



**RESSEEPE NEWSLETTER**  
ISSUE 02 - JUNE 2015

# PROJECT SUMMARY

# RESSEEPE NEWSLETTER

## RESSEEPE

### RETROFITTING SOLUTIONS AND SERVICES FOR THE ENHANCEMENT OF ENERGY EFFICIENCY IN PUBLIC EDIFICATION

rESSEEPE will bring together design and decision making tools, innovative building fabric manufacturers and a strong demonstration program to demonstrate the improved building performance through retrofitting. The core idea of the rESSEEPE project is to technically advance, adapt, demonstrate and assess a number of innovative retrofit technologies. Reductions in the area of 50% will be achieved in terms of energy consumption. A systemic process will be also implemented that will allow the selection of the best possible retrofitting mix, customised to the needs of the particular building.

### INNOVATIVE TECHNOLOGIES AND MATERIALS TO BE INTEGRATED IN THE RETROFITTING PROCESS

- Envelope Retrofitting: Ventilated Facades, Aerogel-based Superinsulating mortar, Wooden Insulating Wall Panels and VIP Panels.
- Integration of RES: PV Energy, Thermal Collectors
- Energy Storage Systems: Thermal storage and PCMs
- Nanotechnologies and smart materials: EC/PV Windows
- ICT: Strategies at building and district level
- Intelligent Building Controls: HVAC systems

### THE SCIENTIFIC AND TECHNICAL OBJECTIVES OF THE RESSEEPE PROJECT ARE THE FOLLOWING

- To set up a diagnosis methodology for an integrated renovation of public edification at building and district level.
- Innovative development and enhancement of retrofit technologies that will be able to achieve energy savings in the area of 50%.
- Development of a systemic view for selection of the most empowering retrofitting mix: Net-zero energy renovation of existing public districts.
- To validate the RESSEEPE technologies in three different demo-sites.

## DEMO SITES

The RESSEEPE technologies will be validated in three different demo-sites:

- Coventry (UK)
- Skellefteå (SE)
- Barcelona (ES)

Image (Right): Coventry's demo site; (Coventry University).



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RESSEEPE ON SHOW AT EUROPAVECKAN



RESSEEPE ON SHOW AT EUROPAVECKAN

## Future Events

- 08 / JULY: ENERGY EFFICIENCY IN BUILDINGS AND BUILDING INTEGRATION PHOTOVOLTAICS (BIPV): WHERE SUSTAINABILITY MEETS AESTHETICS, LONDON, UK.
- 16-18/ SEPTEMBER: THE SECOND RESSEEPE WORKSHOP, SAVONA, ITALY,

## INTERNATIONAL CONFERENCE ON SOLAR ENERGY AND BUILDINGS EUROSUN

Last September in 2014, the heat and mass transfer technological center (cttc) of UPC – BarcEloNa Tech participated in the International conference on Solar Energy and Buildings EuroSun, presenting a paper entitled: “a multifunctional ventilated façade model within a parallel object oriented numerical platform for the prediction of the thermal performance of buildings”, within the framework of WP3 task 3.3 Solar Strategies for Energy and Heat Recovery. EuroSun conference is a significant European event of International Solar Energy Society (ISES), clearly oriented to solar energy and solar buildings as fundamental pillars to achieve a transition to a renewable energy society. It presented the opportunity to bring light to the latest developments from scientists, engineers, architects and representatives from industry and business to present and discuss the latest research results, technological developments and business opportunities in solar energy. UPc had the opportunity to present the numerical results of multifunctional ventilated façade within the framework of RESSEEPE project as one of the retrofitting solutions to be implemented.

government, consulting offices, laboratories and universities to reach an audience of 500-600 participants from over 30 countries. The aim of these conferences are focused primarily on research and advanced development of components and systems and are co-sponsored by the Ray W. Herrick Laboratories, ACCA, AHRI, ASHRAE, IIR, the USNCR/IIR and the USGBC. UPC had the opportunity to present the Indoor Air Quality Analysis developed within the framework of RESSEEPE project as one of the basic criteria to be used on retrofitting solutions.

## PUBLICATIONS

1. [Sakkas, N. , Valls, J. , Daskalakis, C. and Kaltsis, E. (2015) **Non Intrusive U Value Metering. Open Journal of Energy Efficiency, 4, 28-35. doi: 10.4236/ojee.2015.42003**].

This paper introduces an easily deployed, plug and play, contact less technology, able to provide a reasonable approximation of the building element U value and its variation with external air speed as well as an accurate estimation of the U value change in case of a shell (wall or window) retrofit.

2. [Nanoscale, 2015, 7 , 7174-7177].

