Exemplary Advances

2020 April ***"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.

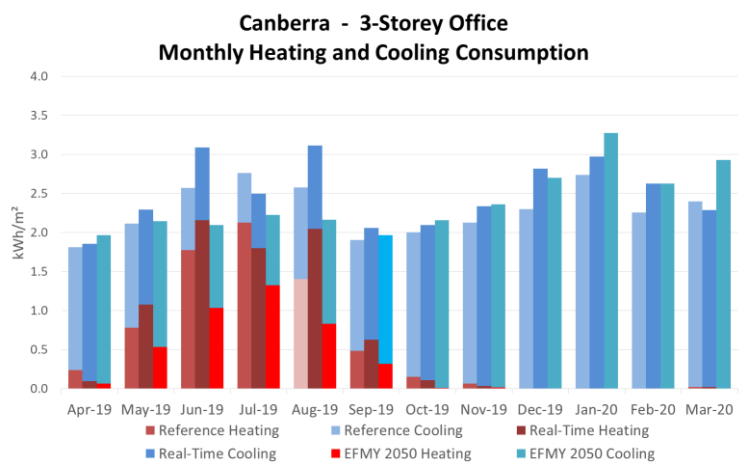
Past editions of ***"Exemplary Advances"*** are available on our website.

Exemplary Weather and Energy (EWE) Index[i] - March 2020

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

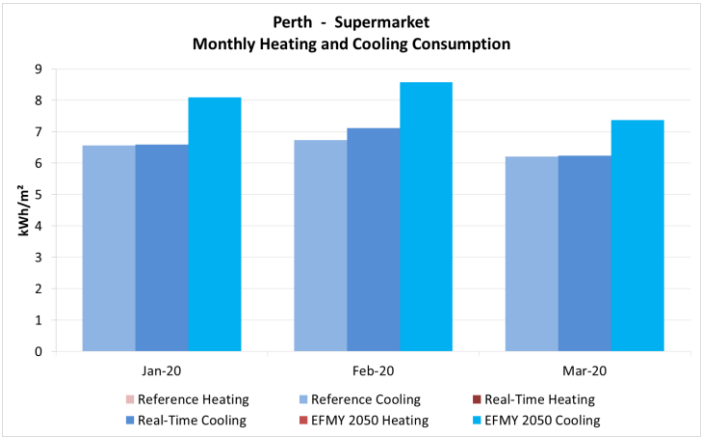
2020 March	Canberra		Perth		Sydney	
	Heat	Cool	Heat	Cool	Heat	Cool
10-Storey	-	-5.2%	-	-4.5%	-	-28.6%
3-Storey	-	-5.0%	-	-3.0%	-	-34.9%
Supermarket	-	-34.0%	-	0.6%	-	-78.6%
Solar PV	-8.9%		-6.0%		9.0%	

The Exemplary Real Time Year weather files (RTYs), the current Reference Meteorological Year files (RMYs) and the Ersatz Future Meteorological Years (EFMYs) used for these monthly simulations are available for purchase to allow clients to simulate their own designs for energy budgeting and monitoring rather than rely on analogy with the performance of these archetypical buildings and systems.



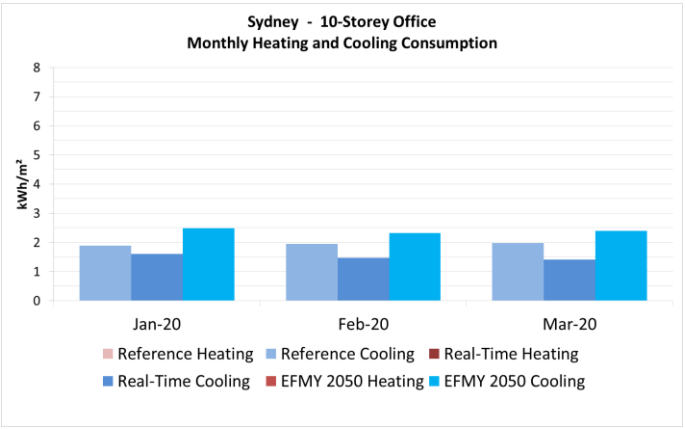
Canberra had a cooler than average March. The mean average and mean maximum temperatures were 0.6°C and 1.5°C lower. Only the mean minimum temperature was 0.5°C higher. All three commercial building models had lower than average cooling consumptions. It was overall cloudier as well, therefore, the solar PV array had an energy yield of 8.9% lower than the average. Due to the cooler and cloudier weather, the cooling energy consumption of the 10-storey office East and West facing zones were 6.7% and 5.7% lower than the averages respectively. Despite the overall cooler and cloudier weather, the maximum temperature at the hour of cooling consumption at its peak was 30.8°C, which was 1.8°C higher than the average. During that hour, it was actually sunnier in terms of the amount of global horizontal radiation (19.5% higher). Therefore, the peak cooling consumption of the 10-storey office model was 12.3% higher than the average due to the warmer and sunnier weather at the hour of peak. When comparing the simulation results using our EFMY 2050 climate data with the RTY, it is projected that the two office building models would have over 20% higher cooling consumption and the supermarket would have 65% higher cooling consumption than the RTY.

