INTERNATIONAL CONFERENCE

SUSTAINABLE PLACES

1-3 OCTOBER 2014

NICE | FRANCE

www.sustainable-places.eu

CONFERENCE INFORMATION BOOKLET

Foreword

On behalf of the Organizing Committee, we would like to welcome you to the 2nd Sustainable Places International Conference in the city of Nice, France.

This second iteration is an original initiative from the Resilient and Performer FP7 European projects consortiums, and is organized as part of the projects, with the aim to generate a successful, sustainable and world-class series of annual conferences.
The objectives of the conference are to bring together scientists, researchers, and engineers, from research institutes and the industry, around one of the greatest challenge that our societies have ever faced: ensuring long-term environmental sustainability of ever-growing, densifying urban areas, in a resource-constrained world.

The recognition of this challenge has been quick and has generated numerous initiatives worldwide these last years. Specifically in Europe, this awareness has translated into a considerable creation of political and financial incentives and regulations to guide the transition towards more sustainable, energy-efficient practices.

In this respect, the Architecture, Engineering and Construction (AEC) economic sector, with an acknowledged impact of 40 % of total EU energy consumption and 36% of Green-House Gases emission, is considered as a strategic target. The recast of the European Public Building Directive (EPBD), which requires all EU countries to shift towards new and retrofitted nearly-zero energy buildings by 2020, or the Energy-efficient Building (EeB) Public-Private-Partnership (PPP) set up by the European Commission in the frame of the 7th Framework Program, and pursued in the scope of H2020, both impressively illustrate the willingness of the European Authorities to stimulate this transition to sustainability.

It is the belief of the organizers and of the program committee that we, as members of the industry and academic research community, are among the key players of this European-wide effort. For this effort to be successful, we need to act collectively, being aware of each other's goals and achievements. The Sustainable Places conference is an attempt to support this collective awareness and – hopefully – one further step towards an EU-wide integrated research effort on cities & their Regions' sustainability.

It is the intent of the organizing committee to bring each year a new batch of key topics. In setting up this second edition, we wanted to foster networking and clustering among the projects funded in the frame of the FP7 EeB PPP. We also wanted to widen our thematic scope. The focus on how Information and Communications Technology (ICT) is revolutionizing sustainability and on how ICT complements the improvements brought by the other research domains (energy, materials, methods and practices, etc) is still at the core of the conference. But with the inclusion this year of the EIA (Architecture, City, and Information Design) conference, we also tried to better take in consideration the societal dimension of sustainability.

The conference program is quite dense, with several thematic sessions – opening session, innovative business models, innovative technologies & modeling, two technical focus sessions, closing session – , several workshops – the 2nd edition of the Key Performances Indicators (KPI) workshop organized under the auspices of the European Commission (DG Connect), clustering workshops –, and a co-located conference (EIA14). The challenge was to deal with a broad spectrum of topics (methodologies, data models, software tools, societal challenges), to consider different scales (building, district), and to highlight both theoretical and field results. We hope this program includes topics of interest for each and every conference attendee.

Before closing this foreword, the organizers would like to warmly thank the event sponsors Nice Côte d'Azur Metropolis and Delta Dore, and the European Commission Directorate-General for Research & Innovation and Directorate-General for Communications Networks, Content and Technology, for their kind support. We would also like to thank the initiator of the EeB KPI workshops, namely M. Rogelio Segovia (DG CONNECT), for having given us the opportunity to organize the second edition of the EeB KPI workshop in the scope of the conference. We also express our warm thanks to the Energy Efficient Buildings Association, and to Dr. Luc Bourdeau, its Secretary General, for their help.

And – last but not least - thank you for your participation. We hope you will have an enjoyable and stimulating event.

Sincerely,

Holy Andrianantenaina, Régis Decorme, Sylvain Robert & Zia Lennard -
SP'14 Organizing Committee

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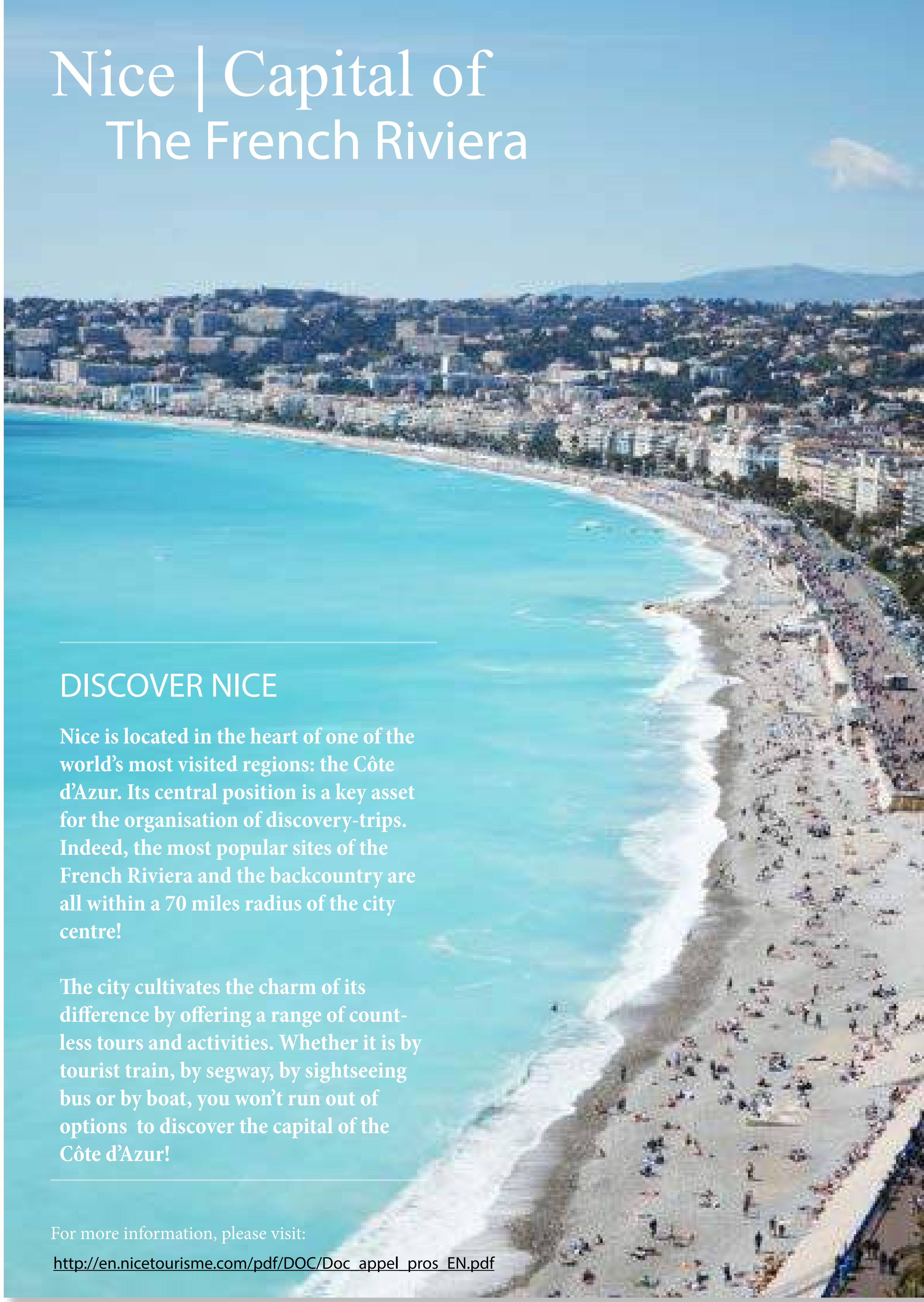
WELCOME TO NICE

Nice | Capital of The French Riviera



DISCOVER NICE

Nice is located in the heart of one of the world's most visited regions: the Côte d'Azur. Its central position is a key asset for the organisation of discovery-trips. Indeed, the most popular sites of the French Riviera and the backcountry are all within a 70 miles radius of the city centre!

The city cultivates the charm of its difference by offering a range of countless tours and activities. Whether it is by tourist train, by segway, by sightseeing bus or by boat, you won't run out of options to discover the capital of the Côte d'Azur!

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http://en.nicetourisme.com/pdf/DOC/Doc_appel_pros_EN.pdf

International Conference: Sustainable Places

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Tracey Crosbie, Teesside University
Yasmine Assef, EMBIX


SUSTAINABLE PLACES 2014

WEDNESDAY, OCTOBER 1

08:00 Registration

OPENING SESSION

INNOVATIVE BUSINESS MODELS - THEMATIC SESSION

INNOVATIVE TECHNOLOGIES & MODELLING - THEMATIC SESSION

TECHNICAL ROOMS 1

TECHNICAL ROOMS 2

WEDNESDAY, OCTOBER 1 (continued)

THURSDAY, OCTOBER 2

EUROPEAN EEB PROJECT CLUSTERING (PRIVATE)

ENERGY POSITIVE DISTRICTS / SMART CITIES WORKSHOP

EVALUATION FRAMEWORK WORKSHOP

DATA MODELS TUTORIAL

CLOSING SESSION

FRIDAY, OCTOBER 3

Keynote Speakers

Carole Le Gall

Managing Director

CSTB

http://ow.ly/D0TSA

Didier Vanden Abeele

Deputy Director

CEA List

http://ow.ly/D0U8z

Christian Tordo

Municipal Delegate

City of Nice

http://ow.ly/D0UtX

Christian Wetzel

CEO

CalCon

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Marta Fernandez

Associate Director

ARUP

http://ow.ly/D0UVf

SUSTAINABLE PLACES 2014

October 1-3, 2014
Nice, France

Innovative Business Models

Chaired by Anna Perehinec, GDF Suez
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Abstracts

Smart control of multiple energy commodities on district scale

Innovation

Simultaneous control of electricity and heat to match supply and demand on district scale using demand side management and energy storage, aiming to maximise the use of locally generated renewable energy.

Authors

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Frans Koene is a Senior Research Scientist and Project Manager at TNO. He holds a Master's degree in Physics from the Technical University of Eindhoven. Having worked on renewable energy in the built environment for over 15 years, he has acquired a broad knowledge of monitoring, modelling and analysis techniques. As a project manager Frans is coordinating several larger EU-projects, e,g. the E-hub and Proficient projects. In addition, Frans has managed numerous national and international projects such as the 'Huis vol energie' brochure on energy neutral dwellings and the Building Future 2 project focussing on behavioural models for tenants, bridging the gap between modelled and actual energy consumption.

