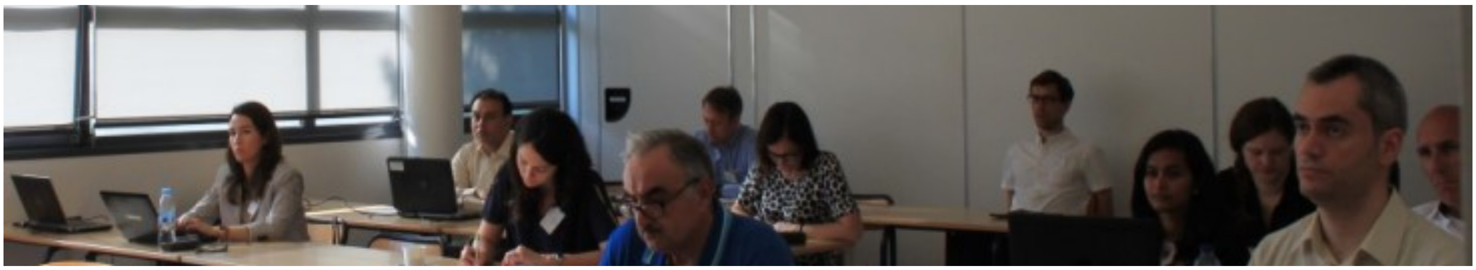
Good demonstration of circular economy principles applied to building design and construction (material reuse / design for disassembly).

Pilot Site Visit 4: ZAC de Séqué - Eco-district and large renovation project in Bayonne

Eco district in the North of Bayonne: integration/social mix/ sustainable buildings/services + First participative housing project in New Aquitaine

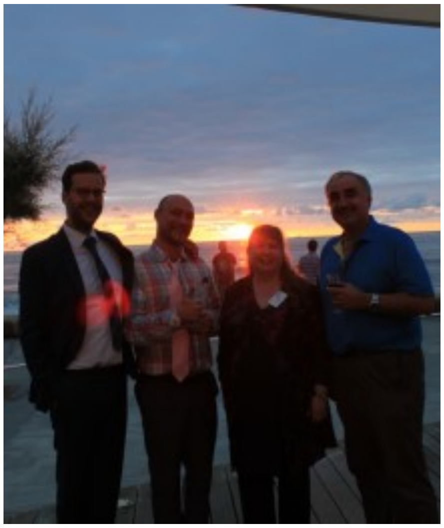




NETWORKING EVENTS

The local fare and gracious hosting of Nobatek made it easy to enjoy a the 3-day event. There were 2 networking events offered at SP'16, a gala dinner on day 1 at "space of the ocean, at the room of love" or Espace de l'Océan Anglet-Chambre d'Amour, and a farewell drink on day 2 at the "washing stage, of the Quintaou theatre, or l'Avant Scène-Théâtre Quintaou.



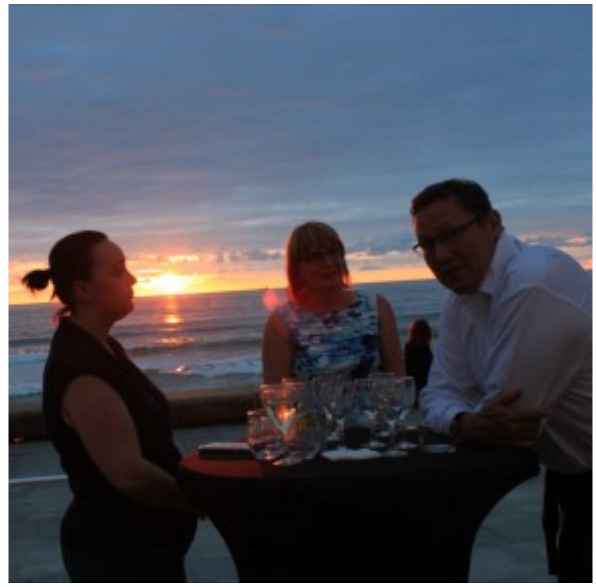
Networking event 1 — Gala Dinner

A beautiful view of the Mediterranean Sea served as the backdrop to drinks and some food after a day of science & technology!

