Exemplary Advances

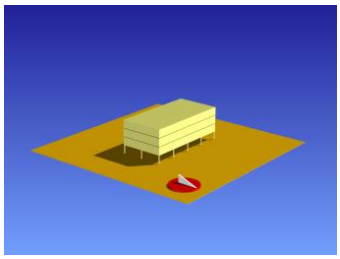
2020 September ***"Exemplary Advances"*** is the newsletter for Exemplary Energy Partners, Canberra. Feel free to forward it to friends and colleagues. Click here to subscribe or unsubscribe. Feedback is most welcome.

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

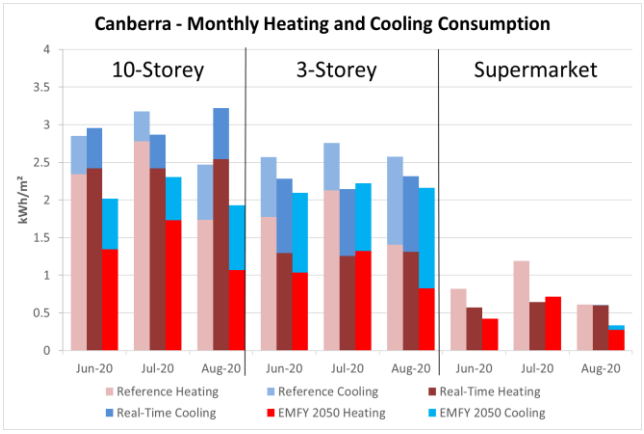
Exemplary Weather and Energy (EWE) Index[i] - August 2020

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

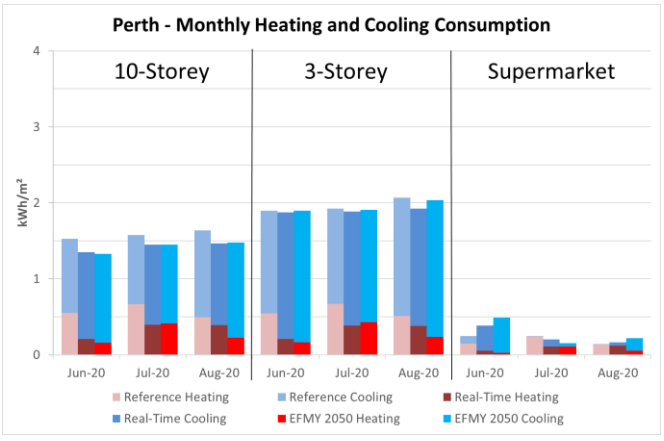
2020 August	Canberra		Perth		Sydney	
	Heat	Cool	Heat	Cool	Heat	Cool
10-Storey	5.0%	-7.5%	-21.9%	-5.3%	-54.8%	7.8%
3-Storey	-6.4%	-14.4%	-26.4%	-0.6%	-53.1%	7.9%
Supermarket	-1.1%	N.A.	-9.8%	N.A.	-50.7%	-64.3%
Solar PV	-10.1%		-4.5%		2%	



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.

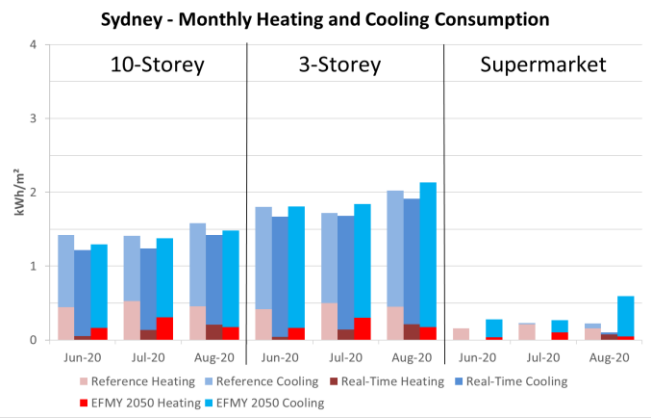


Canberra had a slightly cooler than average August. The mean average and the mean maximum value of the recorded temperatures was lower than the average by 1.5°C and 3.6°C respectively while the mean minimum temperature was higher than the averages by 0.3°C. The solar PV array had an energy yield of 10.1% lower than the average. The two office building models had lower than average cooling consumptions. While the 3-Storey building model produced a lower heating energy consumption than the average, it was the contrary in case of 10-Storey Office building model which showed a 5.0% increase in heating consumption than average. As for the supermarket, the heating consumption was lower than the average as the temperatures during the morning hours were higher than the average. The higher than average heating energy consumption of the 10-Storey office was contributed to most by the east facing zone (which was 46.6% higher than average) while the other zones were found to be around 25% higher than average. When comparing the simulation results using our EFMY 2050 climate data with the RTY, it is projected that the two office building models would both have over 20% more cooling consumption than the RTY, and the supermarket would require 25.3% more.