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Paul Booij received the M.Sc. degree (with honours) in Electrical Engineering from Eindhoven University of Technology, Eindhoven, The Netherlands in 2009. He now works as research scientist at TNO, in Delft and The Hague, The Netherlands. Current activities focus on applied research in distributed control. Applications include modelling, estimation and control of three dimensional fluid dynamics, e.g. climate distributions in greenhouses and factories, as well as modelling and control of smart energy networks, including electricity, heat and gas networks.

Abstract

To achieve low energy or even energy neutral districts, the share of on-site renewable energy needs to increase drastically over present levels. However, a complicating factor is the fluctuating character of the energy supply from a wind turbine or a PV (Photo Voltaic) field. As a result, most of the time the supply from renewable sources will be either too large or too small to cover the momentary energy demand. The mismatch between supply and demand plays on hourly level but also on seasonal level and it plays for heat as well as for electricity.

The mismatch may be solved by a combination of thermal and electrical storage, and intelligent control of equipment. The latter may entail time shifting the operation of smart white goods, smart electrical hot water heaters and even smart heat pumps as long as the desired time frame or desired temperature ranges are respected.

A smart energy control system called the Multi Commodity Matcher (MCM) was developed to match supply and demand of electricity and heat simultaneously on district level. The MCM is an extension of the Powermatcher, using agent based technology, and inheriting the Powermatcher's advantages of scalability and user autonomy.

To assess the benefits of the MCM on district scale, a simulation platform was made in the Matlab © programming language. The platform includes models of heat and electricity generating and storage equipment, an electricity grid, a heating network and aggregated models of the buildings in the district.

A number of districts were simulated using the simulation platform with the MCM: Tweewaters, Leuven (Belgium), Dalian (China), Houthavens, Amsterdam (The Netherlands), Weingarten, Freiburg (Germany) and Alzano Lombardo, Bergamo (Italy). For each district, three scenarios were simulated:

1) Reference or Business As Usual scenario
In the reference scenario the energy demand of the district is met with conventional sources, i.e. electricity is taken from the public grid and heat is produced by de-central gas fired boilers.

2) RES (Renewable Energy Sources) scenario with fixed energy demand
In the RES scenario, heat and electricity are (partly) produced with renewables, such as Photo Voltaic panels or a central biomass fired CHP. In this scenario there is no supply-side flexibility (i.e. no thermal energy storage) and no demand-side flexibility (i.e. no smart appliances).

3) Smart scenario or RES scenario with flexible energy demand and supply
In this scenario, renewable energy sources are used (as in second scenario). In addition, demand-side and supply-side flexibilities are used to optimize a given business objective. This involves maximizing the profit for the Balancing Responsible Party based on the day-ahead electricity price, while respecting the heat demand of the heat consumers in the district.

The results of the three scenarios are expressed in KPI's on energy, economy and ecology. These results and their analysis will be the core of this paper.

Business models to underpin the development of energy positive neighbourhoods

Innovation

The basic innovation underlying the proposed paper is the idea that it is possible to measure the energy efficiency of existing housing stock using freely available open access data. The potential cost and time benefits arising from following such an approach are very considerable and so this approach should be studied in more detail and appropriate KPIs developed. An example referencing the UK is given.

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Dr Tracey Crosbie 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 transdisciplinary 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 is currently a WP leader in two ongoing EU FP7 projects. IDEAS- Intelligent Neighbourhood Energy Allocation & Supervision" and SEMANCO - Semantic Tools for Carbon Reduction in Urban Planning.

Abstract

Energy Positive Neighbourhoods (EPNs) are those in which the annual energy demand is lower than energy supply from local renewable energy sources. The concept underpinning the notion of an EPN, is not only to encourage distributed renewable energy generation (DREG) but also to reduce overload problems related to DREG and transmission networks by encouraging the local consumption of electricity produced from renewable energy sources. To realise an EPN it will be necessary to encourage a new type of service provider that offer services to support Demand Side Management (DSM), Supply Side Management (SSM), investment in renewable energy production and storage, local energy distribution and careful consideration of future design options for the urban environment. We have called this new type of service provider an Energy Positive Neighbourhood Service Supplier (EPNSP). The research presented details two business models for different types of EPNSPs elements of which will be tested at two demonstration sites one of which is in France and the other is in Finland. It must be noted that currently there are regulatory and financial barriers to the implementation of both the business models presented. Therefore this research also identifies these in the case of each of the business models and discusses which elements of the business models will be demonstrated at the pilot sites either by simulation or actual implementation.

The work presented is part of the IDEAS Collaborative Project (Grant Agreement No. 600071) which co-funded by the European Commission, Information Society and Media Directorate-General, under the Seventh Framework Programme (FP7), Cooperation theme three, "Information and Communication Technologies'

Energy saving performance contracts: public lighting versus building

Innovation

Integrated solutions are not dominant in construction. Energy saving performance contracts contribute to their development. The aim is to explore the conditions that could lead to the development and the success of ESPC.

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Frédéric Bougrain is a researcher at CSTB. He works on issues such as energy saving performance contracts, innovation in the construction industry and public private partnerships.

Abstract

As in other sectors construction firms are modifying their business model. They are moving into new kinds of value-added activities and are becoming providers of integrated solutions.

Integrated solutions are not dominant in construction which is frequently characterised by the separation between design, construction and operation activities. However, the development of new procurement process such as Public Private Partnerships (PPP) has contributed to the development of such solutions. PPP is a shift from conventional procurement process. Under this scheme, design, build, finance and operation are transferred to a private consortium. It is a way to deliver integrated solutions to public authorities who are more and more demanding for packaged product and service delivery.

The private consortium in charge of the contract is supposed to have an interest in minimizing the whole life cost. Thus, by taking appropriate decision at the design, construction and operation stages the private consortium in charge of the project should bring its contribution to national energy policies aiming at reduce energy consumption in buildings and greenhouse gas emissions. Among French PPP projects, energy saving performance contracts (ESPC) represent a high percentage.

The European Parliament (2006) defined ESPC as "a contractual arrangement between the beneficiary and the provider (normally an ESCO) of an energy efficiency improvement measure, where investments in that measure are paid for in relation to a contractually agreed level of energy efficiency improvement."

The aim of this presentation is to present two cases of ESPC: the first will concern public lighting and the second buildings. It will examine the ability of private consortia and public authorities to develop together solutions that reduce energy consumptions and the performance of these contracts. The results will show that ESPC dealing with public lighting are less complex and risky than projects concerning buildings, and less subjects to the influence of unexpected behaviors coming from the users.

District energy flow optimization taking into account building flexibilities

Innovation

The proposed solution tackles the energy flow optimization at district level through a holistic approach. Production, consumption and flexibility of each player are taken into account in an optimization approach, at the opposite of the standard silo approach.

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Emmanuel ONILLON (M), 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.

Abstract

As of today, cities represent more than 80% of the CO_2 emission and it is expected that the percentage of the worldwide population living in cities will grow from 50% today to 70% by 2050. At the same time, the foreseeable increase in the energy consumption of a household is of 40% by 2040.

To limit the impact of these phenomena on both the energy costs, the grid security and the environment requires from energy management systems to take advantage of each component flexibility; whether they be consummers or producers. To achieve the best results and highest savings, the district has to be considered as a whole. Therefore, a holistic approach needs to be envisaged, starting at building levels proceeding to extend at a district level, and taking into account the key district players. After an introduction of the energy dilemma at district level, this paper presents several energy flow optimizations developed in parallel in the AMBASSADOR and RESILIENT projects. Ambassador relies on a central optimization and Resilient on a distributed one.

Ambassador development allows both explicit and implicit approaches: In case of the implicit approaches, each subsystem optimizes its consumption or production taking into account virtual tariffs calculated by the global optimization. In return, the subsystem sends back its predicted consumption or production. A negotiation loop takes place until an agreement was established between the subsystems and the optimization. In case of the explicit approach, each subsystem exposes its flexibility (i.e state of charge of a battery), consumption and production forecast. In return, the central optimization minimizes a criteria favoring usage of renewable energy, using the exposed flexibility as a main leverage. Resilient proposal stands on the hypotheses that the various actors of a district are not always willing to share their private information, and that a distributed optimization mechanism may be more flexible when the managed district reaches a significant size.

Resilient approach thus relies on a multiagent architecture where the optimization at the scale of the district is the result of a negotiation operated between the district components, each one taking into account its own constraints and objectives. After describing these optimization approaches, a preliminary comparison is performed (in terms of communication volume, scalability, flexibility, performances) and synergies are discussed. Possible associated business models are presented. Test results are foreseen to be obtained during the year 2015.

Performance KPI for flexible business modeling

Innovation

The proposed solution formulates 'generic' Performance Indicators which could be easily and efficiently tailored to the needs of different stakeholders and business models. For the categorisation of raw data the solution uses a sub-set of dimensional data originating from a standardised, internationally recognised meta-data model (IFC4). Thus, the effort to compile and analyse performance data is dramatically reduced. The performance evaluation framework is holistic, covering comfort, consumption, systems' operation, and sustainability. Furthermore, it covers buildings and energy supply networks.

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Professor Menzel was appointed Chair of Information Technology in Architecture, Engineering, and Construction at University College Cork, Ireland in 2006. He joined the IRUSE research group in 2007. From 2007 to 2013 he coordinated the Strategic Research Cluster (SRC) ITOBO (Information Technology for Optimised Building Operation) funded by Science Foundation Ireland. Currently, he coordinates the EU-FP7 project CAMPUS21 with partners from Austria, Germany, Ireland, The Netherlands, and Spain. He has published more than 100 papers in Journals, Conference Proceedings or books. Before his appointment at UCC (1991 to 2005) Professor Menzel worked for Universities in Germany and the USA. He participated in numerous European and national research projects.

Abstract

The Informatics research Unit for Sustainable Engineering at University College Cork, Ireland (IRUSE@UCC) in collaboration with their research partners of the EU-FP7 projects CAMPUS21 and BaaS as well as the SFI-SRC ITOBO has developed a holistic framework for building performance monitoring and evaluation. The emphasis of our current work is the demonstration of the reliability of such an evaluation framework that is based on two major IT-pillars, (1) Data Warehouse based performance analysis tools and (2) a holistic performance evaluation metrics.

Bulk data compiled from monitoring devices is stored as fact data in a Data Warehouse. For analysis purposes it is combined with dimensional data compiled from openBIM systems. It was found that the meta-data model developed in IFC4 provides a very robust, flexible and scalable modelling framework. We have extensively explored the modelling principle of 'objectified relationships' and exploit these for the specification of the dimensional hierarchies modelled in the Data Warehouse, namely the "Spatial Dimension", the "Systemic Dimension" and the "Organisation Dimension".