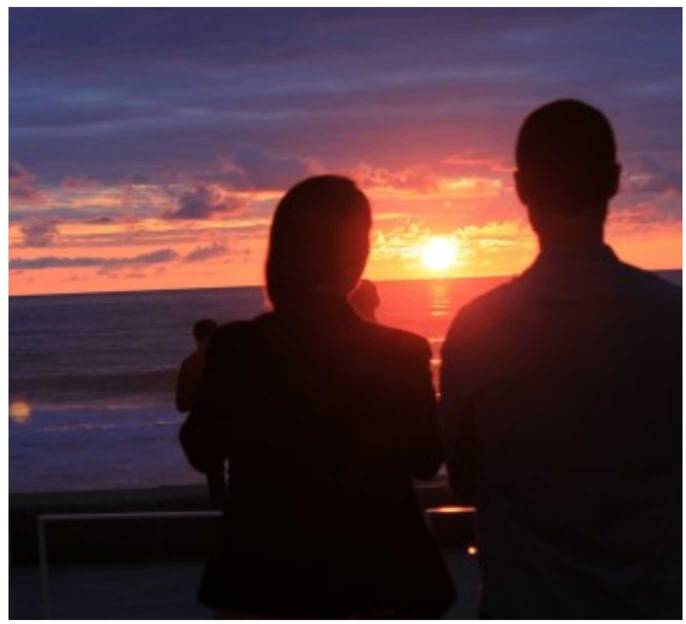
Networking event 2 — Farewell Drink

Many said farewell on the 30th June, but others prepared for what the following day had to offer...

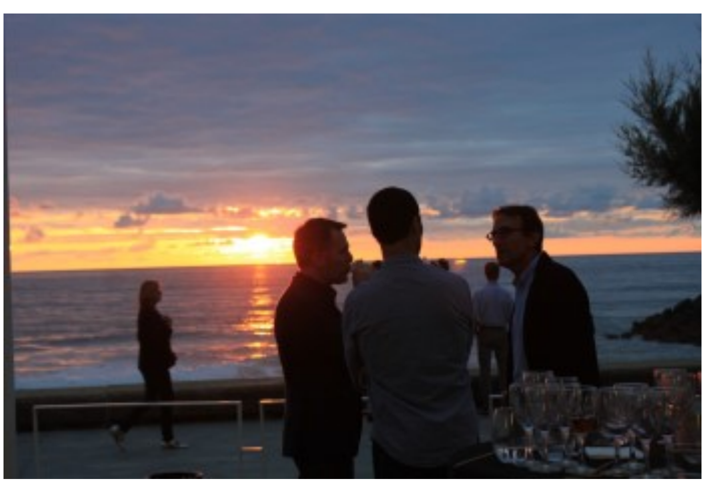
Local Basque fare served at the beautiful Nobatek facilities!



Networking is fundamental at SP:

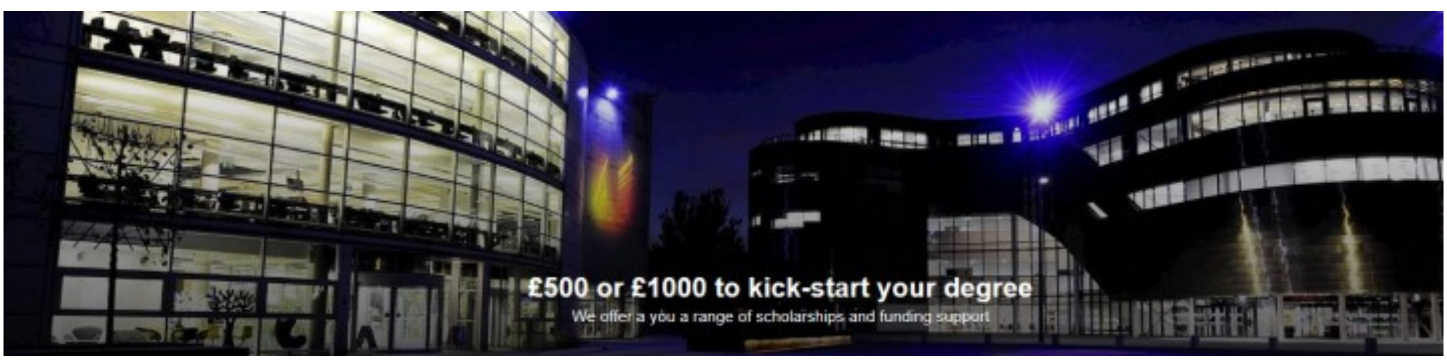


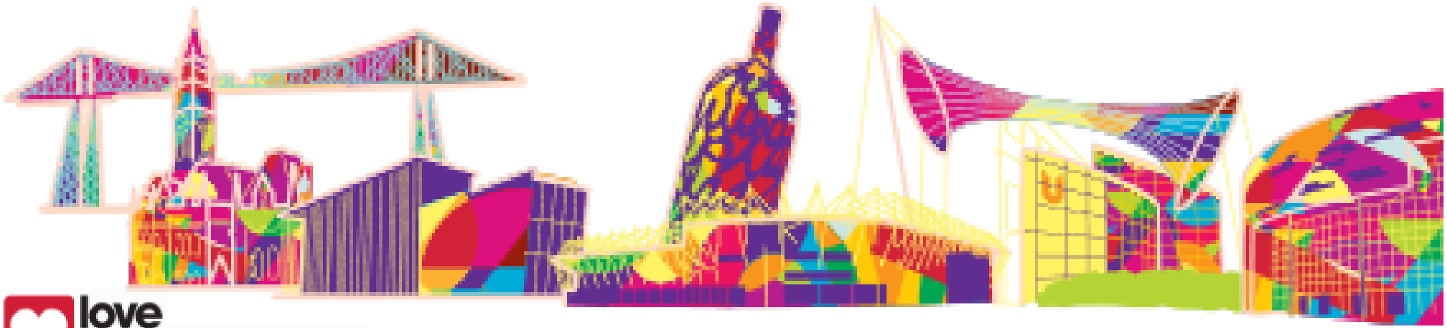
For SP’17 there will be a “WALL OF CARDS” designed to facilitate effective relationship building for attendees.



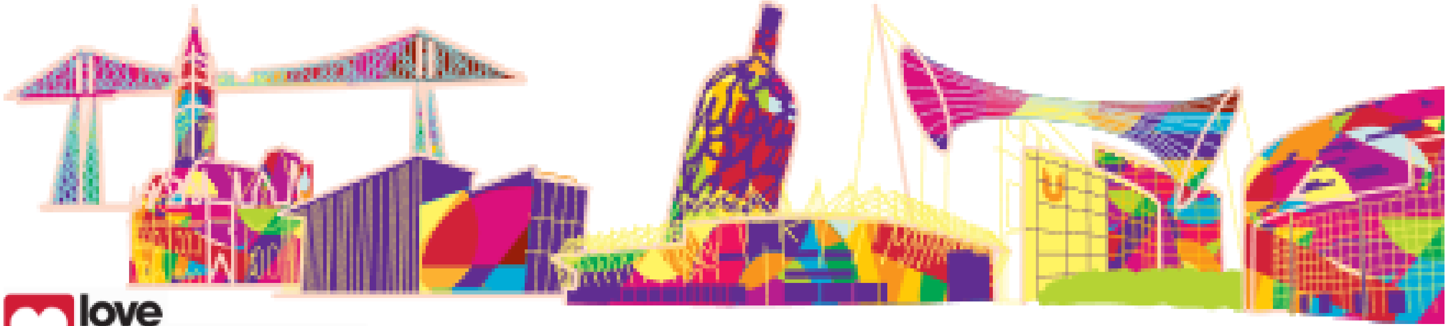
SP’17

It has been decided that SP’17 will be hosted by TEESSIDE UNIVERSITY, and the PERFORMER project will be delivering a live demonstration of project results!



