Exemplary Advances

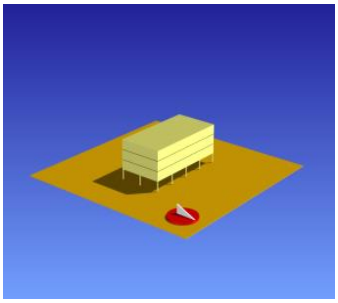
2020 December ***"Exemplary Advances"*** is the newsletter for Exemplary Energy Partners, Canberra. Feel free to forward it to friends and colleagues. Click here to subscribe or unsubscribe. Feedback is most welcome.

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

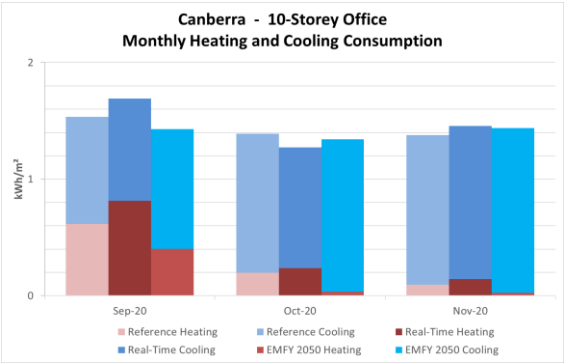
Exemplary Weather and Energy (EWE) Index[i] - November 2020

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

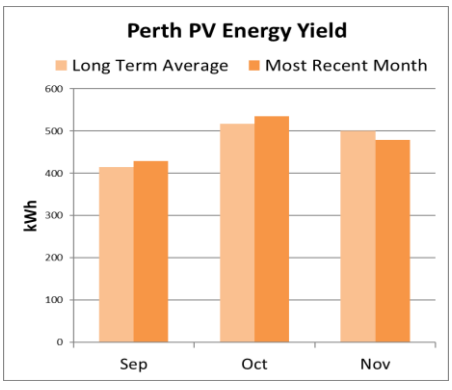
2020 November	Canberra		Perth		Sydney	
	Heat	Cool	Heat	Cool	Heat	Cool
10-Storey	78%	5%	N.A.	-7%	N.A.	2.8%
3-Storey	53%	2%	N.A.	-5%	N.A.	2.8%
Supermarket	-55%	38%	N.A.	-29%	N.A.	3.4%
Solar PV	16.3%		-4.4%		15.8%	
PV Farm	9.5%		N.A.		N.A.	



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.

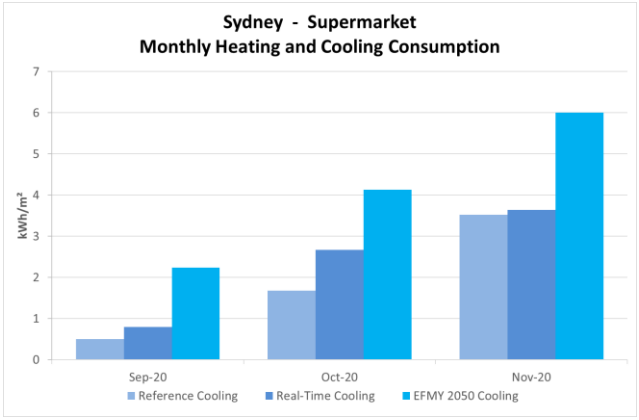


Canberra had a warmer than average November. The mean average, mean maximum, and mean minimum temperatures were higher than the average by 2.1°C, 1.4°C and 1.4°C respectively. It was sunnier than the usual especially at times close to noon which may have led to the substantially higher PV energy output for November. All the commercial building models had higher than average cooling consumptions. The heating energy consumption was also higher in case of the office building models as Canberra had to face some wet days with cold mornings. The east facing zone of the 10-storey office building had around 22% less cooling energy consumption than average when compared to 17-20% less than average in the north and west facing zones due to higher than average wind speeds in the morning which dropped to less than average in the afternoons. The temperature at the hour when cooling consumption was at its peak was 35.7°C, which was 14.5°C higher than the average and hence the cooling energy consumption at the time of peak load was 21.5% higher than average. Overall, the cooling energy consumption of 10 storey office building was 15% lower than usual. 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 around 8% higher cooling consumption than the RTY, and the supermarket would require around 15% more cooling consumption than the RTY in November.



Perth had a cooler than average November. The mean average, mean maximum, and mean minimum temperatures were lower than the averages by 2.1°C, 0.2°C and 1.5°C respectively. The wind speeds were

lower than the average for most parts of the days and the solar irradiation was generally lower than average in the afternoons both of which have diminished the PV energy output and it was simulated to be 4.4% less than average. All three commercial building models had lower than average cooling consumption with the office building in the range of 5-7% while the supermarket had 29% less than usual due to lower than average temperatures. The 10-storey office east facing zone had only 3.7% lower than average cooling energy consumption while all other zones had 11-16% decrease in cooling energy consumption potentially due to low solar irradiation in the mornings. At the hour of peak cooling, the air temperature was at 33.7°C which was about 7°C higher than the average. The peak cooling consumption of the 10-storey office model was 11.3% higher than the average due to the higher temperature than average at the hour of peak load. 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 around 15% higher cooling consumption and the supermarket would have 47% higher cooling consumption than this November.