The evaluation metrics covers the following parts (i) Comfort Analysis, (ii) Consumption Analysis, (iii) Systems Performance Analysis, (iv) Sustainability Analysis.
The comfort analysis uses sensed data and evaluates if the comfort parameters of Spatial Structure Elements (rooms, floors, buildings, sites) satisfy the legal and technical constraints. Those KPI can be calculated for different sets of Spatial Structure Elements, such as rooms occupied by one tenant, buildings managed by one operator etc.

The Consumption Analysis uses metered data in combination with feedback signals from actuators and sensors (to model 'virtual meters'). It allows to evaluate the energy consumption on building, system or in some cases even on component level.

The Systems' Performance Analysis is based on a set of KPI analyzing feedback signals from actuators such as pumps, valves or magnetic sensors at doors and windows. The developed KPI are used to analyze if systems and subsystems are operated holistically and in an integrated way. The primary element is a "load combination matrix", i.e. KPI indicate to what degree subsystems are operated simultaneously.

Finally, the Sustainability Analysis is based on KPI evaluating the Financial and Environmental Performance. Currently, we calculate energy prices and CO2-Emmissions. More sophisticated KPI addressing the evaluation of "Total Cost of Ownership" are under development. These aim to analyze maintenance records, etc.

Parts of the above methodology were implemented under the umbrella of the EU-FP7 projects CAMPUS21 and BaaS. Monitoring data and BIM models of six different buildings and a district heating network powered by two CHP-units with 1MW of capacity for each unit were available for tests. The most holistic demonstration scenario has been set up on the campus of UCC, using the district heating network with its buildings and the CHP-units. Other buildings for demonstration are a Sports Arena in Germany, University and School buildings in Greece, Ireland and Spain, and research facilities in Germany and Spain.

For all demonstration buildings we performed a Gap Analysis of the existing business models, reaching from (i) the classical Owner-Operator Model" to (ii) various outsourcing models, and even (iii) joint ventures with public authorities. For our gap analysis we followed a business modelling approach published by Osterwalder.

FC-DISTRICT: Evaluation of energy saving potentials for districts served by distributed micro-cogeneration units

Innovation

Innovative energy management concept for districts.

Author

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Maria Founti is Professor at the School of Mechanical Engineering of the National Technical University of Athens, Greece, and Director of the Laboratory of Heterogeneous Mixtures and Combustion Systems. Her research fields include heterogeneous mixtures, spray and combustion systems, fire engineering and compartment fires, advanced energy production (fuel cells) and storage (Phase Change Materials) technologies, energy efficiency in buildings and industry, thermo-chemical characteristics of building components, multi-criteria assessment integrated with Life Cycle Analysis. She has 200 publications in International Journals and Conferences and has supervised more than 50 M.Sc. and Ph.D. theses. She has organized and managed more than 25 E.C. and national funded projects. She has acted as external expert for project and Framework Programme monitoring (DG RTD and TREN). She has been a member of the External Advisory Group (1998-2002) of FP5 - KA1 «Innovative products, processes and organisation» and chairperson of the Advisory Group of Priority 3 – NMP for FP6 (2002 -2006). She is member of the organizing committee of the "Greek Construction Technology Platform", member of the European Construction Technology Platform and of the Public Private Partnership in Energy Efficiency in Buildings.

Abstract

Achieving sustainable development in the energy sector in general and in building energy consumption in particular, requires the reduction of non-renewable primary energy input and greenhouse gas emissions. One possible developmental path is decentralization of the electricity system. The paper presents the results of the FP7 FC-DISTRICT project (New m-CHP network technologies for energy efficient and sustainable districts). It focuses on an energy balance study for an innovative energy management concept for districts.

According to this concept, the buildings in a district are interconnected by thermal and electric micro-grids. Heat and power are produced within district limits by a "swarm" of centrally controlled micro-CHP systems. The balance between district energy production and demand is maintained by power imports/exports to the central grid and appropriate back-up boilers.

The performance of the "micro-CHP" case (gas boilers and SOFC units/back-up gas boilers) is compared to a conventional "Reference" case (individual gas boiler per building). In order to acquire realistic energy (heat) balance data, a detailed energy demand and supply simulation at district level has been performed on an hourly basis. Two district types have been considered: Residential (including Single Family Houses - SFHs) and Financial Center (including office buildings and hotels). Each district features a different heat demand profile: The residential load fluctuates intensively, while the financial district features a smoother heat load profile, with heat demand even in summer months and with a higher total thermal energy demand.

The in-house developed, Matlab based, DEPOSIT software has been utilized in the present work. The importance of heat-led control is shown, especially under fluctuating demand. A clear Primary Energy Consumption (PEC) reduction potential has been identified for all cases examined, ranging from 6% up to 35%.

Innovative Technologies and Modeling

Chaired by Zia Lennard, CSTB

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Abstracts

Towards an optimal energy network topology by applying the cross-entropy method

Innovation

A generic method has been applied to determine the optimal layout of energy networks with different carriers. This streamlines the optimization of future energy networks in which interaction is key.

Author

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Wiet Mazairac is working on his PhD on the optimization of hybrid energynetworks after completing the master Design and Decision Support Systems at the Eindhoven Technical University.

Abstract

During the last decades awareness regarding the problems related to the future of our energy supply increased significantly. E.g. changing relations between countries threaten a secure and constant supply of energy towards those countries not able to meet their own energy demand. The melting of the ice caps due to global warming and the resulting sea level rise can be attributed to the increased amount of fossil fuels in the last few decades. To cope with these problems a transition from fossil fuels towards renewable energy sources is required. Although this process is ongoing, the current energy networks are not suited to support mass integration of distributed renewable energy sources. Nor has the current energy distribution system the possibility to cope with unexpected fluctuations in the supply of energy.

In this presentation we will illustrate the ongoing development of an algorithm which can eventually determine the optimal layout of an energy distribution network that can handle mass integration of renewable energy sources and can cope with fluctuations in the supply of energy. Coping with these fluctuations requires the topology optimization of all different energy networks and their possible interaction. Therefore the fundamentals of the optimization algorithm can be applied to different energy carriers. By altering the boundary conditions it can be applied to a network with an arbitrary carrier. Those details involve the calculations required to determine the flow or current and involve the calculations required to determine the operating and investment costs. This method uses path finding algorithms in combination with thermal energy flow models. The first, when applied to the pipelines in the district thermal network, help maximizing the number of connected consumers, while the latter help minimize e.g. energy losses. Different optimization algorithms have been applied, e.g. the genetic algorithm, simulated annealing and the cross-entropy method. The advantages and disadvantages of each method will be explained. In the near future, with the application of the presented approach, energy networks can cope with current and future problems, while being constructed against optimized investment and operating costs.

Data mining for building energy management

Innovation

Our paper summarizes the most relevant contributions in the last years in the innovative area of energy data mining, both from the academic and the industrial perspectives, and puts them in the context of the current requirements and needs of building energy managers. We put emphasis on promising approaches that are expected to drive the forthcoming advances in research and development, thus offering a wider analysis and, more interestingly, some recommendations and guidelines for the future.

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Miguel Molina holds a PhD in Computer Science. He is currently member of the Department of Computer Science and Artificial Intelligence of University of Granada, working as postdoc researcher on the FP7 EnergyInTime project. His ongoing research lines are Data and Knowledge Representation and Information Retrieval in the fields of Music and Energy Efficiency.

Abstract

Nowadays there is a wide consensus on the impact of human activities to global warming and climate change. A significant contribution to these threats is due to the emissions produced by the generation processes of the energy needed for operating buildings' lighting and HVAC (heat, ventilation and air-conditioning) systems. Inefficient energy management in aging buildings combined with the increase of construction activities in developing countries indicates that this problem will get worse in the near future. Besides, the rising energy costs in the current economical context calls for more efficient strategies to reduce energy consumption.

The main goal of sustainable buildings is to optimize energy generation, transport, and use in accordance with the users' actual energy needs. This requires collecting data to characterize the building operational context and the users' behavior, and interpreting the information to implement adapted energy management policies. Data may come from several heterogeneous sources ranging from in-site sensors (machines, ambience, etc.) to external relevant parameters (weather, energy costs, etc.)

Not surprisingly, energy data exploitation has been an important issue for energy companies in the last decade. Notable efforts have been done in this direction in the data mining research area. Data mining aims at the automatic discovery of underlying non-trivial knowledge from datasets. In building energy management, data mining techniques are being applied to address problems such as analyzing equipment state and failures to optimize maintenance costs, predicting the energetic demand to adapt the production and the distribution, and finding patterns of energy consumption to create customized commercial offers and to detect fraud.

In the near future, we can expect that this trend will be even more important. Big Data technologies will leverage the capabilities of data mining, since they allow the exploitation of even larger volumes of data. Being able to take the most of energy data that companies have (or could have) available will certainly make a difference in the ultra-competitive energy-related industries, not to mention the reduction of the environmental footprint of buildings. For these reasons, the European Union has expressed its interest in the areas of data analysis and energy efficiency in the Horizon2020 programme.

In our contribution to Sustainable Place 2014, we describe the fundamentals of energy data mining and how the associated techniques have been applied to different energy management problems. We also discuss how we envision the future trends in energy data exploitation, and particularly how the advent of Big Data can change the current state of affairs.

Innovation

At present, different energy distribution grids (electricity, heating/cooling, gas) still mainly operate independently and do not make use of synergies between them. Although interactions and synergies are increasingly apparent, they neither have been comprehensively analysed nor implemented in practise. The OrPHEuS will provide a strong contribution in investigating and optimising the synergies among energy grids in cities. The technology innovation of the proposed OrPHEuS project is related to the provisioning of a cross-domain multi-utility energy management system targeting increase of efficiency for renewable energy integration and minimizing the overall energy demand and CO2 footprint of cities by exploitation of a higher level of ICT in all energy systems.

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Silvia Caneva holds a Master of Science in Environmental Engineering and a post graduate diploma in Energy Resource Management. From 2004 to 2007 she was a researcher at the R&D Centre of the Italian utility Edison in the field of electricity generation from renewable energy sources. She has been working since 2008 with WIP as project manager concerning projects mainly for European Commission in the field of integration of renewable energy systems in buildings and into the electrical grids. She is involved in the coordinator of the Smart Build and of the OrPHEus project, which are respectively related to the development of ICT concepts for the integration of the renewable energy systems in building and into the electrical grid and also to energy business models.