Technology partner INSTM recently published a communication in Nanoscale; a high impact factor Journal of royal Society of chemistry. the communication is a novel type of WO<sub>3</sub> nanostructure, i.e. nanorolls was obtained as a self-assembled thin film on a transparent conductive substrate. the mild conditions of preparation, avoiding the use of hcl, result in an eco-friendly and low cost hydrothermal method with reduced crystallization time. FESEF and HR-TEM show that WO<sub>3</sub> nanocrystals are made of rolled nanoflakes with a telescope-like appearance at their tip. for their nano-porosity, electrochemical accessibility, good adhesion to substrates and the envisaged presence of nanocavities between the WO<sub>3</sub> layers, these materials hold tremendous promise in nano-electronics, electrochromic devices, water photo-splitting cells, li-ion batteries.

## INTERNATIONAL HIGH PERFORMANCE BUILDINGS CONFERENCE

Last July 2014 the Heat and Mass Transfer Technological Center (CTTC) of UPC – BARCELONA TECH participated in the International High Performance Buildings Conference that took place in Purdue University (Indiana) USA, presenting a paper entitled:” Analysis of IAQ based on modelling of building envelope coupled with CFD&HT room airflow”, within the framework of WP5 Task 5.2 Indoor Environmental Quality. Purdue Conferences are 3 parallel events related with refrigeration, air-conditioning and high performance building at the same time, becoming an excellent opportunity for practitioners and researchers in industry,

## RESSEEPE ON SHOW AT EUROPAVECKAN

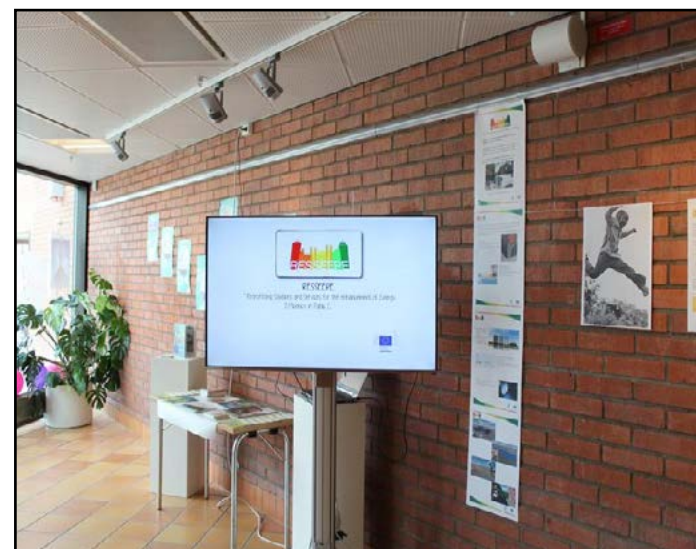
Europaveckan - “European week” - is a regional initiative in the northernmost regions in Sweden, where a number of activities are performed to spread information about the European Union. It is organised by the Europe Direct information offices in May.

In 2015, the RESSEEPE project was presented in the showroom of the city hall in Skellefteå, on Wednesday May 6th, together with the TEN-T project BioGaC. Project representatives handed out folders, demonstrated technology samples and broadcasted the project videos.

The showroom reaches both employees working in the city hall (such as main decision makers) and citizens that visit the city hall. The exhibition area is highly visible next to the customer service desk and attracts many visitors.

During the exhibition, the main message delivered was that using new innovative technologies and methodologies, we can lower the energy consumption and decrease the CO<sub>2</sub> emissions of public buildings. This is an area of great interest for the citizens, and the response from the visitors was good.

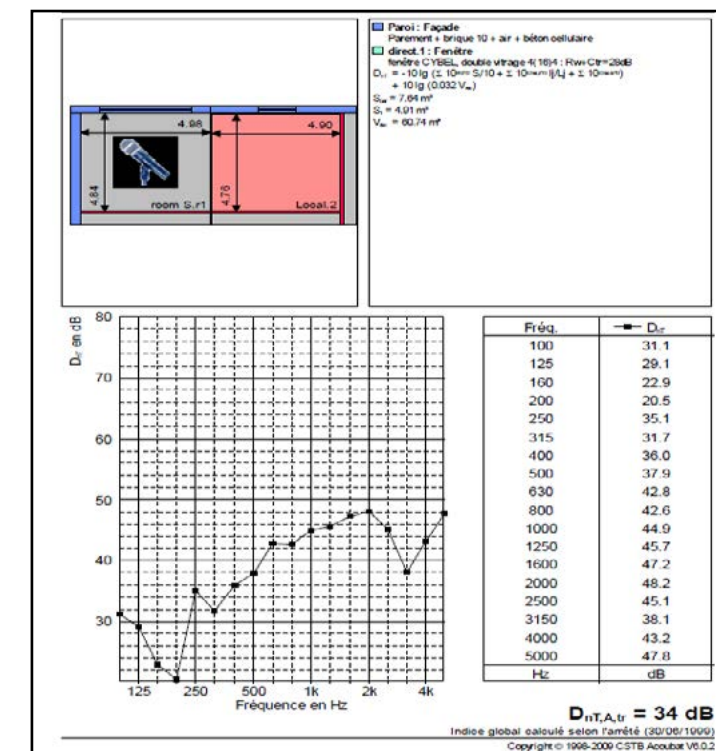
With the Europe Direct information offices marketing their activities, the project information (and website) was also spread through other channels such as social media during the week, giving an even wider impact.



