$ReCO_2ST$: Residential Retrofit assessment platform and demonstrations for near zero energy and CO_2 emissions with optimum cost, health, comfort and environmental quality

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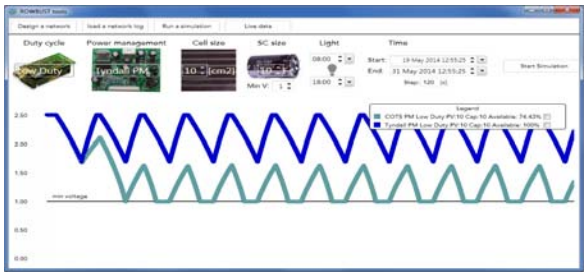
$ReCO_2ST$

Led by Brunel this project brings together academia and industry to develop a 'Retrofit Kit' that can be used to reduce energy consumption by 60-95% in renovated buildings. The Retrofit Kit will bring together a number of advanced, cost efficient, and energy saving technologies – including smart windows with pre-heating and cooling technology, ventilation heat recovery, photovoltaic panels, and nature-based technologies – which can be fitted 30% quicker than typical renovations with a payback period of under 15 years. Four demonstration sites located in the UK, Denmark, Switzerland and Spain will be developed.

Tyndall's role

- For this project, Tyndall's role is to leverage the work completed by a Tyndall-IERC joint project known as RoWBUsT.
- RoWBUsT was a project that was funded by IERC and its goal was to develop an energy harvesting, wireless sensor deployment, assisting simulation tool.
- While creating a simulation tool, Tyndall will also give advice on the use of sensors to gather baseline data, perform monitoring and in some cases provide data that is fed to actuation systems to make better, more informed decisions regarding energy usage.

RoWBUsT



- Each component is characterized, allowing the user the determine the size of the energy harvesting and storage devices.
- For this example, the comparison between a Tyndall PM board and a COTS PM board is shown.
- The simulation is easy to read and shows the daily power availability for each device.

Objectives

- Improve upon RoWBUsT with a more intuitive and detailed application.
- Create a highly intelligent application that has the ability to compare battery life with a battery and/or energy harvesting hybrid system.
- Allow the user to gather data from a wider range of energy sources.
- Design a more user friendly cross-platform application.

Problem Statement

- To effectively improve energy efficiency in buildings requires a large number of sensors (temperature, light, humidity, PIR, CO2) at low cost.
- The Installation of wireless sensors is a challenging task due to the dynamic nature of buildings.
- There is a need for support tools for planning, commissioning and reliably operating wireless sensor networks.

Reasoning

The difficulty to achieve long-term deployment with minimised maintenance is one of the most important issues in the practical utilization of WSN systems. To prolong deployment lifetime when WSN is battery powered, many approaches are considered based on either reducing the power consumption of the mote and/or increasing the capacity of the power source (e.g. battery). However, due to the finite energy capacity, limited lifetime and number of recharge cycles, the COTS battery constrains the deployment lifetime of WSN.

The resultant battery replacements increase the maintenance cost considerably in long-term deployments and any power failures may compromise the system reliability and data integrity.

Efficiency

$ReCO_2ST$ can be seen as the technology to make WSN nodes more energy efficient, however we also see the possibility of having the WSN nodes gather sensory data to make energy management systems more efficient. For example:

- If we gather multiple temperature readings in a room they can be fed to a HVAC/BMS system to refine the control as well as perhaps detect anomalies (e.g. if a window is left open an unusual temperature differential can be detected).
- Alternatively WSN nodes could be used to 'custom build' an ICT sensory platform that feeds data to a simple heating or cooling equipment that otherwise does not have a BMS.

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