Perth was slightly warmer than the average August. The mean average, mean maximum and mean minimum temperatures were higher than the averages by 0.7°C, 0.1°C and 0.1°C respectively. The 3-Storey and

the 10-Storey office buildings had a cooling consumption close to the average and differed by only -0.6% and -5.3% respectively. As for the heating energy consumption, all the building models produced lower than average consumption. The heating consumption of both the office buildings was lower by more than 20% while the supermarket was differing by -10%. The solar PV array had an energy yield of 4.5% less due to the slightly warmer weather and lower than average wind speeds which reduced the modules' efficiency. The 10-Storey office East facing zones had close to 36% higher than averages cooling energy due to the warmer and generally sunnier weather during the morning. The South facing zones also had close to 20% higher cooling energy due primarily to the warmer air temperatures. When comparing the simulation results using our EFMY 2050 climate data with the current climate, it is projected that the two office building models would have about 14% higher cooling consumption and the supermarket would have 78% higher cooling consumption than for the August just gone.



Sydney also had a much warmer than average August. The mean average and mean minimum temperatures were 1.1°C and 2.2°C higher than the averages respectively. The mean maximum was lower by 1.7°C when compared to the average. The heating consumptions of all the commercial building models were lower than the average. The cooling consumption was lower by 64% than average for the supermarket while for the office buildings it was higher than average by around 8%. The 10-Storey office North, South and West facing zones all had heating consumption lower than the averages by around 50% while the east facing zone was lower by 35%. It was sunnier, therefore, the solar PV array had an energy yield of 2% higher. When comparing our EFMY 2050 simulation results with the results for the August just gone, it is projected that the two office models would have around 20% less heating consumption, and, the supermarket would have 21% higher cooling consumption than the August of the RTY.

Passive Ventilation to Decarbonise Commercial Buildings in Australia

As described in "*Exemplary Advances*" 2020 July, Jack Wardale, a doctoral candidate in engineering for sustainable development at Cambridge University, UK, has partnered with Exemplary Energy to work on his dissertation project on prospects to shift to solutions involving passive ventilation to decarbonise commercial buildings in Australia. He presented his dissertation on Wednesday 26 August and has made his work accessible to our readers now through our Publications web portal.

Climate Change – Impact on Building Design and Energy

DeltaQ, led by engineer **Grace Foo** (pictured), has undertaken a research project entitled *Climate Change – Impact on Building Design and Energy* on behalf of the Department of Industry, Science, Energy and Resources (DISER) to better understand the impact of climate change on commercial building energy consumption and any HVAC and building design changes. Simulation expertise for the project came from Northrop's **Michael Smith** while the Ersatz Future Meteorological Years (EFMYs) and climate change expertise were provided by **Trevor Lee** of Exemplary. The report from this research has now been published and can be accessed through the Department or our Publications web portal.

Delays to Solar Radiation Data for 2019

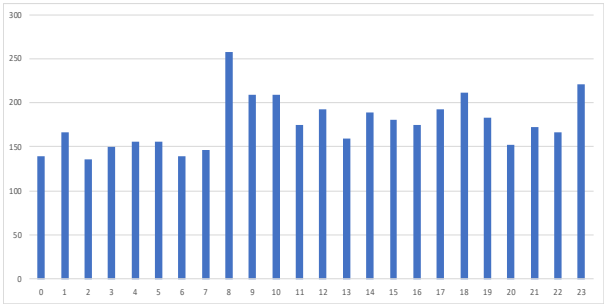
Regular readers might recall that Dr Ian Grant, the scientist at the Bureau of Meteorology (BoM) who processed the satellite data into estimated gridded solar irradiation data, died late last year (see "*Exemplary Advances"* 2019 December). Sadly the BoM has yet to restore that service, which has stalled with the data to the end of July, 2019, to the renewable energy and building simulation community. The Australian PhotoVoltaic Institute (APVI) is working with other interested groups and the BoM to restore that service as soon as possible. As usual, we hope to provide an update on their progress in the next edition as there has been no progress over the past month.

Exemplary Climate Data for APVI's SunSPoT Web-based Design Tool

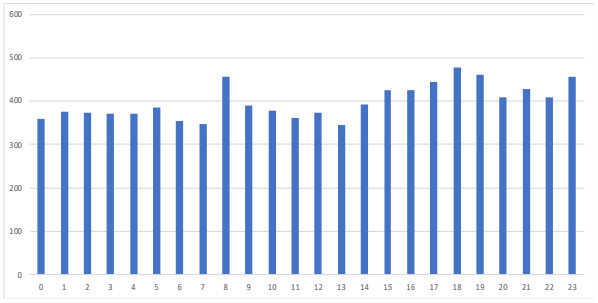
In light of the ongoing delays with the BoM processing the satellite data into estimated gridded solar irradiation data, Exemplary is proceeding to supply climate data to the APVI's SunSPoT project based on our data 1990-2017 inclusive. This allows the solar potential of many Australian local government areas to be graphically available to industry and consumers alike even though it is not quite as current as we would like.

