2018

EeB PPP Promising Technologies

Urban and district scale solutions

ENERGY EFFICIENT BUILDINGS

AN ECTP COMMITTEE FOR INNOVATIVE BUILT ENVIRONMENT

EFFESUS decision support tool

Decision support for energy efficiency measures in historical buildings

Monitor interface of EFFESUS Decision Support Tool

The EFFESUS Decision Support System (DSS) aids city planning experts in making strategic decisions to enhance energy performance of historical and cultural heritage buildings at urban scale.
The DSS is an ecosystem (methodologies, tools) for evidence-based diagnosis and decision-making, to prioritise retrofit measures improving energy performance of historic districts. It offers a user-friendly web application using information from multiscale data models to perform a categorisation of the building stock and support the selection of representative historical district buildings, to provide decision support on energy renovation packages.

The DSS uses an embedded expert system guiding the user to select best strategies for historic district energy retrofit. It targets municipalities and urban managers in charge of improving the sustainability of historic districts, guiding the stakeholders in this process as they usually coordinate the first phase of the retrofitting process for historical buildings and districts. The DSS is mostly standalone with some features requiring a degree of expertise from the user in relation to cultural heritage assessment and energy efficiency. Besides the technical staff of municipalities, urban managers, architectural and engineering firms that provide energy services and consulting in historical buildings energy renovation, other stakeholders are grant managers (e.g. energy agencies), owners, investors, solution providers, building users, local/ regional authorities, etc..

To maximise the application possibilities, the DSS establishes different decision-making levels depending on the information availability and the process stage. Strategies are selected by using a multiscale heritage significance impact assessment method to estimate the applicability of the solutions, in combination with multi-criteria methods to rank the strategies according to user preferences. The DSS provides the estimation of impact indicators at district level, related to the energy demand and carbon emissions reduction, thermal comfort and indoor air quality improvement and the economic feasibility of the proposed retrofitting solutions.

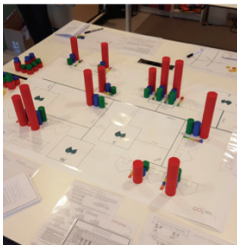
- **Standard categorization of historical buildings**
- **Step-by-step guidance in the planning of energy efficiency measures of historical buildings**
- **Streamlined decision making process for historical building refurbishment**
- **Traceable and repeatable refurbishment decision making which increased assurances on the results and the resaons behind the selection**
- **Consideration of legal and regulatory aspects via targetd questionnaire**
- **Expert system assists the stakeholders in the decision making process.**
- **Integrations with multi-scale data modelling for decision support on detailed and refined set of strategies at building level**

- Technical completion: less than 1 year
- Can't be used in new constructions
- Can be used in renovation/ retro-fitting
- Compatible with existing solutions

Project: EFFESUS, www.effesus.eu

Contact: Isabel RODRIGUEZ-MARIBONA, TECNALIA, isabel.rodriguez-maribona@tecnalia.com

Go2Zero
Serious role-play game for district carbon emissions reductions



In the serious game Go2Zero stakeholders involved in the local energy transition experience what it takes to 'go to zero', to make existing neighbourhoods energy efficient and carbon emission free. In the interactive, multiplayer game session you will experience how different measures contribute to the local objectives, as well as your individual goals.

The Go2Zero game simulates stakeholders at any level of the energy transition process. The players are challenged to plan and execute strategies to reach the game objectives, individually or by collaborating with other actors in the neighbourhood, district, city.

In a typical Go2Zero game session players start by determining your strategy: what are the personal preferences of the players and what approach will they take to achieve their objectives. During game play players will execute your strategy and try to achieve their objectives interacting with other players. The session concludes with a debriefing and reflection on your results. Go2Zero considers the following actors, objectives and measures:

- Actors: governments, utilities, residents, contractors, housing corporations.
- Game objectives: reduce carbon emissions, reduce energy consumption, increase renewable energy.
- Measures: energy saving, energy production, and energy distribution technologies.

Different phases in the energy transition pose different challenges to stakeholders. To facilitate different needs. One of the complicated aspects of the energy transition is that no actor has the resources, authority and availability to make the district CO2 free on his own. Go2Zero includes a variety of actors, each with its own resources and measures to contribute to the energy objectives of the district.

The game provides feedback on two levels. First, all individual players get insight in the stakeholders involved in the process and the possible measures they can take. Second, players receive feedback on the joint performance of different measures in the district, such as energy demand, renewable energy share, bank account, and grid performance (outages). During the game players can observe how they succeed in achieving the game objectives. The game experience will help local stakeholders to develop strategies and actions for the local energy transition.