Ingrid Weiss

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Abstract

The OrPHEuS project elaborates hybrid energy network control strategies for smart cities implementing novel cooperative local grid and inter grid control strategies for the optimal interactions between multiple energy grids. The OrPHEuS project aims at optimising the synergies between multiple energy grids by enabling simultaneous optimization for individual response requirements, energy efficiencies and energy savings as well as coupled operational, economic and social impacts.

The project investigates the implementation of the control strategies on specific use cases scenario in two demonstration sites located in the City of Skellefteå in Sweden and in the City of Ulm in Germany. The operational focus of the project is the cross-domain coupling of energy infrastructures in order to increase energy efficiency through energy transformation and grid coupling. In particular, the project researches scenarios for transition between energy resources and flexible infrastructures e.g. along Power-to-Heat processes. In particular, balancing of fluctuating renewable energy generation against the flexibility in supply, demand and storage capacities within the power grid and via process coupling across energy networks will be investigated. The project will look on technical as well as socio-economical aspects considered as multi-dimensional strategy framework.

With respect to the hybrid energy characteristics, both demonstration sites are quite distinct. At the Sweden demonstration site, the reduction of vertical production (driven unsustainable with fossil fuel) is in the centre of the targeted control strategies. Looking on the specifics of the Ulm testing site, the major issue is the balancing of the high penetration of solar generation under today's operation with a pre-dominant operational challenge for PV control. The key focus at the Ulm demonstration site is to define control strategies to increase the intake of the energy supply from PV on the roof generation into the grid while maximizing the benefits for the low voltage power grid.

The Sustainable Place 2014 Conference in Nice will represent a unique opportunity to present information on the methodology adopted by the OrPHEuS Consortium to optimise the synergies among energy grids and therefore to contribute to the establishment of sustainable districts and cities in Europe.

Ecobim - BIM and PLM for value driven life cycle based sustainable business models

Innovation

The innovation of the ECOBIM approach is the usage of IFC open standard used for BIM definition coupled with PLM technology which brings all the necessary process required for building project management, all along its life cycle. The strength of IFC is the openness of the solution which enables the different actors (architects, engineers, economists, product manufacturers, and controllers, insurers…) to use their most preferred and adapted tools to their disciplines.

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Eric Lebègue has more than 25 years' experience in the combined usage of CAD & analysis tools, open standards like STEP and IFC and PLM technologies acquired first in mechanical and aeronautic industries (working with ESA, NASA, Airbus, PSA, Renault, EDF…) and then in the construction sector. He is now deputy manager of BIM activities at CSTB and also International Technical Leader for the extension of IFC standard for bridges within the buildingSMART organisation.

Abstract

This presentation is about the results of the ECO-INNOVERA ECOBIM project and the combined usage of BIM and PLM (Project Life Management) platform for the development of new business models for sustainable buildings and Key Performance Indicators (KPI) management.

For ensuring collaborative work around the BIM, introducing PLM tools offers several applications:

- Managing the different actors of the construction project with their different roles, properties and access rights (read and/or write) on the different pieces of the BIM.
- Managing and organizing the collection of BIM files (IFC models, annotation files, analysis results…).
- Managing the versions and variants of the BIM files.
- Managing the KPI in relation with the BIM objects.
- Managing the collaborative work with planning and workflows.
- Gathering the design and construction data for commissioning phase.

How to facilitate the integration of distributed energy resources into the local grid?

Innovation

Nice Grid develops an Energy Management System that integrates the following mechanisms:
- Day-ahead forecast of the local PV production and energy consumption;
- Batteries integration at different grid levels, from the substation to host-consumers;
- Objective to turn local consumers into a community of "consum'actors / prosumers";
- Test of innovative solutions using ICTs to foster remotely-controlled usages.

While stabilizing the electricity supply in the district, this project creates value for households and industries by maximizing the integration of the local PV production and helping them control power loads (such as water heating, air conditioning…).

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Born in 1956, Christophe Arnoult graduated as a Civil Engineer of Mines in 1979. He started his career with Procter and Gamble in Paris before joining EDF in 1980 as planning engineer of the LV network in Paris. In 2000, he became Chief Administrative Officer of EDF Trading, based in London. He held as well the position of secretary of the Risk Committee. He was also member of the Board of Capcol, the fossil fuel purchasing subsidiary of EDF. Back to France in 2005, he became project manager to achieve a major reorganisation of the logistics functions of the Mediterranean region. He is currently Head of the «Large Projects and International» department at Electricité Réseau Distribution France (ERDF) in the Mediterranean Region.

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Abstract

GRID4EU is one of the most significant large scale demonstration projects of advanced smart grids solutions with replication and scalability potential for Europe. It comprises 6 demonstrators. The French one is Nice Grid which is a pilot project on photovoltaic-powered neighborhoods funded by the French government and the European Union. The project, coordinated by ERDF, started in November 2011 and will last 4 years with an overall budget of €30 million.

Nice Grid is located in the city center and the industrial area of Carros, a medium-sized town close to Nice on the French Riviera. This region is at the far end of high-voltage transmission lines, which creates a weakness in the electricity supply and in the local grid's stability and reliability. The area is also endowed with major sources of renewable energy, most notably solar energy.

The ambition of Nice Grid is to test the entire smart grid concept, including the impact of the massive integration of Distributed Energy Resources (DER) on the low voltage grid. In the project, DER can be divided into three categories: load management with the support of customers involved in the project, storage (electrical and thermal) and PV generation (rooftop solar panels owned by Carros residents). The citizens and industrial companies of Carros support the optimization of electricity production, consumption and storage on the Carros medium and low voltage grid in order to maintain and secure the quality and efficiency of their electricity supply.

The Nice Grid project consists of a smart electricity distribution grid that harmoniously integrates a high proportion of solar panels, energy storage (electrical and thermal), load management devices and smart meters installed in the homes of volunteer participants.

Making use of a high proportion of local intermittent energy sources, the project seeks to demonstrate an optimal approach to electricity management, at the level of a district or town, involving the large-scale integration of dispersed photovoltaic (PV) power generation systems, load-shedding capacities (target: 3.5 MW) and energy storage systems (lithium-ion batteries with 1.5 MW total capacity), at different points in the overall system: the distribution grid, electricity producers and consumers. Four main use cases are tested:

- reduction of power demand
- management of maximized PV production on an LV network with respect to constraints and flexibility programs
- encouraging consumers to adopt smarter habits in accordance with the network state
- islanding.

The architecture relies on AMI infrastructure and utilization of smart meters, which enable more accurate consumption forecasts and allow participating customers or aggregators to control and monitor devices such as hot water tanks and heating systems without additional internet boxes or parallel communication infrastructure. In particular, consumers play an active role within the energy system by providing data on power use and consumption, storing energy in hot water tanks and/or batteries using controllable smart devices, generating electricity from PV panels and adapting their behaviors towards a better integration of PV generation. The metrics evaluated include load managing, environmental, forecasting, reliability, efficiency and societal KPIs.

Integrated game engine and BIM-based interfaces for neighbourhood energy service providers and users

Innovation

ICT based tools for neighbourhood level energy management systems. New tools for engagement and motivation of users utilizing new approaches as social media, serious gaming, or crowd sourcing.

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Abstract

The presentation will focus on the demonstration of an integrated BIM based interface for neighbourhood service providers and users.

The interface is being developed and demonstrated within the FP7 project EEPOS – "Energy management and decision support systems for energy positive neighbourhoods". The project's goal is to realize energy positive neighbourhoods by developing open integrated urban neighbourhood energy management and decision support systems in which local consumers and producers as well as the main electric power and heating and cooling grids will be integrated.

Within the EEPOS project, a central ICT platform along with several tools connected to it is to be implemented and tested. The neighbourhood performance monitoring and operations planning tool is part of this system and is divided in three modules: performance monitoring, data analysis, and visualization. This presentation focuses on the neighbourhood level visualization module based on the Unity 3d game engine, and especially on VTT's building level visualization engine based on BIM and BACS integration.

The goal is to integrate, visualize, and analyse BIM and building automation information as a part of neighbourhood performance monitoring. The building performance indicators are visualized and reported by means of 4D VR BIM. The functionality will include fault detection as well as predictions about the energy consumption of the neighbourhood. The visualization tools will make the parameter predictions and faults found by the analysis tools easily available to the user operating the neighbourhood, e.g. a central facility manager.

A variety of end user platforms should be supported ranging from common web browsers on desktop computers to native applications on the major mobile operating systems.

The following geometry models are needed for visualizing the neighbourhood related geometry data.

- Landscape model of the neighbourhood
- Building models (all buildings in the neighbourhood)
- Energy grid model (electric power and heating and cooling networks) including energy production units
- Optionally some supporting geometry models like humans, trees, furniture, etc.

Setting up the integrated 3D neighbourhood model is done by combining the separate landscape, building, and energy grid models into one neighbourhood level 3D model. The monitoring tool needs this integrated 3D model and access to the related historical and real time data

The user can navigate in this 3D game engine based neighbourhood and start real time monitoring by clicking on an item (building, energy production unit, energy grid component, etc.) and selecting the monitored variable (e.g. available measurements, calculated KPIs, etc.). Examples of the possible monitored variables are index of energy positive neighbourhood, neighbourhood level energy reduction, neighbourhood and building level energy performance index, energy consumption and production on neighbourhood and building level, related costs, RES part of the used energy and the load shifting being done. The tool can also detect some energy consumption related faults and highlight the offending items in the virtual neighbourhood. For more information the user can click on the alarm target.

Innovation

Three innovative aspects are addressed in this paper: First "techno-sharing" by using EV not only for mobility but also for energy storage. This approach is similar to the one of "smartphone" which can be used for music and movies. Second, the EV recharge at Home & Work as cars are parked at these both places for a few hours every day. The recharge is carried out during "sleeping" and "working" without bothering users. Third, the use of wastes resulting from food production at farm and eating at home by methanisation in order to produce fuel to assist the variable PV production.

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Dr. Daniel Quenard is head of the Division "Envelope & Innovative Materials" at the CSTB in Grenoble. He has a broad experience in the characterization of building materials. His research fields include the development of special devices to measure thermal properties and the development of tools to perform microstructural analyses on building materials in relation with thermal & mechanical properties. He has also introduced the Energy Positive Building concept and the Building & Transportation convergence at CSTB

Abstract

Building and Transportation are the main consumers of final energy and emitters of GHG, whether at the household scale or at the country scale.

In France, many efforts are made to improve energy performance of buildings, but the location of these buildings may erase the gains, indeed 80 kWh/m²/yr of energy savings in building, is wiped off by 20 km by car every day for a year.