Precipitation Data being Added to Weather and Climate Files

In developing a complete 30 year record of hourly weather data for over 200 Australian locations, we are analysing recent hourly data to infer such data from the single daily precipitation values collected for most of those sites for the first half of those 30 years.



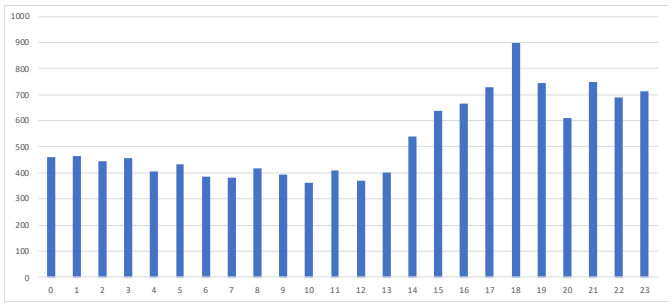
Plot 1: Hour of precipitation onset, Canberra 1996-2017



Plot 2: Frequency of precipitation onset, Canberra 1996-2017

As part of our analysis to derive algorithms or rules-of-thumb to distribute recorded daily precipitation across 24 hours on a 'most likely' basis, we wanted to test the idea that precipitation will have some probabilistic association with time of day. Further investigation was also prompted by a recent article by Joel Pippard, Weatherzone meteorologist: Why is it more likely to rain in the afternoon?

These graphs for Canberra plot the frequency of onset, frequency of any precipitation and the total volume of precipitation against time of day for the 21-year period up to the end of 2017.



Plot 3: Total volume of hourly precipitation, Canberra 1996-2017

The data confirms the higher likelihood of afternoon rain in Canberra especially in terms of total volume over the period. The hourly precipitation data on the other Australian locations also showed some time of day patterns. Further analysis would also have to include refinements for seasonality (time of year).

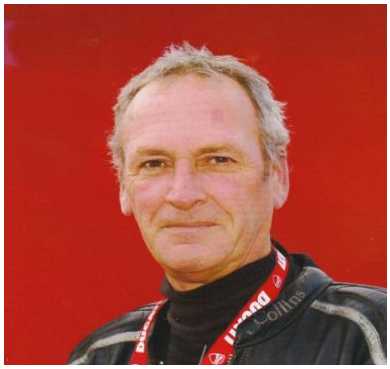
Asia Pacific Solar Research Conference – APSRC Melbourne 2020

Exemplary's Director (Buildings), **Trevor Le**e, will be presenting three papers at this year's APSRC at the end of November:

1. Updating Australia's Reference Meteorological Years (RMYs) with the addition of Hourly Precipitation Data (lead author **Graham Anderson**)
2. Effect of Energy Efficiency Rating (EER) of Dwellings on Sale Prices in the ACT 1999-2020 (lead author **Yoke Fung**)
3. Verification of ClimateCypher Climate Data Outputs with System Advisor Model (SAM) (lead author **Nihal Abdul Hameed**)

More details will be provided in future editions of "Exemplary Advances". Once presented, the papers will be available from our Publications web portal.

Vale Richard William Collins: 22 May 1955 - 30 August 2020



Richard Collins was a true pioneer of solar electrics in Australia and Europe. **Geoff Stapleton** reflects: "I was honoured to make Richard part of the team at GSES in 2016. One of the founding directors, Susan Neill, was retiring and it was good to bring on another vastly experienced person to continue the mentoring role that Susan had undertaken."

Richard was born in Adelaide and as his father worked in the banking industry, they moved to Melbourne and then to London. When his family returned to Melbourne, Richard stayed on in London, doing a physics degree at the University of London. It was there that he met Sandra.

In 1980 he joined Lucas Energy Systems which was acquired by BP a few months after he joined, and the company changed to **BP Solar Systems**. Here he was involved in all technical aspects of BP Solar systems including design, production, system engineering, sourcing and the introduction of Quality Assurance. In 1985 he was seconded by BP Solar Spain where he was based in Madrid and was Assistant Project Manager in the establishment of a fully operational solar cell and solar module production line.

For the full eulogy, go to Global Sustainable Energy Solutions (GSES).

Improving Building Performance in Remote Communities in Australia

Exemplary is supporting doctoral candidate at the University of Canberra (UC), **Samuel Udom**, whose research thesis is on improving performance of healthcare clinics and residential buildings in remote communities in Australia. The included case study is a healthcare clinic in an indigenous community, Wanarn in the sub-tropical desert area of Western Australia, and a 2 bedroom house. This is with a view to provide appropriate energy conservation measures and also benchmark these building typologies for this region and climatic condition – nearest BoM weather station is Giles (WMO 94461). In support of this work, we have provided a 29 year weather data file along with three climate files (RMY-A, P10 and P90) and six scenarios for future climate files (two EFMYs for 2030 and four EFMYs for 2050).

Details and progress reports will be in future editions of "Exemplary Advances".

[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.