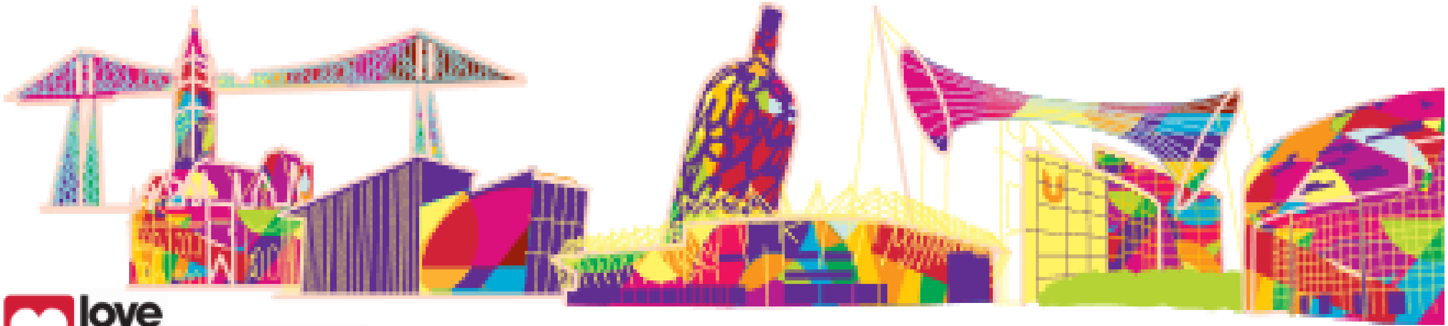


love middlesbrough



love middlesbrough

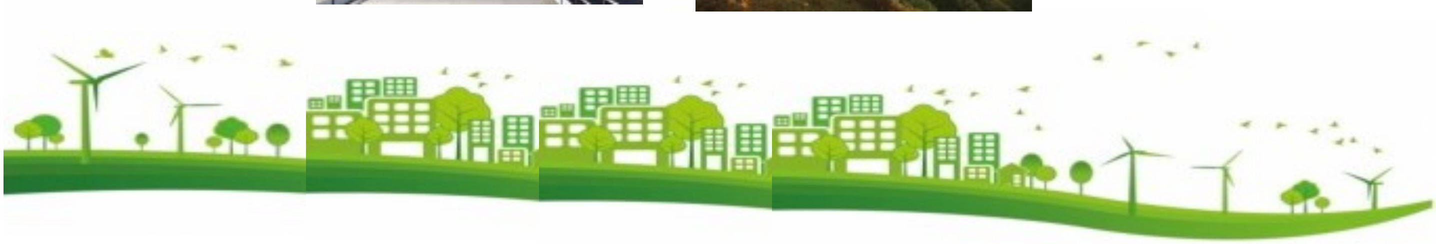
The TEESSIDE UNIVERSITY-hosted SP’17 event date and call for contributions announcement shall be published in September 2016, stay tuned...



love middlesbrough

TOP TEN TEESSIDE EXPERIENCES

1. Bungee jump from the Tees Transporter Bridge - one of only a few places in the UK you can bungee from a bridge.
2. Try some local produce at one of Teesside's many farmers' markets.
3. Have a fun day out at Saltburn - enjoy the surf, explore the Victorian pier and Penny Arcade, and ride the unique cliff lift.
4. Climb nearby Roseberry Topping for breathtaking views of Teesside.
5. Discover foods from around the world in Middlesbrough's international supermarkets.
6. Visit the Redcar Beacon, whilst eating a traditional lemon top ice cream.
7. Take afternoon tea with friends in the Olde Young Tea House, just one street away from the University.
8. Watch The Boro play at the Riverside Football Stadium - then celebrate with a parmo, Middlesbrough's signature chicken dish.
9. Experience white-water rafting or canoeing at Tees Barrage International White Water Centre.
10. Visit the nearby Gothic fishing town of Whitby, Bram Stoker's inspiration for Dracula - and try some of the best fish and chips in the UK while you are there.



SUSTAINABLE PLACES 2016

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