The present study aims to assess the impact of a concept based on NZEB (Nearly Zero Energy Building) coupled with electric vehicle (EV) on the power grid. Using TRNSYS software the source of energy (PV, Grid, EV battery) used by household equipments and EV for commuting to work is investigated. The EV battery is used as a power source to minimize the energy needs from the power grid during peaks of electricity demand. Twelve scenarios have been examined in order to integrate assumptions on plug-in, climate and commuting distance. Finally, the influence of efficiency reduction due to aging of PV cells has been evaluated on a case.

Whatever the scenario is, the results show that, the annual PV energy production is greater than consumption, but as expected, does not match every time: for 50 to 70% of the time, the use of power grid is required. EV charging at work reduces drastically the need to the grid for consumption due to mobility. Moreover, the use of a plug-in station at home is particularly effective: EV battery acts as a source of additional electricity, it supplies the needs related to home electrical appliances and avoids the use of power grid during peak hours. Finally, the decrease of PV efficiency

Streamer: The development of energy efficient KPI's

Innovation

The identification of a KPI for energy is important, however it is the supporting thought and delivery process that will make it a success and how the decisions that support the KPI's are used in the overall BIM model.

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Abstract

Streamer is an FP7 EU research project with 10 Work Packages covering the energy use on the healthcare district/campus. It considers the building types to found, the types of layers (technical usage,acuity and flexibility) and the engineering systems. Further developments of the project relate to the integration of thermal models, GIS models in order to conclude with an overarching and integrated BIM model that will allow hospital owners to make early decisions on the priorities for development of the site that will offer the best energy value proposition. One requirement of the Streamer project is the development of a set of KPI's for the long term management of energy efficient buildings on the acute hospital campus/district site. This paper considers the development of the KPI's for this purpose. It takes into account the process of design, construction and operation of the facilities and sets out the issues that should be considered in the practical delivery of such a KPI. Of particular importance is the ancillary requirement of the need to deliver both a quality environment for the benefit of patients and staff and also the requirements of flexibility in what is an ever changing environment. There will also be a need to introduce new engineering technologies into the complex low energy/low carbon hospital environment but we must also consider the 24/7 nature of the facility and the resilience that must be embedded in our design approach.

Technical Focus

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Abstracts

Tools to support incremental roll-out of energy positive neighbourhoods

Innovation

This is one of the first attempts to balance the energy demand and supply on neighbourhood level in real time, regarding more than one energy vector. Innovative ways to involve the users in this activity are developed. Decision support is needed to ensure that the infrastructure of the neighbourhood supports energy positivity: the low demand connected with possibility for local renewable production.

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Abstract

In an Energy Positive Neighbourhood (EPN) the annual energy demand is lower than energy supply from local renewable energy sources. Short-term imbalances in energy supply and demand are corrected with national energy supplies. The aim is to provide a functional, healthy, user friendly environment with as low energy demand and little environmental impact as possible. The IDEAS project aims to develop and validate the technologies and business models required for the cost effective and incremental rollout of EPNs.

The tools, user interfaces and business models developed will underpin the incremental rollout of EPNs at the demonstration sites: part of a University campus in Bordeaux (IUT), France and a newly built residential area in Porvoo, Finland. In this paper the early stages the development - the specifications - of the tools for intelligent management of energy positive neighbourhoods are presented. These tools include an energy management tool for real-time management of the energy flows, an urban planning decision support tool and user interfaces that support energy efficient behavior of the users in the neighbourhood. The specifications and tools are result of European co-operation, and are designed so that they can easily be adopted in different European countries with minimum changes.

Achieving EPNs will require co-ordinated and optimised demand side management (DSM) and supply side management (SSM) to reduce and shift peak energy demands and smooth out the inevitable production variability of renewable energy. To facilitate this, a supporting ICT infrastructure that provides a wide variety of interconnectivity options for measurement, control and user interface equipment (e.g. smart meters, synchrophasors, weather measurement stations, grid inverters, building automation controllers, energy trading applications, etc) is needed. The ICT infrastructure envisions a smarter grid, to enable the buying and selling of energy between prosumers connected via a local grid infrastructure. This grid infrastructure is smart - in that it not only allows for the physical transfer of energy - but also supports ICTs that enable information related to energy supply/demand availability and pricing to be exchanged, along with real-time information related to the health and status of the power flows.

The ICT architecture specified in course of the iDEAS project covers three separate domains: (i) the local generation and distribution (field) domain, (ii) the customer domain and (iii) the web services domain. Relevant standards are leveraged to provide a path towards common data semantics and protocols that may be used across these domains within the context of an EPN.

Again at a generic level, the optimisation and decision support tool provides several main types of operational functionality: (i) adaptive prediction of future energy supply and demand potential, (ii) access to current market conditions and predictions of future market conditions (e.g. energy prices), (iii) receding horizon optimisation to balance supply and demand given the market conditions and (iv) additional decision support and dynamic pricing incentives to prosumers and utilities within the EPN.

Thermoeconomic optimisation of an energy hub

Innovation

The main innovative aspect of this paper is to compare the results of a thermoeconomic approach with real field tests.

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Abstract

The aim of this paper is to illustrate the operation of a real energy hub that can satisfy both thermal and electrical demands of a generic user. In particular, a specific case study developed around the smart grid of the University Campus of Savona (Italy), which just completed in 2014, is analysed. The grid includes different cogenerative prime movers and a storage system to manage the thermal load demand. Through a time-dependent thermo-economic hierarchical approach developed by the Authors, the work aims at optimizing the management strategy of the different prime movers to satisfy the energy demand, taking into proper account both the energetic and economic aspects. The analysis was carried out considering two different layouts, with and without a conventional stratified thermal storage, to evaluate the impact of this component in the management of the district.

INTrEPID - Intelligent systems for energy prosumer buildings at district level

Innovation

The INTrEPID platform envisages being scalable by using Cloud Technologies. For this purpose, the middleware layer will interconnect: Supervisory Control, Energy Brokerage and Business Intelligence and the Indoor Home Networks. Additionally, middleware is based on a distributed publish/subscribe architecture allowing for transparent implementation of applications. INTrEPID will also allow multiple gateways for different technologies which can then be aggregated into the INTrEPID middleware. The INTrEPID project will also be capable of providing extended market opportunities since its services can be provided from any entity capable of offering the services envisaged by the higher layer modules.

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Abstract

In the past years, the energy grid has evolved from a unidirectional production-transmission-distribution-consumption pipeline to a complex system where every level of the pipeline comprises multiple actors that produce and consume energy, as well as exchange it among themselves. Different solutions have been proposed for these smarter grid architectures, with the goal of facilitating management of complex systems, where the energy grid can interact with the final users to control their energy consumption either by direct control of some appliances (for example, a washing machine) or indirect control by varying the cost of energy at a given time, such that the final user tunes his own schedule to lower the cost and presumably thereby the overall consumption.

The INTrEPID project aims to develop technologies that will enable energy optimization of residential buildings, both performing an optimal control of internal sub-systems within the Home Area Network and also providing advanced mechanisms for effective interaction with external world, including other buildings, local producers, electricity distributors, and enabling energy exchange capabilities at district level.

A common issue in a typical Smart Grid system is its size and complexity. In fact, a Smart Grid usually serves a large number of users by providing them the energy they consume. This characteristic and the fact that each actor is an independent entity, lead to organizing Smart Grids using component-based architectures.

The architecture for INTrEPID tries to fulfil the needs of current and future large-scale Smart Grid applications. Consequently, its development is driven by the following principles: interoperability, scalability and creation of new market opportunities.

INTrEPID architecture is divided into the following logical blocks: (1) Indoor Home Networks: a complex set of interacting components that collect information about energy consumption and production in the building as well as providing the infrastructure for controlling the appliances in order to increase the efficiency use of the energy; (2) Middleware: event-based system that processes the data from the building network as a stream of events. Responsible for storing the data coming from the connected building blocks and for providing them in a consistent, secure way, while maintaining necessary levels of privacy; (3) Supervisory Control Strategies will exploit the capabilities of the appliances and subsystems and coordinate them in a more optimal way while not compromising the desired level of comfort; (4) Energy Brokerage and Business Intelligence based on previous consumption patterns and energy production forecast, it will provide analysis of the energy use and make decisions. In terms of these higher-level blocks, Indoor Home Networks is identified with the monitoring and execution elements. Middleware will provide a uniform data communication and processing bus between the INTrEPID platform elements. On the other hand, Supervisory Control Strategies component will be responsible for a control strategy offered to the individual execution elements within a defined network and supplied to them via the INTrEPID Middleware. Energy Brokerage and Business Intelligence strategies will be developed involving short and long term decisions about the participation in energy brokerage, retrofits, equipment replacements and other capital investment actions.

Short methodologies for in-situ assessment of the intrinsic thermal performance of the building envelope

Innovation

There is nowadays no consensual method to deduce thermal performance of a built envelop from thermal measurements. The most studied method, the co-heating test, is not always possible for both technical and economic reasons (difficult to run in summer, long time needed with no occupant inside the tested building…). It is than crucial to develop shorter but still accurate methods in order to measure as-built thermal performance of the envelope, as a first step for energy performance guarantee.

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Graduate of INSA of Lyon in 2012, I worked in 2013 at CEA-INES as an internship student for 6 mouths and as research engineer for 4 months. I am now starting a PhD thesis at CSTB with the collaboration of INSA of Lyon on the in situ thermal assessment of buildings.

Abstract

Intrinsic thermal performance of the envelope is usually assessed by assembling elements such as opaque elements (walls, windows, doors, roof, etc.) taking into account physical phenomena such as thermal bridges. This assembling process is achieved by calculation and measurements, but there is nowadays no consensual method to deduce thermal performance of a built envelop from thermal measurements whereas this data is a key element to guarantee the energy consumption of a building. One target of the PERFORMER European project is to develop methodologies to assess strategic indicators of intrinsic performance of the building envelope. In this context two experimental procedures developed by CSTB and Saint-Gobain have been identified and tested in a full scale building under real climate provided by CEA.

We conducted the tests in one of the 4 experimental buildings of the CEA-INES test facility INCAS platform located in Chambery, FRANCE. The buildings have the same internal shape, architecture and level of insulation but are made with different material. They look like two-storey individual houses of 90m² having 3 bedrooms and a bathroom upstairs and the living room, dining room and kitchen on the ground floor. We tested both methodologies to assess thermal characteristics in the monomur building called «IMA».