Perth also had a cooler than average March. The mean average and mean maximum temperatures were lower than the averages by 0.6°C and 0.9°C respectively. The mean minimum temperature was about the same as the average. The two office building models had lower than average cooling consumptions, only the supermarket had slightly higher cooling consumption due to the generally sunnier weather during the early morning (the time when the supermarket operates while the offices



are still closed). Despite the sunnier weather in the early morning, it was overall cloudier, therefore, the solar PV array had an energy yield of 6.0% lower. The 10-storey office West facing zones had 7.1% lower cooling consumption than the norm. Southern zones had 8.4% lower cooling due primarily to the cooler air temperature but lower average wind speeds were also a contributing factor. The maximum temperature was 35.9°C at the hour of peak cooling, which was 2.3°C lower than the average. Also, the global horizontal radiation was 29.3% less than the average. Therefore, the peak cooling consumption of the 10-storey office model was 2.1% lower than the average due to the cooler and cloudier weather during the hour of peak load. When comparing the simulation results using our EFMY 2050 climate data with the current climate, it is projected that all our three commercial building models would have around 15%-16% higher cooling consumption than for the March just gone.

Sydney also had a cooler than average March but to a greater degree than Canberra and Perth. The mean average temperature was 3.9°C lower. The mean maximum and minimum temperatures were also lower than the averages by 5.0°C and 2.7°C respectively. The cooling consumption of all the commercial building models were lower than the averages even though the Relative Humidity (RH%) was an average of 2.2 percentage points higher. The 10-storey office East facing zones had the highest reduction of cooling consumption than the average when compared with zones on other facades. It is due to the cooler and generally cloudier weather in the morning. However, it was overall sunnier. Therefore, the solar PV array had an energy yield of 9.0% higher. The maximum temperature was 24.8°C at the hour of peak cooling, which was 7.9°C lower than the average. Also, the global horizontal radiation was 7.7% less than the average. Therefore, the peak cooling consumption of the 10-storey office model was 37.3% lower than the average due to the cooler and cloudier weather at the hour of peak. When comparing our EFMY 2050 simulation results with the results for the March just gone, it is projected that the two office models would have around 41%-48% higher cooling consumption, and, the supermarket would have 84% higher cooling consumption than the March of the RTY.



Rainfall Data to be Added to Climate Files

Technically speaking, we will be adding Precipitation data to our files as the measure for "rainfall" includes snow, hail, sleet, dew and mist where they are sufficient to meet the 0.2 mm minimum measurement trigger of current instruments. Aligning with the format conventions for ACDB solar data and TMY2 solar data, we are using half hourly data to generate hourly data to the ACDB convention of the hour centred on the time stamp (i.e. half hour before and half hour after) and the TMY2 convention of the hour leading up to the time stamp (i.e. the two preceding half hours). This subtle difference in solar data is currently ignored in the officially available climate data for commercial building simulation in Australia to the discredit of those who generate it.

The ACDB data format has sufficient unused cells to allow the precipitation data to be added to the end of each hourly line in a form agreed with the CSIRO's Dr Dong Chen. However, the TMY2 format has no space for precipitation and so we must graduate now to the TMY3 format to achieve this weather and climate richness of reporting and simulation.

There are other complications to be dealt with too. Accordingly, we are embarking on a statistical analysis of half-hourly precipitation data to allow the best possible alignment of that data for the full period 1990 to 2019 even in the earlier years when only daily rainfall data was being manually collected on a 24 hours to 9:00 AM basis in many of our over 200 sites of interest.

Spatial Weather Variations in Metropolitan Sydney

Exemplary is teaming up with Dr **Anir Upadhyay** (Architecture UNSW) to analyse the spatial variation in greater Metropolitan Sydney of weather and climate patterns. This work is focused on its impact on residential buildings energy and comfort performance with specific reference to Nationwide House Energy Rating Scheme (NatHERS) but it will have much wider application. It will be based on the 11 automatic weather stations (AWS) maintained by the BoM and also data from Macquarie University, UNSW, UTS and the network of stations run by the Environment, Energy and Science division of the NSW Department of Planning, Industry and Environment.

This study is in addition to the climate temporal analysis with UNSW and the BoM that was reported on in the previous edition of "Exemplary Advances".

Introducing New Staff Member – Graham Anderson

Graham Anderson has recently joined the Exemplary team after returning to Canberra after a long absence. He was well known to the Exemplary team when it was a part of Energy Strategies Pty Ltd a decade ago. His first assignment is to tackle the statistical analysis of half-hourly precipitation data to allow the best possible alignment of that data for the full period 1990 to 2019 even in the earlier years when only daily rainfall data was being manually collected on a 24 hours to 9:00 AM basis. Here he describes his skills and experience which are being applied to that task.

I am a thoughtful and optimistic professional with more than 20 years' experience in energy and greenhouse gas data analysis and reporting in Australia and Europe.