RESSEEPE on show at Europaveckan

## IEQ STATUS IN DEMO SITES REVEALS POTENTIAL FOR IMPROVEMENT

Partners involved in assessment of Indoor Environmental Quality of RESSEEPE demo sites (UPC, Nobatek, CIM Foundation, ASCAMM Foundation) have concluded that there is a potential for improvement in all aspects considered (air quality, temperature, humidity, light, acoustics). Particularly, 2 rooms for each one of the 4 demo sites have been assessed. As regards acoustics, the acoustic performance of each building element has been calculated with Acous Stiff® and VA ONE®. The results obtained from this step have been introduced in Acoubat® to obtain the noise level difference of each room. The results obtained show that most of the rooms simulated in the study have an acoustic performance good enough to pass the acoustic regulations in France and Spain. However, the noise level difference values obtained from these simulations are very close to the minimum acoustic limits required. On the other hand, the sound insulation performance of the exterior opaque walls is good in all the buildings simulated. The consequence of the poor global sound insulation index is mainly due to the influence of the windows.



Graph showing the results for a room in Sabadell Hospital.

# VALIDATION OF THE PHOTOVOLTAIC (PV) POWERED ELECTROCHROMIC (EC) WINDOW PROTOTYPE

An electrochromic window (EC) can change its light transmission properties in a controlled and reversible manner when a small electric current flows through the device. This technology provides a dynamic control on the impinging sunlight and thereby reduces the energy expenses by 19% and 48% in the cooling and lighting demand respectively.

The most suitable option that a building's windows could benefit from in regards to solar control could be a Ec smart window with no external wiring and power source. an integrated photovoltaic (Pv) is the most desirable choice to power the Ec window, particularly since the characteristics features of both Pv and Ec technologies are mutually compatible. A simplified block diagram of principal parts and functions of the standalone Pv powered EC (PV/EC) window is shown in figure 1, where the battery stores energy when there is an excess and provide it when required. The control unit tracks the maximum power point from PV module, providing wireless communication and regulates the battery state of charge.

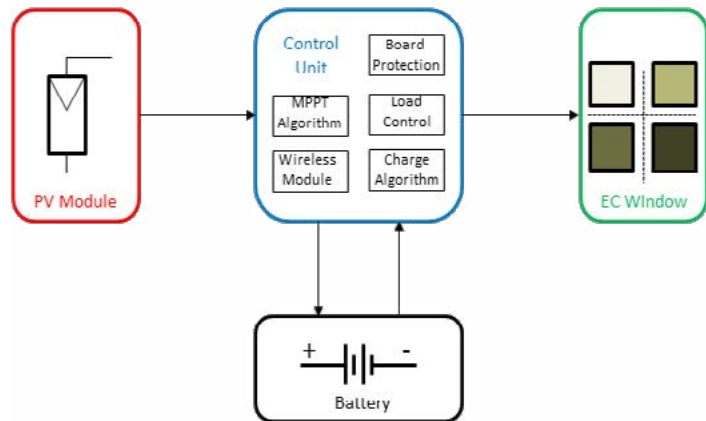


Figure 1: Block diagram of a stand-alone PV powered EC window

The interface between the end-user and the Ec windows is based on a communication protocol between the window's electronic control and the global user's control that it is characterized by its versatility network hierarchy and low power consumption. the design, characterization and dimensioning of each individual component were accomplished within the subtask 3.3. detailed description can be found in deliverable d3.2. In this communication we report about the manufacturing of components and the validation of

the functionalities carried out within subtask 5.8. Several tests were conducted in order to characterize and validate the PV powered EC window prototype: communications, control algorithm, static and dynamic MPPT performance, battery charging and discharging cycles and manual and automatic color transitions were analysed and validated under indoor and controlled conditions. Figure 2 depicts the PV/EC window prototype and its components during the evaluation tests at LEITAT facilities last 05.2015.