The first methodology called ISABELE (In Situ Assessment of the Building EnveLope pErformances) and developed by CSTB is an identification method based on the model used in the French thermal regulation (RT 2012) which is close to the simple hourly method described in the international standard ISO 13790: 2013. The general principle is to inject a controlled heating power inside the tested building and to measure its thermal reaction in order to deduce the thermal properties of the envelope.
The second methodology called QUB (Quick U-Value of Buildings) and developed by Saint-Gobain is a very simple diagnosis method enabling the measurement, in at most two nights, of the heat loss coefficient of a building. It is done simply by measuring its temperature response to two consecutive thermal loads, usually a constant heating power followed by a free decreasing period.
After a description of methods and the building case study, we present the results of both methods and compare them with a reference value (regulatory thermal study…). We finally critically discuss the advantages and drawbacks of these short methodologies in the context of PERFORMER.

Energy Harvester exploting Seebeck effect in traditional domestic boiler

Innovation

Harvesting the exhaust heat of traditional non cogenerative boilers (or biomass boilers) to produce electricity exploiting a safe and stable technology.

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Abstract

In this paper, a system to harvest waste heat and convert it into electrical energy is presented; such a system is based on thermoelectric generators (TEG) modules exploiting the Seebeck Effect. A technical and economic feasibility study of the system is presented, the most convenient applications of thermal energy residuals recovery in residential environment (detached house, condos, isolated off-the grid house) are evaluated according to the electrical supply of typical domestic low consumption devices (i.e. LED lighting); the total yearly production of thermoelectric generator is considered in different techno-economic scenarios.

Mapping multi-form flows in smart multi-energy districts to facilitate new business cases

Innovation

There is a clear need to understand better the networked interactions of value flows in a Smart Grid environment, given the much higher complexity with respect to "traditional" power systems. At the district level, this issue is even more challenging as other energy vectors such as gas and heat are involved. To the authors' knowledge, there is no such a methodology as the one proposed that is capable to map multiple forms of flows (energy, cash, emissions, etc) for multiple energy vectors and actors both internally and externally to a reference aggregated system (for instance, an energy positive district).

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Abstract

Advances in ICT and the rise of various aggregation concepts are making it possible that many of new distributed low carbon technologies (from solar PV and combined heat and power to flexible demand response and storage) could actively interact with the rest of the energy system by: (i) partaking in energy markets and power system services markets, (ii) creating business case opportunities for the resource owners and resource aggregators, (iii) generally improving the efficiency of the associated markets, and (iv) removing the need for expensive infrastructure upgrades/construction. This could happen particularly at a district level, where there are fruitful opportunities to aggregate controllable distributed energy resources in for instance microgrids of virtual power plants set up by energy services companies, cooperatives, communities, and so forth.

Such new business cases and commercial interactions will result in major changes to the traditionally uni-directional multi-form flows of products/services/cash that have characterised the energy system since liberalisation. More specifically, active participation of demand side technologies will mean dynamic flows of energy through various markets, possibly resulting in fuel substitution and/or demand curtailment/shifting compared to business as usual. In particular, given the highly networked nature of energy (especially electricity) systems, purchase of demand response by one actor will affect, positively or negatively, other actors. On the other hand, consideration needs to be given too to various types of flows internal to districts, for instance for proper allocation of costs and benefits when demand response and demand management schemes are set up and activated. For actors ("internal" and "external" to the district) to properly assess business models and for regulators to properly design regulation and incentive schemes, the effects of such business models (which should include effects relating to all energy-related commodities, for example CO2) must be well understood. For this purpose, and within the FP7 COOPERATE project, the authors propose a multi-commodity value mapping methodology which graphically demonstrates interactions between actors in multi-energy systems and informs interaction matrices which enumerate the consequences of specific business cases for all involved actors. Numerical case studies will be shown to illustrate the proposed methodology and the benefits arising from its utilization.

WORKSHOP ON EeB KPIs

Chaired by Andrea Maria Ferrari, D'Appolonia
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This workshop is organised by the European Commission - DG CONNECT

The aim is to encourage R&D sister-projects to adopt and implement comparable evaluation methodologies to facilitate a comparative analysis, benchmarking and exploitation of their outcomes. The workshop will support knowledge transfer of best practice in the measurement and application of KPIs for urban sustainability. Existing reference frameworks for evaluating the energy performance and sustainability of buildings, districts and cities will be presented.

Full papers are available into a booklet distributed by the European Commission, and will be published at ValMet Wiki

Abstracts

Energy-related KPIs at building and neighbourhood scale for optimization of building's design

Innovation

On the basis of stakeholders' interviews, the need for an evaluation framework based on an integrated and neighbourhood-aware approach has been highlighted. Thus, in order to take into account this "broad" vision two set of KPIs have been considered: at building and neighborhood scale.

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Abstract

The aim of this paper is to present a novel building design methodology together with the related KPIs system, defined in order to assess building performance over the whole design process. A general overview of the project in which the aforementioned methodology has been developed is herein presented, followed by the description of a common understanding of the KPIs system in the assessment of a process performance so that to introduce the building performance related KPIs. The evaluation framework proposed within a novel building design methodology and its aim to define a global assessment scheme is presented in terms of energetic, environmental, social and economic KPIs both at building and neighborhood scale, showing the mutual impact and interaction between building and the neighboring urban area. Additionally, the main features of the multi-criteria analysis (foreseen within the proposed methodology) as a tool to enable reliable and holistic assessment on design choices and based on the defined KPIs set, are briefly summarized.

Use of KPIs in an integrated decision support system for energy efficient retrofitting

Innovation

Developing an software backbone that integrates various calculation modules.

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Abstract

Retrofitting urban districts is a complex process. It deals with multiple stakeholders who have wide range of stakes, priorities, different time horizons and scale of investments. This complexity is boosted by the energy policies, as the retrofitting requires to incorporate both selection and use of different sustainability measures dealing with each stakeholder's vision, financial capacity, and different performance expectations. Thus, retrofitting at district level displays an interplay between different measures at various scale and details.

Integrated Decision Support (IDSS) is a tool in progress in the ECODISTR-ICT project. It facilitates decision making through credible input for selection and incorporation of measures in design phase. It refers to a 'software backbone' that integrates existing design and calculation modules rather than developing a new ones. The IDSS aims to deliver an integrated approach for stakeholders. In this integrated approach, Key Performance Indicators (KPIs) become important for the stakeholders to structure and manage their decision process, as the KPI modules are to be connected to the IDSS. Based on KPIs and their results, the stakeholders make explicit choices on multi-levels and perspectives. Thus, through the IDSS and the use of KPI, retrofitting process can have a wider social, economic and environmental impact. However, there are critical observations.

Decision making in practice is a dynamic, iterative yet complex process. When it attempts to be mediated through computers, there is a probability to end up with a rigid and prescriptive decision process which does not correspond to the stakeholders' practices. Thus, there is a need to model a decision process the IDSS can support this dynamic and iterative nature and fit-to-the purpose of the stakeholders.

Decision making in practice includes several KPIs at different levels with different data requirements. However, their use is mainly on getting the scores, rather than how KPIs are used and can be instrumented for the stakeholders in making choices. Thus, the process of KPI inclusion is often not explicitly embedded in the decision making processes and particularly not in a computer-supported settings. Therefore, there is a need to identify the use of KPIs that stakeholders require and the way to support it through the IDSS.

Decision making in practice is supported by several advanced software and tools that run calculation and provide credible input for decision. However, there are also KPIs that are used in decision process but are based on qualitative assessments. In any case, there is no single integrated environment which synthesizes the calculation modules and assessment modules.

In the light of these observations, this paper will firstly identify a simple yet iterative and dynamic decision process model that the IDSS can support. It secondly will define inclusion of KPI use in an IDSS supported decision process. The paper thirdly will identify the way that calculation and assessment-based KPIs are incorporated in the decision process. The paper consequently will establish an understanding of the number of components that the IDSS consists of and indicate functional requirements for each components with prospective activities for the IDSS.

Building requirements as basis for a key point controlled design method

Innovation

Building requirements contain numerous explicit and implicit requests, which can be, in a next step described as checkable milestones (KPIs). This paper discusses how to structure building requirements to be able to formalize the data as basis for the definition of KPIs. This KPI driven design process is expected to lead to greater efficiency in the planning procedure to final design results of higher quality. At the same time, it will provide an opportunity of weighing up many more alternatives than currently possible.

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Abstract

The biggest opportunity to influence the relationship between energy goals and architectural design is during the early planning phases of a building project. It is commonly known that unilateral elaborate design decisions can have substantial negative influence on the economic and the environmental performance of a building. Great opportunities are seen in the early design phase, where only general conditions and basic constraints are predetermined by the client and the participating planners. Building requirements contain numerous explicit and implicit requests, which can in a next step be defined as verifiable design checkpoints. These Key Points will allow designers to easily structure the design process in individual evaluable parts and will thus help them to concentrate on high-level strategic decision making tasks. Against this background, the central question that motivates this paper is: how can we aggregate building requirements to be able to formalize the data as basis for the definition of Key Points? To answer this question, a closer look at building requirements of different participating planners and their individual decision making is taken. The Key Point driven design process is expected to lead to greater efficiency in the planning procedure to final design results of higher quality. At the same time, it will provide an opportunity of weighing up many more alternatives than currently possible.

Defining the concept of an energy positive neighbourhood and related KPIs

Innovation

This is the first known attempt to define Energy Positive Neighbourhood and indicators for it. In order to know what kind of solutions are essential for an Energy Positive Neighbourhood, the people working on them have to know what is meant by Energy Positive Neighbourhoods. This could not be found in the literature, so the partners in IDEAS consortium had to start by defining that themselves.

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Dr Tracey Crosbie 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 transdisciplinary 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 is currently a WP leader in two ongoing EU FP7 projects. IDEAS- Intelligent Neighbourhood Energy Allocation & Supervision" and SEMANCO - Semantic Tools for Carbon Reduction in Urban Planning.

