Exemplary Advances

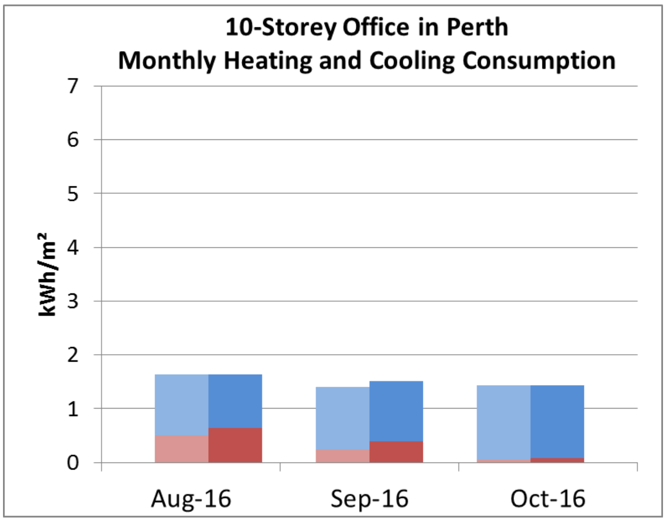
2016 November ***"Exemplary Advances"*** is the newsletter for Exemplary Energy Partners, Canberra. Feel free to forward it to friends and colleagues. Click here to subscribe or unsubscribe. Feedback is most welcome.
Past editions of ***"Exemplary Advances"*** are available on our website.

Exemplary Weather and Energy (EWE) Index[i] - October 2016

Monthly tabulation and commentary relative to the climatic norm – the Reference Meteorological Years

2016 October	Canberra		Perth		Sydney	
	Heat	**Cool**	**Heat**	**Cool**	**Heat**	**Cool**
10-Storey	27%	-5%	N.A.	-3%	N.A.	-2%
3-Storey	17%	-6%	N.A.	-5%	N.A.	-3%
Supermarket	-1%	-53%	N.A.	-39%	N.A.	-23%
Solar PV	-31%		24.3%		15.8%	

Canberra had cooler and cloudier than average weather in October. The PV panel had an energy yield that was over 31% lower in this weather. The mean maximum and average temperatures were lower by 3.6°C and 0.8°C respectively. Only the minimum was higher by 0.1°C. The 10-storey office East facing zone had over 12% less cooling consumption over the long term average due to the cooler and cloudier weather. The cooling consumption in the North and West facing zones were around 15% less than the average because the weather was cloudier than average. The South facing zones consumed around 22% less cooling than the norm due primarily to the lower air temperatures. The supermarket heating consumption was lower by 1% but the actual values were negligible.



Perth also had cooler but sunnier than average weather in October. The mean maximum and average temperatures were both lower by 0.5°C. Only the minimum was higher than the average by 1.7°C. All the commercial building models had lower than average cooling consumptions under this weather. It was also windier. The 10-storey office South facing zone had over 20% less than average cooling energy consumption due to the cooler and breezier weather. The North facing zone also consumed over 15% less cooling than the climatic norm. The PV panel efficiency benefited from this weather and therefore the energy yield was 24.3% higher.

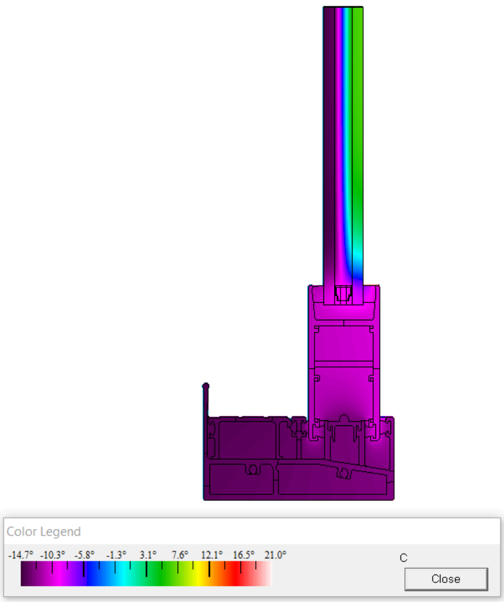
Sydney had cooler than average weather in October as well. The mean maximum, minimum and average were lower by 2.7°C, 0.9°C and 0.6°C respectively. The cooling consumptions of our 3 commercial building models were lower than the average as a result. It was sunnier than the average as well, which improved the solar panel efficiency and hence the energy yield was 15.8% higher. The 10-storey office South facing zone had over 10% less than average cooling energy consumption due to the cooler weather. The North and East facing zones also consumed 6.5% and 3.6% less cooling than the climatic norm.

Simulating Highly-Conducting Window Frames in Building Models

At [Building Simulation 2017](), Exemplary Energy associate, Dr **Peter Lyons**, will be presenting a detailed analysis entitled *"A New Method of Representing Highly-Conducting Window Frames in Building Simulation Models"* with his co-researcher D. **Charlie Curcija** (Ph.D.) from the Windows and Envelope Materials Group at Lawrence Berkeley National Laboratory (LBNL) in California, USA.

Highly conducting metal window frames are, alas, still common in many countries. At standard (US) NFRC and AFRC environmental conditions, such frames typically exhibit actual U-factors exceeding 6 W/m².K and these can be as high as 15 W/m².K. Such U-values are routinely and correctly calculated using finite-element heat transfer software and have been extensively validated by physical testing using guarded hot boxes. Calculated heat transfer includes information about both the projected area of the frame (in a vertical plane in the case of sills and heads) and the total, "wetted" area of the exposed frame surface. Even when the frame's thermal resistance (from outside surface to inside surface) is negligible – true for most unbroken metal frames – the apparent, simple one-dimensional (1-D) U-factor cannot exceed 6 W/m².K for both the parent wall and also the glazing within that frame. **Yet we know that real frame U-factors can be more than twice this value.**

Window-frame film coefficients, both exterior and interior, are typically larger than the film coefficients applying to the same window's parent wall. This is because window frames and other complex 2-D shapes exhibit increased convective and radiative heat transfer, similar to that on, say, a finned heat sink or on the cooling fins of an air-cooled engine. This "fin effect" can result in very large film coefficients and energy transfers, both outdoors and indoors.



At present it is not computationally feasible to perform 2-D, finite-element modelling on every framing element in a building, for all 8760 hours of the year. The next best option is to estimate the real-world, frame film coefficients based on knowledge of the frame geometry, and use these "fin-inflated" coefficients to calculate the "true" frame heat flow, rather than using standard 1-D coefficients applying to the parent wall.

Mandatory Home Energy Rating in the ACT for 212 Months

Mandatory rating and disclosure of the energy efficiency of existing homes at the time of sale has been law in the ACT since April 1999 and we have tracked the $/star value correlation since then. Recently, we have disaggregated the data by housing type and will be publishing those results soon.

Home Energy Rating OptiMizer – HERO - available for free trial

The service is now available for AccuRate and BERS Pro files with a version to handle FirstRate5 files under advanced development. Contact us for your free trial.

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[i] Exemplary publishes the EWE for three archetypical buildings and a residential solar PV system each month; applying the RTYs to EnergyPlus models developed using DesignBuilder for a 10-storey office, a 3-storey office and a single level supermarket as well as an SAM model of a typical 3 kW_{peak} solar PV system designed by GSES. All values are % increase/decrease of energy demand/output relative to climatically typical weather. Especially during the mild seasons, large % changes can occur from small absolute differences.