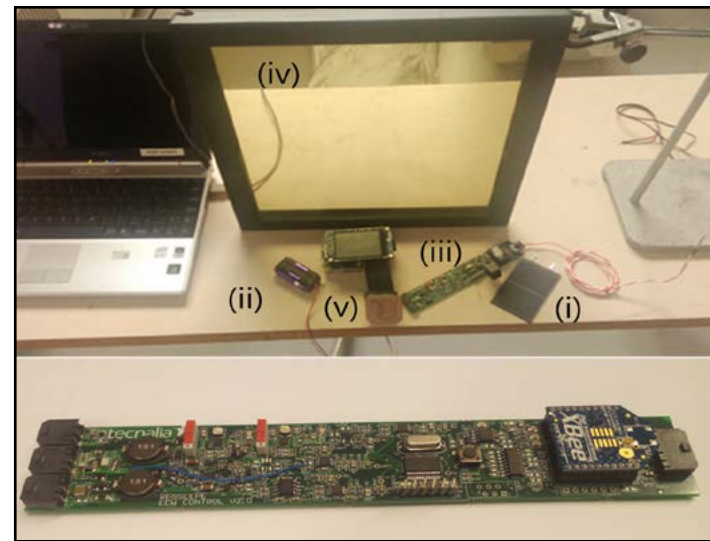


Figure 2. PV powered EC window prototype. (top) general view of components: (i) PV module, (ii) battery, (iii) window's control, (iv) user's interface and (v) EC window. (bottom) close-up view of the window's control.

the energy balance of the prototype was investigated during the color transitions. measurements under one sun of class B solar simulation and 25°C were performed when the Ec smart window was powered at 1.0v during approximately 10 minutes. Figure 3 compares the evolution over time of the energy produced ( $E_{PV}$ ), the Ec energy consumption ( $E_{SUP}$ ) and the total energy consumption ( $E_{Bat}$ ). this last case includes the energy consumption from the wireless communication device and it is, by far, the most significant contribution to the energy consumption and can be drastically reduced and optimized when working in real operation conditions. Figure 3 clearly states that a small PV module produces enough energy to supply the energy demand but further investigations about the autonomy of the Pv/ Ec window prototype will be carried out through the monitoring activities scheduled in subtask 5.9.

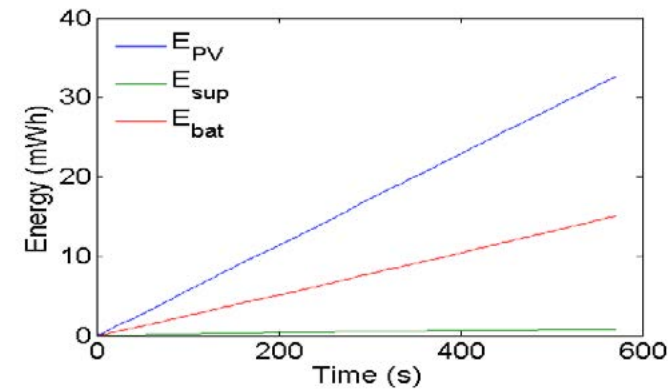


Figure 3. Energy balance in the PV/EC prototype when coloring at 1.0V during 10 min and PV module illuminated at 1 sun.

The main conclusion of the evaluation tests is that the required functionalities in the PV/EC window prototype are successfully implemented. The components of the prototype are currently being embedded in a commercial framework to provide stiffness and comfort for future analysis. Optimizations of the energy consumption and automatic working mode remain the main activities to be carried out under real weather conditions within subtask 5.9. Figure 4 compares two tinted levels in the smart PV/EC window prototype and shows the teamwork involved in the evaluation of the prototype.



Figure 4: Comparison of two tinted levels in the EC window and teamwork involved. The concept idea about the PV powered EC window prototype has been successfully proven within the RESSEEPE framework at laboratory scale and detailed evaluation under real weather condition will be performed in subtask 5.9.

# STAKEHOLDER ENGAGEMENT ACTIVITIES

Stakeholder engagement is a very important part of any building interventions. Coventry University developed user satisfaction surveys to evaluate the user responses to the building in terms of comfort and general condition of the building and building facilities. CU is also in the process of organising stakeholder engagement events that will bring together multiple factions of stakeholders from within the university including staff, students, facilities management and university senior management. Additionally other external stakeholders will be invited in to the events such as representatives from the local planning authorities such as Coventry City Council, Directors of Estate Management from organisations with large built assets such as Universities and the National Health Service and representatives from professional bodies such as Chartered Institute of Buildings, Royal Institute of Chartered Surveyors, Chartered Institute of Building Services Engineers (CIBSE) and Royal Institute of British Architects (RIBA).

The events will be held in August and September for internal and external stakeholders respectively. The event will give us the opportunity to disseminate the ethos of the project and get valuable stakeholder engagement which will be invaluable in managing the building interventions. Dates will be circulated to the consortium in due course for participation.

LET'S GET IN TOUCH

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