Sydney was slightly warmer than the average October. The mean average, mean maximum, and mean minimum temperatures were 0.8°C, 0.9°C and 0.5°C higher than the long-term averages. It was generally sunnier after 10am and the wind speeds were higher than average in Sydney, the combination resulting in the solar PV array output being higher than average by 15.8%. The cooling consumptions of all the commercial building models were higher than the average by 2-3%. The west facing zone of the 10 storey office building saw the highest increase in cooling energy consumption which was 12% when compared to 1-6% for other zones owing to higher than average temperatures in the afternoon and also higher solar irradiation during those times. Overall the 10 storey office building had a 2.8% increase in the cooling energy consumption in November. During the hour of peak cooling of the 10-storey office building model, the temperature was 30.7°C which was 4.4°C higher than the long term average. The peak cooling energy consumption was therefore simulated to be 9.7% higher than the average. When comparing our EFMY 2050 simulation results with the results for November 2020, it is projected that the two office models would have around 15-18% higher cooling consumption, and, the supermarket would have about 39% higher cooling consumption than for the November just gone.

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.

Last month, the Bureau ran a web-based end-user survey after it released a one-page statement of their intentions which indicate a substantial improvement to the service in terms of its promptness of publication and its temporal and spatial resolution, making fuller use of the capabilities of the Himawari 8 satellite as reported in ***"Exemplary Advances"*** 2016 August.

We will continue to keep you informed of developments in this field. The hiatus since July 2019 has meant an embarrassing delay to the production of up to date weather files for well over a year now. The full one-page statement is available here for reference in the interim.

Solar World Congress – SWC50 – 3 to 5 December 2020

Exemplary Energy's Director of Buildings **Trevor Lee** attended the SWC50 nominally held in Melbourne on the 50th Anniversary of the first SWC held there in 1970. Due to the pandemic, however, the event was run virtually in time slots which were selected to be in the normal waking hours for the full gamut of national sections of the International Solar Energy Society (ISES) which is headquartered in Freiburg, Germany.

Marking half a century of Solar World Congresses, the program included much reflection and congratulations on the achievements over that period with two documents being formally launched:

1. ISES Solar Energy Museum
2. ISES SWC50 - The Century of Solar - Stories and Vision and Pioneers (book)

Asia Pacific Solar Research Conference – 30 November to 2 December

Exemplary Energy staff attended the Asia Pacific Solar Research Conference APSRC2020 run annually by the Australian PhotoVoltaic Institute (APVI) and this year in both Sydney and Melbourne on Day One (30 November) and virtually on the following two days. The proceedings, when web published, will include three extended abstracts offered by Exemplary Energy.

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

"Exemplary Advances" will report on each in turn over the next few months

Enhanced accuracy of ClimateCypher's P10 and P90 years

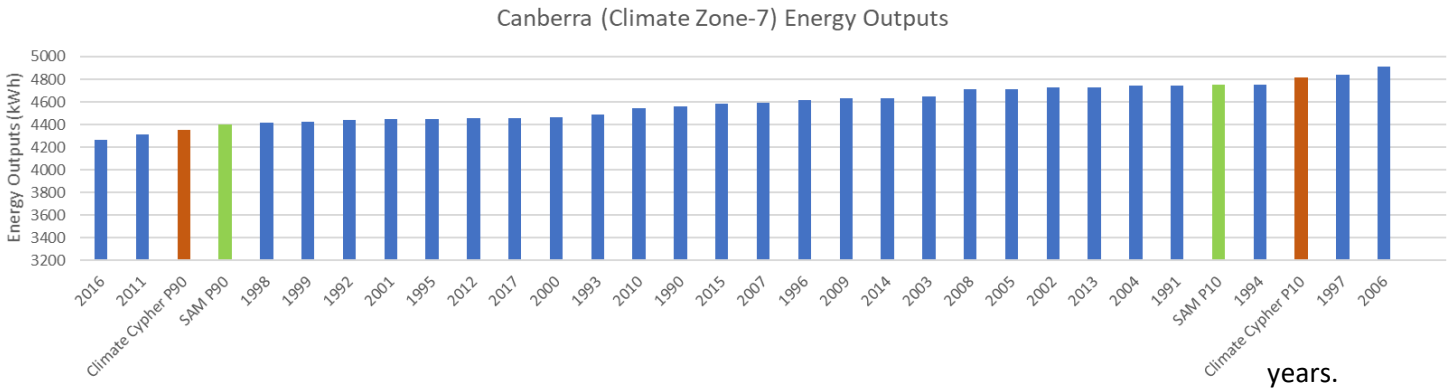
By Trevor Lee and Nihal Hameed

We at Exemplary Energy have enhanced our in-house software, ClimateCypher, by fine tuning its capability of selecting the months for concatenating into P10 and P90 years for a given period - generally several decades.