Abstract

Despite the widespread use of the term 'energy positive neighbourhood' (EPN), it is not well defined in earlier work. In this paper the following definition for an EPN is suggested: "Energy positive neighbourhoods are those in which the annual energy demand is lower than annual energy supply from local renewable energy sources. Short-term imbalances in energy supply and demand are corrected with national energy supplies. The aim is to provide a functional, healthy, user friendly environment with as low energy demand and little environmental impact as possible." Furthermore, in order to be able to assess how well a neighbourhood is fulfilling the definition of EPN, i.e. the energy positivity level of the neighbourhood, a set of KPIs is developed. In addition, an energy positivity label for evaluating neighbourhoods is proposed. The IDEAS project aims to illustrate how communities, public authorities and utility companies across the EU can be engaged in the development and operation of energy positive neighbourhoods and the economic and environmental benefits of doing so. The concept of energy positive neighbourhoods plays therefore a very central role in the project, and it is essential to have the KPIs to evaluate the potential benefits. The IDEAS consortium felt that it was important to define what exactly was meant by energy positive neighbourhoods (EPNs) in this context. Hence, the definition for EPN was born, and it was later discussed with other project groups on the same ICT for EPN activity. According to the definition developed in IDEAS, "Energy positive neighbourhoods are those in which the annual energy demand is lower than energy supply from local renewable energy sources. Short-term imbalances in energy supply and demand are corrected with national energy supplies. The aim is to provide a functional, healthy, user friendly environment with as low energy demand and little environmental impact as possible."

The context is further explained with the following text: "Balancing the energy supply from local renewable sources with the energy demand of a neighbourhood will involve maximising energy efficiency and minimising peak power demand while maximising local renewable energy supply and resolving energy storage issues. To avoid sub–optimisation it is key that the wider context is considered in the design and operation of energy positive neighbourhoods throughout its entire life cycle. Energy demand of a neighbourhood includes the energy demand of buildings and other urban infrastructures, such as waste and water management, parks, open spaces and public lighting, as well as the energy demand from transport. Renewable energy includes solar, wind and hydro power, as well as other forms of solar energy, biofuels and heat pumps (ground, rock or water), with the supply facilities placed where it is most efficient and sustainable. The transport distance of biofuels must be limited to 100 km." The definition was aimed to be applicable to wider use than merely one specific project, therefore the energy use of waste and water management and transport were included, although they are out of scope of the IDEAS project.

In order to be able to assess how well a neighbourhood is filling the definition of EPN, i.e. the energy positivity level of the neighbourhood, a set of KPIs were developed. These include yearly on-site energy ratio (OER) and energy mismatch indicators for each energy type (heating, cooling, electricity). The mismatch indicators include annual mismatch ratio (AMRx), maximum hourly surplus (MHSx), maximum hourly deficit (MHDx) and monthly ratio of peak hourly demand to lowest hourly demand (RPLx), where x is replaced by an indicator for the different energy types respectively (h for heating, c for cooling, e for electricity). The indicators will be presented in form of an energy positivity label. Additional KPIs were listed to evaluate how the demo sites of IDEAS - a University campus in France and a newly built residential area in Finland - are performing regarding the different aspects of energy positivity. These include aspects like the low energy demand or little environmental impacts.

Implications of open access data for low cost KPIs measuring energy efficiency

Innovation

The basic innovation underlying the proposed paper is the idea that it is possible to measure the energy efficiency of existing housing stock using freely available open access data. The potential cost and time benefits arising from following such an approach are very considerable and so this approach should be studied in more detail and appropriate KPIs developed. An example referencing the UK is given.

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Dr Mhalas received his PhD from the University of Teesside in 2013 for work relating to the development of a methodology for ranking the energy efficiency of housing using only remotely gathered data. He has also worked on the SEMANCO project.

Abstract

In response to the Energy Performance of Buildings Directive (EPBD) most EU member states have established a national energy calculation methodology to measure the energy performance of buildings. The EPBD came into effect on 4th January 2003. Its principal objective is to promote the improvement of the energy performance of buildings through cost-effective measures. To achieve this it is obviously necessary to have a way of measuring and comparing the energy performance of buildings.

Each of the European countries has developed a different methodology, tailoring them to the specific characteristics of their country. In the UK the chosen standard was SAP. One common feature of all of these methodologies is that they principally attempt to perform a detailed energy calculation for the house concerned. Doing this requires that considerable quantities of detailed information regarding the house are gathered.

When such information can be gathered with minimal effort, such as for new build housing, these approaches are attractive. However problems arise when assessing large numbers of existing housing. In such cases the basic process of visiting the properties to gather the required data consumes considerable amounts of time and effort. In practice the effect of this is that large numbers of existing houses are not assigned a rating. This problem is especially prevalent in the UK, where housing stock turnover is low. This brings into question the suitability of detailed energy assessments as key performance indicators (KPIs) for rating the energy efficiency of existing housing.

Recent developments in ICT, and especially the rapid improvement in the availability and quality of freely available street level photography, offer a potential approach which avoids these problems. Namely they have made feasible the idea that it might be possible to assign energy efficiency ratings to houses without ever visiting them in person.

While it is clearly not possible to fully replicate the calculation of the traditional energy efficiency related KPIs in this manner, much of the data traditionally gathered by visits can be derived using these data sources. In addition, the potential cost and time savings derived from avoiding visits are very considerable, thus strongly motivating the development and testing of such KPI's.

In this paper we present a discussion of this including which of the features relevant to measuring the energy efficiency of houses can be measured using such remote data, which can't and the implications of this for the design of KPIs for measuring energy efficiency. We ground this discussion with reference to an example of a KPI derived from simplifying the British standard SAP, which can be calculated purely using freely accessible open access data. This KPI has been tested against the results of traditional manual SAP visits and the results derived from the two found to be closely aligned.

Implementing KPIs for energy performance assessment in brownfield districts

Innovation

Presented solution focuses on the brownfield areas and is driven by requirements consolidated from use-cases covering districts of different type and scale and having different retrofitting targets. Multitenancy is an important feature of the solution allowing managing multiple locations within one instance of the platform. District performance, retrofitting campaign feasibility and citizen's comfort considered as main drivers for KPI selection. A common KPI computation approach is defined, fitting different kinds of indicators, found throughout the requirements analysis.

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Abstract

Major energy consuming sectors of the EU (transport, industry, residential and services) are concentrated in urban areas. As a result, cities accounted for 75% of the energy resources consumption and 80% of the CO2 emissions. Cities and towns are composed of smaller parts, districts, connected with transportation and utility networks. Districts are often planned and designed to support particular functions of a city (e.g. residential, administrative, and industrial), becoming important functional units. Therefore, improvement of the energy efficiency at district level plays an important role in the reduction of energy consumption and CO2 emissions in the entire city.

While green-field neighborhoods can easily adopt the new solutions for sustainable living, brownfield districts require thorough evaluation of the energy performance prior to implementation of the retrofitting solutions. ICT solutions play important role in creation of harmonized approach to assessment of energy saving potential. Common way to evaluate the energy performance of a district is to define and monitor key performance indicators.

The approach developed in the URB-Grade project suggests use of KPIs for multilateral evaluation of the district, considering such aspects as district's energy performance, feasibility of retrofitting options in monetary and environmental terms, and citizen's comfort. Platform offers a set of tools allowing defining and monitoring KPIs of different level of granularity, analyzing the relationship between energy consumption and the needs covered for better understanding of the energy utilization patterns, and applying forecast algorithms for evaluating the cost of a change against the anticipated benefits. Taking into account diversity of districts and potential end-users, the solution is designed as a multitenant platform, providing an infrastructure capable to serve multiple locations.

Developing ontologies for representing data about key performance indicators

Innovation

In this work we will provide methodological guidelines for developing ontologies for representing Key Performance Indicators in a lightweight fashion. These guidelines will include techniques and tools to carry out each of the proposed activities and advise on design decisions. Ontology evaluation techniques according to Linked Data principles and architecture will also be provided. The ultimate goal of this work is to ease the sharing and interoperability of data about indicators and their relevant information among applications.

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Dr. Raúl García-Castro is Assistant Professor at the Computer Science School at Universidad Politécnica de Madrid (UPM), Spain. After three years as a software engineer, since he graduated in Computer Science (2003) he has been working at UPM in the Ontology Engineering Group in several European and Spanish research projects. His research focuses on the benchmarking of semantic technologies, ontological engineering, and application integration. In 2008 he obtained a Ph.D. in Computer Science and Artificial Intelligence at the UPM, which obtained the Ph.D. Extraordinary Award. He regularly participates in standardization bodies and in the program committees of relevant conferences and workshops and has organized several international conferences and workshops.

Abstract

Multiple indicators are of interest in smart cities at different scales: devices, buildings, districts, cities, etc. The description of such indicators goes beyond giving a label to some value. In order to be successfully used or interchanged, indicator information must be related to other entities that contextualize the indicator and allow a meaningful use of it. Therefore, a concrete indicator: a) usually satisfies some information need that a certain stakeholder requires to make decisions; b) refers to a certain attribute of some entity; c) is specified in terms of a concrete measure, with a concrete scale (nominal, ordinal, interval, or ratio) and unit of measurement; and d) has a concrete value that has been obtained through some method in which certain technologies were used.
In closed measurement environments, there is no need to make explicit most of the entities that conform the context of an indicator. However, in open environments, or when indicator information has to be interchanged across systems, the lack of complete contextual information (e.g., unit of measurement, measurement method) may cause undesirable effects.

Ontologies are formal, explicit specifications of shared conceptualizations and allow developers to reuse and share application domain knowledge using a common vocabulary across heterogeneous systems or environments. Therefore, ontologies do not only provide semantics and reasoning power to the data described in a given application but also increase the interoperability among datasets and applications.

The W3C has defined different specifications to represent ontologies and to represent data according to such ontologies. The ultimate goal is to allow software agents to use that ontologies and data, and the main use scenario is when ontologies and data are published in the Web and/or accessed using web protocols (e.g., HTTP). Furthermore, by following the Linked Data principles, data published online can be easily accessed and integrated with other data. This has caused that, in the last years, the amount of semantically structured data (i.e., Linked Data) available on the Web has witnessed a substantial growth.

In order to realize the notion of Linked Data, not only must data be available in a standard format, but also concepts and relationships among datasets must be defined by means of ontologies. New ontologies to model data to be exposed as Linked Data should be created and published when the existing and broadly-used ontologies do not cover all the data intended for publication. Practitioners should describe their data, on the one hand, by reusing as many terms as possible from those existing in the vocabularies already published and, on the other hand, by creating new terms when available vocabularies do not model all the data that must be represented. During this apparently simple process of developing an ontology for a concrete use case, several questions may arise for a data publisher.

This paper aims at guiding through the process of developing an ontology to represent data about Key Performance Indicators and their context. To this end, it provides a lightweight method for developing ontologies with advice on design decisions related to the representation of indicators (e.g., how to represent measurements) along with an instantiation of such method in the development of an ontology for modelling energy consumption data.