The motivation behind my focus on greenhouse gas emissions measurement, reporting and verification (MRV), is the maxim that to manage a thing you have to measure it. To achieve emissions reductions requires (among many things), measurement and reporting of progress.

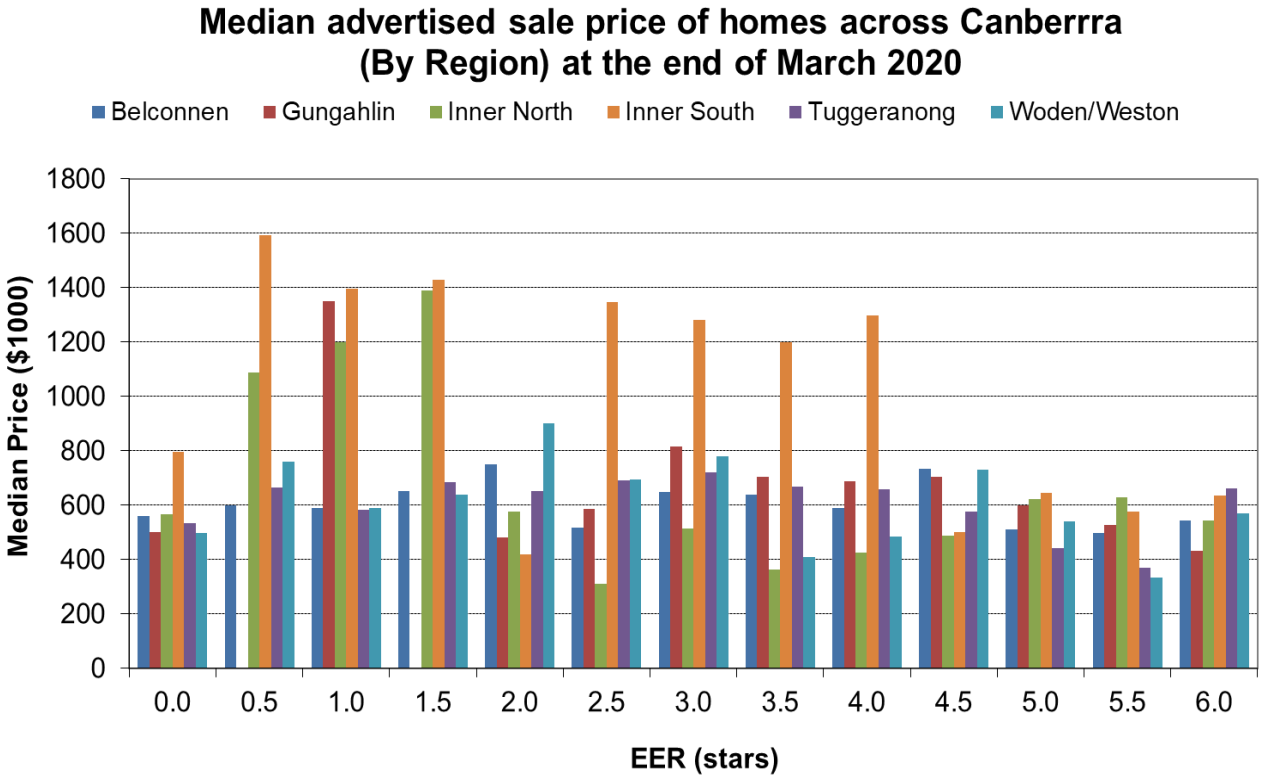
My hope is to find that my work is redundant. I want to see the trend in greenhouse gas emissions turn downward and hit zero.

I have worked on MRV of greenhouse gas emissions and on the transparency of mitigation activities in developed and developing countries: largely in the energy and industrial emissions sectors but I also have significant experience in compiling and analysing energy use and emissions mitigation projects. I hold a Master of Environmental Science (Climate Change) degree from the Australian National University and I am an experienced energy sector review expert under the UNFCCC. I have also compiled and reviewed the industrial processes - minerals and chemicals sub-sectors (IPPU 2A and 2B) of the greenhouse gas emissions inventories for the European Union. My expertise encompasses MRV systems and data management as well as the development and interpretation of methodologies. My work on compiling the EU Approximated GHG inventory included comparison and analysis of EU Emissions Trading System (ETS) and non-ETS performance. I also have experience in capacity development for MRV and GHG inventory calculation. At the Öko-Institut in Berlin I was also responsible for the collection and compilation of company-specific reporting under the EU Fluorinated greenhouse gases (F-gas) regulation.

$/* EER Analysis of the Canberra Housing Market

Exemplary continues to monitor the residential market in the ACT with respect to the correlation between its asking prices and Energy Efficiency Rating (EER) since the disclosure of the EER was made compulsory by unanimous vote of the ACT Legislative Assembly in 1999. Initially that monitoring was done manually by the quarterly analysis of advertisements in The Canberra Times (CT) newspaper but now this is continued by monitoring internet advertisements on a monthly basis.

Reports on these trends are made public from time to time and the next one is due in the coming months. *"Exemplary Advances"* readers will be advised as soon as that occurs.



[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. RTYs are available for purchase for your own simulations.