P10 and P90 values are defined as the values which are expected to occur or be exceeded 10% and 90% of the time in a dataset. ClimateCypher produces weather data of a user defined period of years and also the RMY (Reference Meteorological Years) used as the single synthesised year representative of a set of years. By this new function, ClimateCypher will now be able to produce a 12 month synthetic year dataset in which each month will be expected to occur an empirically selected %age of the time based on the weather elements especially solar irradiation, temperature and wind speed.

This was achieved by employing a Month Selection Parameter (MSP) which was empirically established for each of the 8 climate zones in Australia as defined in the National Construction Code (NCC). Each of the capital cities and other locations like Alice Springs, Tennant Creek, Oodnadatta and Cabramurra were selected to represent all the climate zones in our analysis and to reach the optimum value of MSPs. The energy outputs for the P10 and P90 years generated by ClimateCypher were then compared

with the P10 and P90 energy outputs for the same period of years obtained from the open software System Advisor Model (SAM). For better understanding of the this work, the comparison graph for Canberra has been shown below with the blue bars representing energy outputs of each year in the period 1990-2017, the green bars denote the SAM obtained P10 and P90 energies and the red bars indicating the energy output corresponding to the ClimateCypher generated P10 and P90 synthetic



years.

We continue improving ClimateCypher by adding the functionality of the P00 and P99 months which will help in understanding the worst and best case scenarios for a period of time; the P00 and P99 years data would expect an energy output close to the output corresponding to 2016 and 2006 in case of the Canberra example shown above, and also refining the P10 and P90 month selection process, the updates of which will be posted in the coming editions.

Community Energy for Goulburn – Solar PV Farm

Exemplary Energy confirms its investment in another community owned solar farm: this one in Goulburn, NSW. The Co-op was formed in mid 2020 by a local community association, Community Energy for Goulburn Inc (CE4G) established in late 2014 to build the community owned solar farm. Details of the proposal were included in our November edition.

They are still raising the last of the investor finance of $1.9M with a minimum Investment of $400 with initial preference going to residents of Goulburn Mulwaree and adjoining local government areas (LGAs) but **investment is now open** to residents of the rest of NSW and the ACT.

Wind Energy Generation Standards - IEC TC 88

The wind energy industry is one of the fastest growing renewable energy sources, with the expectation for continued growth until at least 2030. Standards Australia has announced their participation in the international technical committee, IEC TC 88: Wind Energy Generation Systems.

Australia's participation in that technical committee means that Australian wind industry will ensure Australia has a voice and its unique conditions are accounted for, with the objective to create a "mirror" committee to adopt international standards suited to Australia's industry and landscape. The mirror committee along with Australia's participation, will directly benefit the current market needs and provide opportunities for the further development and uptake of this renewable energy source.

Read more in Standards Australia's recent blog.

New Intern – Naman Jain

Naman Jain has recently joined the growing Exemplary team as an Intern. He is currently pursuing his postgraduate studies in Renewable Energy from the Australian National University (ANU). A Mechanical and Automation Engineer at heart, he has done his undergraduate studies at Amity University, Noida in the northern state of Uttar Pradesh, India. He has also worked as a sales representative for a Brisbane based solar company. With his passion to be part of the green energy revolution to curtail, if not reverse, climate change with the help of innovative approaches in engineering, he has already shown himself to be of great value at Exemplary.

Tasmania reaches 100 per cent renewable electricity

The Tasmanian Government has claimed that the state is the first in Australia and one of only a handful of jurisdictions in the world to achieve this target, delivering on a key Government commitment from the 2018 election.

The State Government said that it reached 100 per cent renewable energy (by which they mean electricity) thanks to its commitment to realising Tasmania's renewable energy potential through nation-leading energy policies and making Tasmania attractive for industry investment.

This landmark achievement was realised as the 29th of 31 wind turbines at Granville Harbour officially came online.

Daytime WA power tariff slashed to 8 c/kWh to soak up rooftop solar

By Sophie Vorrath (full article)

Western Australia's state owned electricity retailer Synergy is launching a trial in which it will offer households an ultra-low daytime electricity tariff of 8 c/kWh, in a bid to help soak up the state's abundant rooftop solar energy supply.

The new "Midday Saver" tariff will be trialled by more than 400 residential Synergy customers, who will be offered the low rate from 9am to 3pm, a time period within which solar power regularly reaches 50 per cent of total supply for the state.

A higher rate of 55 cents per unit will apply during the 3pm to 9pm peak, to reflect the higher cost of supplying energy at that time, while a mid-range tariff of 20 c/kWh will be offered between the hours of 9pm to 9am.

Participants will also be able to view their daily usage data to track their costs and manage their electricity use, a statement from the state government said.

---

[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.