EUROPEAN ENERGY EFFICIENT BUILDINGS PROJECT CLUSTERING (Private Workshops)

Chaired by Vaclav Smitka, Amires

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Purpose of this 90´ meeting is to discuss details of future collaboration between European projects which are focused on Energy efficient buildings. Representatives of the ENERGY IN TIME, PERFORMER, TRIBUTE and DIRECTION projects will identify possible areas (dissemination activities, technical approach, business model development, etc.) where projects could cooperate and exchange some experiences and information.

Chaired by Andrea Maria Ferrari, D'Appolonia

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Purpose of this 90´ meeting is to further discuss clustering between AMBASSADOR and RESILIENT FP7 projects. Both of them are funded from FP7-EeB.NMP.2012-1 call topic "Interaction and integration between buildings, grids, heating and cooling networks, and energy storage and energy generation systems" and have been closely collaborating for more than one year. The collaboration has been narrowed to two specific topics – optimization and district modelling – where the exchange and sharing of information and results bring the highest impact to further development and progress.

Innovation Cooperation between European projects helps to achieve better results due to information and data exchange. It also contributes to better dissemination of the gained results and increasing of the public awareness.

Chaired by Vaclav Smitka, Amires

TRIBUTE	Take the energy bill back to the promised building performance
PERFORMER	Portable, exhaustive, reliable, flexible and optimized approach to monitoring and evaluation of building energy performance
ENERGY IN TIME	Simulation based control for energy efficiency operation and maintenance
DIRECTION	Very innovative and cost-effective energy efficiency technologies for the achievement of very low energy new buildings

Chaired by Andrea Maria Ferrari, D'Appolonia

RESILIENT	Integrated concept for optimized energy management at district level
AMBASSADOR	Flexible buildings to make eco-friendly districts

ENERGY POSITIVE DISTRICTS / SMART CITIES (Workshop)

Chaired by Mikel Larrañaga, IK4-Tekniker

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The European energy consumption can be divided in three big sectors: transport (32%), industry (27%), residential and services (37%). These sectors are mostly located in urban areas, due to the fact that the demographic trend is evolving to these locations. In order to stop the increase of the energy consumption, the concept of energy positive District/Smart City must emerge.

This workshop builds on four different relevant topics where the energy positive District/Smart City must rely on:

- Data Models
- User / Stakeholder Involvement
- Business Models
- Evaluation Framework

The workshop will identify improvement areas, lessons learned, and explore synergies and collaboration opportunities in order to achieve a common way to define the activities that Districts/Smart Cities should follow to become more energy efficient by exploring synergies and collaboration opportunities between European projects in order to evaluate, assess and improve energy performance of districts and cities. Based on this common approach, guidelines and roadmaps will be established in order to be more efficient and effective.

The target audience could be composed by researchers, developers, industrial adopters and representatives of energy companies that have interests in last research performed in the EU in the Smart City energy context.

Projects

AMBASSADOR	Autonomous Management System Developed for Building and District Levels
BESOS	Building Energy Decision Support Systems for Smart Cities
CityOpt	Holistic simulation and Optimization of energy systems in smart cities
iURBAN	The iURBAN tool will address increasing market demands for cheaper, cleaner energy services.
INDICATE	Indicator-based Interactive Decision Support and Information Exchange Platform for Smart Cities
SmartKye	Smart Grid Key Neighborhood Indicator Cockpit
URB Grade	URB-Grade: Decision Support Tool for Retrofitting a District, Towards the District as a Service
Ready4SmartCities	ICT roadmap and data interoperability for energy systems in smart cities

EVALUATION FRAMEWORK (Workshop)

Chaired by Marie Tatibouët, Nice Côte d'Azur
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REPUBLIC-MED project "Retrofitting public spaces in intelligent Mediterranean cities" aims to develop and promote a new methodology for improving technical / economic studies for the refurbishment of public buildings and open spaces. Inefficiencies of current national methods applied for retrofitting purposes have been identified and a joint methodology to overcome them will be proposed. The approach includes experimentation through pilot studies in various typologies of public spaces.

The proposed workshop will present the REPUBLIC'MED project progress, with a focus on the French and Croatian demo cases (3 public buildings and 2 open spaces) located respectively in Nice Côte d'Azur, France and Zadar, Croatia.

Agenda

Part 1: Presentations

1. REPUBLIC'MED project overview
2. Identification of REPUBLIC'MED pilot sites according to segmentation criteria used to benchmark the NCA buildings and open spaces stock
3. Brief presentation of the public buildings and open spaces selected by NCA and Zadar cities partners
4. Presentation of the REPUBLIC'MED methodology and its implementation by French technical partner (TIPEE) and Croatian Technical partner (EIHP)
5. Presentation of French retrofitting measures selected and modeled for the NCA pilot (first results)

Part 2: Open Debate and Question Raising

The second portion of the workshop will be guided / moderated toward the following issues: relevance and feasibility of selected retrofitting measures for the NCA pilot, replication potential of the proposed approach & methodology, etc.

DATA MODELS (Tutorial)

Chaired by Filip Radulovic, Universidad Politécnica de Madrid

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The Linked Data initiative is the cornerstone of the new generation of the World Wide Web, called the Semantic Web, and a large number of both private and public companies and institutions from various domains are aware of its benefits and have already transformed their data into Linked Data, or have done so with data not coming from their institutions. However, this is not the case in the energy domain, since the number of organizations that have their data in the Linked Data form is rather low. One of the main reasons for this is the fact that energy companies and researchers do not have the required knowledge and know-how related to Linked Data generation, or simply are not familiar with the Linked Data initiative and the benefits that it provides.

This tutorial aims to provide to people interested in publishing online energy-related data detailed guidelines for the generation of their data as Linked Data. Besides giving theoretical backgrounds and a detailed theoretical description of the whole process and its steps, this tutorial will also actively engage its participants; they will be able to follow on their own all the steps of the generation process. This will help in gaining better insight into such process and, hopefully, higher benefit for all the participants. This tutorial is supported by the Ready4SmartCities (ICT Roadmap and Data Interoperability for Energy Systems in Smart Cities) FP7 Coordination and Support Action. It will provide to its participants knowledge about the Linked Data initiative and the necessary know-how in order for them to apply such gained knowledge and produce their own Linked Data. Since, according to our research, energy companies are mostly not familiar with Linked Data or they don't have firm knowledge about it, this tutorial will help these companies to adopt and benefit from the Linked Data initiative, which is a cutting-edge technology in today's World Wide Web.

Participants of this tutorial will benefit in several ways. They will:

- Be introduced to the Linked Data initiative and the benefits this initiative can bring to their organizations
- Gain knowledge about the Linked Data generation process
- Be introduced to Linked Data generation through a complete step by step example
- Gain practical knowledge applicable in the organizations they work

Agenda

Part 1: Presentations

- Introduction to ontologies and Linked Data
- Data analysis and selection
- Resource naming strategy definition
- Ontology development
- Ontology evaluation
- Data source transformation
- Linking with other datasets
- Linked Data evaluation

Part 2: Questions and Discussions

IDEAS
(Private Workshop)

Chaired by Tracey Crosbie, Teesside University
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The objective of the workshop is to facilitate a synergy of the different innovative business models to underpin EPNs developed by the projects in different EU countries around the table to inform an understanding of how utility companies across Europe can be profitably engaged in the development and operation of EPNs. The IDEAS project aims to develop and validate the technologies and business models required for the cost effective and incremental implementation of energy positive neighbourhoods (EPNs). These include:

- A neighbourhood energy management tool: to optimise energy production and consumption;
- User interfaces: to engage communities and individuals in the operation of energy positive neighbourhoods;
- A decision support urban planning tool: to optimise the planning of neighbourhood energy infrastructures;
- Business models: to underpin energy positive neighbourhoods that engage end users, public authorities & utilities.

The tools and elements of the business models developed will be demonstrated at two pilot sites: part of a University campus in Bordeaux, France and a newly built residential area in Porvoo, Finland. In line with wider EU research EPNs are defined in the IDEAS project as neighbourhoods in which the annual energy demand is lower than energy supply from local renewable energy sources . However the concept underpinning the notion of an EPN, in the IDEAS project, is to encourage the local consumption of the electricity produced by distributed renewable energy generation (DREG).

Projects

IDEAS	Autonomous Management System Developed for Building and District Levels
Odysseus	Building Energy Decision Support Systems for Smart Cities
CityOpt	Holistic simulation and Optimization of energy systems in smart cities
EEPOS	The iURBAN tool will address increasing market demands for cheaper, cleaner energy services.
INTREPID	Indicator-based Interactive Decision Support and Information Exchange Platform for Smart Cities

The workshop will begin by clarifying the approaches taken in the different projects to understanding the concept of an EPN. It will then move on to explore the key services and physical infrastructures required for an EPN and the possible revenue streams for traditional utility companies and ESCOs in implementing and maintaining these physical infrastructures and supplying these services. The workshop will also seek to inform an understanding of how the current policy and regulatory approaches in the EU impact on the feasibility of the development of financially stable business approaches to the development of EPNs.

European Business and Innovation Centre of Nice Côte d'Azur (Site Visit)

On October 3, SP2014 delegates are invited to visit the European business & innovation centre of Nice Côte d'Azur From 09h30 to 11h30, the delegation will be able to meet innovative companies involved in energy efficiency. Activities including 15-minute speed meetings, networking & demos have been scheduled with each of these organisations.

- QUALISTEO
- VULOG
- ADVANSOLAR
- VERTECH GROUP
- SUSTAINABLE DESIGN SCHOOL
- ECOLAB (a Fablab hosted by Nice Côte d'Azur and the Sustainable Design School).

TEAM CÔTE D'AZUR

www.investincotedazur.com

About Sustainable Places 2014

Sustainable Places 2014 took place in Nice, on October 1-3, 2014 with the support from the European Commission, ECTP / E2BA, Nice Côte d'Azur Metropolis, Delta Dore, Team Côte d'Azur, Cities Today and Insight Publishers.

This second edition was organized by the RESILIENT and PERFORMER projects. It focused on energy efficiency at building, neighbourhood, district and city levels. It covered research and innovation projects and initiatives across the construction value chain.

This open research forum turned out to be a key opportunity for delegates to access up-to-date information, assess outcomes from the most advanced research and innovation projects, discuss possible synergies, and envision possible standards evolution.

The event included 2 thematic sessions, 2 technical sessions, 1 workshop organized by the European Commission DG Connect on energy efficient buildings KPI's, 6 project workshops, the EuropIA.14 colloquia, a visit of the European business & innovation centre of Nice Côte d'Azur, and a sightseeing tour in Nice.

It particularly aimed at fostering collaboration between FP7 projects involved in research and innovation towards energy efficient buildings, districts, and cities.

Event partners