- **It is a board game, instead of the normal smart-app solutions**
- **The game is actually a workshop opportunity to engage, interact and train the different stakeholders in the challenges of reducing CO2 emissions**
- **It is not intended as a stand-alone tool but rather as part of a training and consultancy service**
- **The game incorporates all roles: home owners, tenants, housing associatons, technology companies, green energy provider, municipalities, network operators.**
- **It makes people think and reason on how to articualte and work together towards achieving the green energy transition in a sustainble way.**

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

Project: City-Zen,
www.cityzen-smartcity.eu/home/games/go2zero

Contact: Mats DE RONDE, DNV-GL,
mats.de.ronde@dnvgl.com

IFC-1832 Linear fresnel collectors and heat storage system

Solar heat generation and storage at mid-high temperature range 90ºC<T<300ºC

IFC-1832 is a solar thermal collector for medium temperature applications. The primary reflecting system integrates 18 high quality silver-plated mirrors, which redirect the solar radiation towards a secondary metallic mirror.
Finally, the sunrays are concentrated into a vacuum glazed absorber, where the heat transfer fluid – either pressurized water or thermal oil - is heated at the requested temperature.
Each module reaches a thermal peak generation of 12.2kW under reference conditions, which corresponds to 530 W/m2 in terms of collector aperture area, and 345W/m2 in terms of footprint area. The collector is integrated by an innovative thermal storage, which employs a special mixture of molten salt. The thermocline design makes the storage compact and flexible.
The main advantages of the system are:

- compact and robust linear concentrating solar collector specifically designed for installation in building integrated sites, including roofs.
- temperature range from 150°C to 300°C, allowing efficient solar heating&cooling approach
- flexibility of integration in industrial processes and district heating&cooling applications, thanks to the compact thermocline storage.

- **Turn-key solution for industrial heating and cooling including energy storage**
- **Compact and robust linear concentrating solar collector specifically designed for installation in building integrated sites, including roofs.**
- **Temperature range from 150°C to 300°C, allowing efficient solar heating&cooling approach.**
- **Patent pending innovative optical design and mounting system.**
- **Specifically designed compact heat storage system to decouple operations from the sun shining times.**

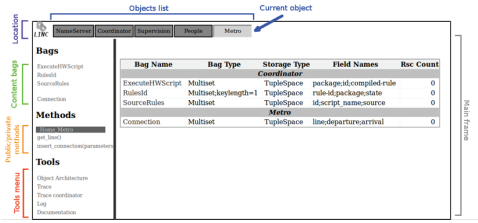
- Technical completion: less than 1 year
- Can be used in new constructions
- Can be used in renovation/ retro-fitting
- Compatible with existing solutions

Project: ZERO-PLUS, www.zeroplus.org

Contact: Filippo PAREDES, Idea srl, fparedes@ideasrl

Link coordination middleware

Resource-based coordination environment for heterogeneous distributed systems



Monitor interface of LINC

The LINC coordination environment is an easy to set-up, reliable and secure distributed system for resource coordination that provide applications with transactional guarantees that ensure their reliability at run-time. It is usually used for distributed applications, possibly large scale, that may include Cyber-Physical Systems (CPS), the Internet of Things (IoT) and Wireless Sensor and Actuator Networks (WSAN).

LINC has proven very efficient in the building automation domain during the H2020 TOPAs project where several demonstrators have been successfully built to monitor and control automatically the buildings.

Thanks to LINC, data collection on several buildings in Ireland and France was easily setup to continuously analyse the buildings' behaviour (about 1000 data points updated every 1 to 10 minutes), with seamless integration of off-the-shelf sensors in addition to the existing ones, which were already known or connected to the Building Management System (BMS). Moreover, LINC was able not only to access the information from the BMS, but also to send commands to the BMS, make it possible for Facility Managers to deploy their own advanced (or rule-based) controllers for the buildings.

A graphical web interface allows Facility Managers to edit BMS rules independently of the actual BMS system, and to write building rules across multiple BMS with the same drag and drop interface. Theoretical work has been performed to make the tool automatically validate and generate correct rules, based on domain specific knowledge or formal models such as Discrete Controller Synthesis (DCS). This ensures to avoid system inconsistencies that can result from communication errors or device failures, and conflicting decisions, including those caused by environment dependencies.

Finally, all the work achieved so far has demonstrated the maturity and versatility of the LINC coordination environment and has led to the creation of a CEA spin-off, called Bag-Era (www.bag-era.fr), which is currently exploiting the technology in the field of smart buildings.

- **A uniform abstraction layer allowing software services, hardware devices, and user interactions to be manipulated with equal ease**
- **A rule-based coordination environment with a transition system to ensure transactional reliability and system consistency**
- **A reduced applicative code, faster to debug, easier to maintain, upgrade and extend**
- **A comprehensive set of design and debugging tools, and tools to monitor, introspect and update running applications without restarting them**
- **A set of ready to use components (reusable components, domain frameworks)**

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

Project: TOPAs, Tools for cOntinuous building Performance Auditing, www.topas-eeb.eu

Contact: Olivier ANTONI, CEA, olivier.antoni@cea.fr

For more information on
ECTP activities and benefits:
ECTP Secretary General
Rue d'Arlon 63-67
B-1040 Brussels
secretariat@ectp.org
www.ectp.org

This technology brochure highlights the highly promising innovations from selected co-funded European projects under the 7th Framework Program (FP7) and the 8th Framework Program (H2020).

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

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

ECTP
INNOVATIVE BUILT ENVIRONMENT

European Commission