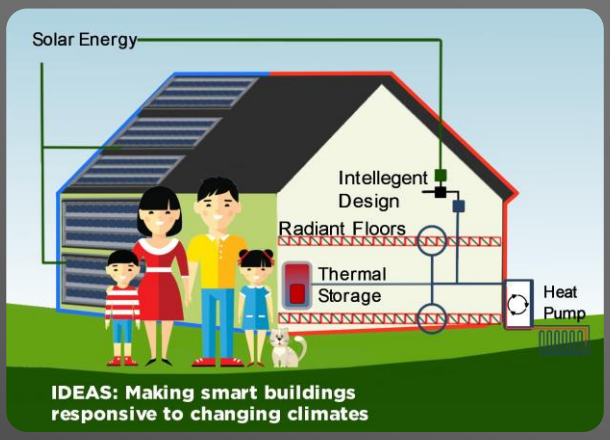
IDEAS NEWS

May 2020

Novel building Integration Designs for increased Efficiencies in Advanced climatically tunable renewable energy Systems

IDEAS project at a glance

IDEAS is an innovative integrated renewable energy system (RES) to cost effectively exceed current RES efficiencies, generating electricity, heat and cooling technologies. The system is optimised for mixed use building types, across various climate conditions, maximising RES output under diffuse solar radiation climate conditions through luminescent and geometric concentrator techniques leading to current solar system efficiencies being exceeded electrically. Thermal enhancement is achieved using enhanced organic phase change materials (PCM) with a passive biomimetic heat transfer mechanism for heat storage and discharge. A heat pump uses waste heat for an integrated underfloor heating and hot water systems This building integrated RES uses advanced control techniques and intelligent design to maximise performance in solar energy, thermal storage and heat pumps.



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IDEAS progress outlined in Ulster University Belfast Workshop

Welcome to the IDEAS Horizon 2020 research projects Newsletter, providing an update on the progress of our work, our findings, and results to inform interested citizens, building energy sector experts, and public housing policy makers.

Professor Sarah MacCormack of Trinity College Dublin leads our team of partners who are applying the latest material sciences and engineering techniques to produce a suite of state-of-the-art solutions for improved energy efficiencies.

Trinity College, Dublin, is developing the IDEAS hybrid solar PV/thermal panel in association with Ulster University. This panel will combine the benefits of Compound Parabolic Concentrators (CPC), a Luminescent Downshifting (LDS) layer, and Phase Change Materials (PCM).

The novel CPC design demonstrated at the partners meeting concentrates the energy of solar rays to achieve additional electrical efficiencies of >15%. The LDS layer will further increase solar cell efficiency and

Partners meeting in Ulster University

offers the opportunity of varying the colour of the cell for additional architectural and aesthetic applications. The PCM backing devised in Ulster University by Professor Ming Huang and her team on the PV panel array also stores **thermal energy** which is distributed by through a heat pump.

The novel IDEAS hybrid panel is being deployed at the University of Ferrara test site. The panels potentially could be deployed on rooftops and building facades across Europe to maximize energy and greatly improve building efficiency.

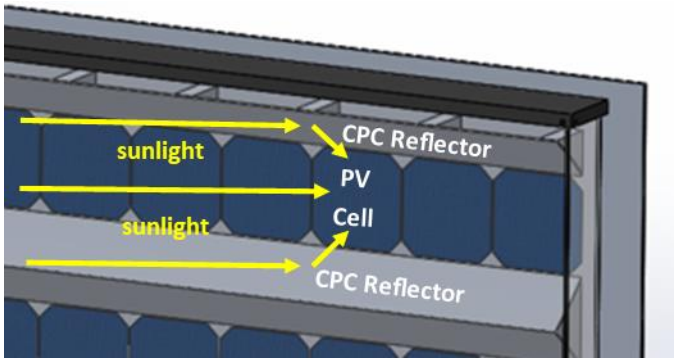
This project is funded by the European Union's Horizon 2020 research and innovation programme under grant agreement No. 815271

Close up of the IDEAS hybrid solar cell array.

The cell characteristics outlined in Belfast University could achieve combined efficiencies of **greater than 40%** of the traditional PV or Solar Thermal systems.

Compound Parabolic Concentrator (CPC)

Professor McCormack working with Anita Ortega in the Civil, Structural & Environmental Engineering, Trinity College, Dublin have produced a reflector array for the panels that redirects additional sunlight, focusing it onto the PV cells. These CPC panels installed on building

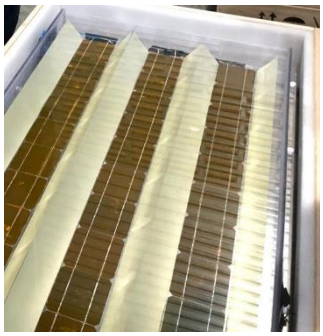


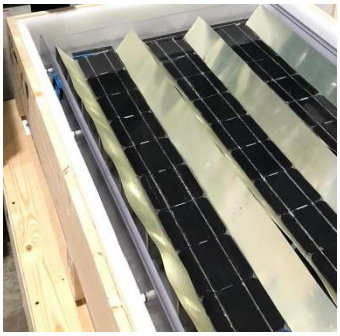
Compound Parabolic Concentrator (CPC) gathering light

facades should operate very efficiently with potential for wider solar generation opportunities.

The LDS: Solar Cells to Dye for

Collaboration between LEITAT, Spain, LNEG, Portugal, and TCD Ireland, a newly developed nano particle dye coating applied to the surface of the PV cells changes the sunlight's wavelength so as to capture yet more energy —up to 20% more. The IDEAS partnership is producing dyes of various colours which will provide aesthetic possibilities which will strengthen the case for deploying the panels on building facades.





PV Cells with orange LSD layer dye (left) and a reference with no dye (right)

PCM: Additional heat trapped and stored

Professor Ming Huang and her team have developed a phase change material backing that maximizes the efficiency of the system to trap heat from the PV panels and, using a unique biomimetic structure, divert this to heat pumps within the building system for the distribution of this thermal energy. This means the IDEAS state of the art Solar panels maximizes the energy output for the space used.

Go to: horizon2020ideas.eu/ to see our video on how the entire IDEAS system works

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