Exemplary Advances

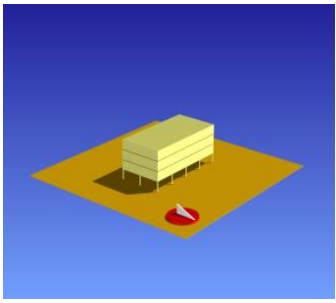
2020 November ***"Exemplary Advances"*** is the newsletter for Exemplary Energy Partners, Canberra. Feel free to forward it to friends and colleagues. Click here to subscribe or unsubscribe. Feedback is most welcome.

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

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

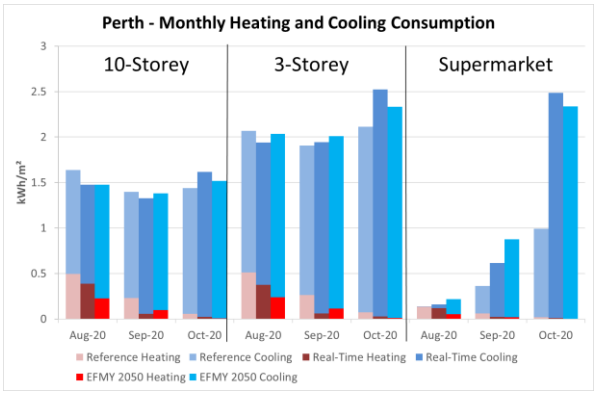
Monthly tabulation and commentary relative to the climatic norm – the Reference Meteorological Years

2020 October	Canberra		Perth		Sydney	
	Heat	Cool	Heat	Cool	Heat	Cool
10-Storey	N.A.	N.A.	-59%	15%	N.A.	2.2%
3-Storey	N.A.	N.A.	-65%	22%	N.A.	3.2%
Supermarket	N.A.	N.A.	-50%	60.7%	N.A.	30%
Solar PV	N.A.		3.0%		7.5%	
PV Farm	N.A.		N.A.		N.A.	



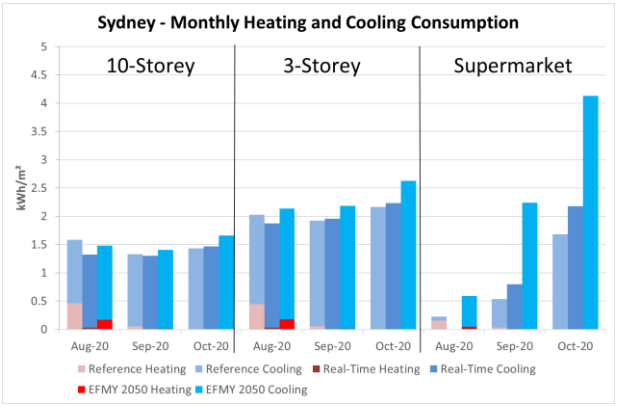
The Exemplary Real Time Year weather files (RTYs) the current Reference Meteorological Year files (RMYs) and the Ersatz Future Meteorological Years (EFMYs) used for these monthly simulations are available for purchase to allow clients to simulate their own designs for energy budgeting and monitoring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

The **Canberra** EWE Index report could not be produced due to inconsistent solar data. The CSIRO weather station had an intermittent failure in its sun-tracking shade disk on its solar radiometer. It was functioning correctly at the beginning of the month and again by the end but too much key data mid-month was missed to allow a reliable RTY to be generated.



Perth had a warmer than average October. The mean average, mean maximum and mean minimum temperatures were higher than the averages by 2.2°C, 2.7°C and 2.3°C respectively. All three commercial building models therefore had lower than average heating consumption in the range of 50-65%. Perth witnessed a generally sunnier October especially in the mornings and early afternoons which led to a 3% increase in solar PV output relative to the long term average. The 10-storey office east facing zone had 56% higher than average cooling energy consumption while the north facing had 41% increase in cooling energy consumption. Even though as mentioned before, mornings and afternoons were sunnier than average, higher wind speeds in the afternoon led to reducing the cooling load in the north facing zones when compared to east facing zone. At the hour of peak cooling, the air temperature was at 22.7°C which was about 2.8°C higher than the average. The peak cooling consumption of the 10-storey office model was 25% 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 8% higher cooling consumption and the supermarket would have 18% higher cooling consumption than this October.

Sydney was slightly warmer than the average October. The mean average, mean maximum and mean minimum temperatures were 0.6°C, 0.2°C and 0.9°C higher than the long term averages. It was generally sunnier post mid-day and the wind speeds were higher than average in Sydney, the combination resulting in the solar PV array output being higher than average by 7.5%. The cooling consumptions of all the commercial building models were higher than the average by 2-3% for office buildings and by 30% for the supermarket. The north facing zone of the 10 storey office building saw about 6.1% increase in cooling energy consumption with comparable 5.5% increase in cooling load due to sunnier afternoons and evenings. During the hour of peak cooling of the 10-storey office building model, the temperature was 28.1°C which was 5.7°C higher than the long term average. The peak cooling energy consumption was therefore simulated to be 21.7% higher than the average. When comparing our EFMY 2050 simulation results with the results for October 2020, it is projected that the two office models would have around 12-15% higher cooling consumption, and, the supermarket would have 47% higher cooling consumption than for the October 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. The Australian PhotoVoltaic Institute (APVI) is working with other interested groups and the BoM to restore that service as soon as possible. At last we can provide an update on their progress.

This 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.

Headed "Gridded solar observations" it cites the following advances:

> *The new solar model output produced in near real-time will be calibrated using quality-controlled ground-based observations. The new product will have the following characteristics:*
>
> *•2x2 kilometre spatial resolution*
>
> *•10-minute temporal resolution*
>
> *•Available within 30-minutes of each satellite observation*
>
> *•Global Horizontal Irradiance (GHI) and Direct Normal Irradiance (DNI) fields*
>
> *The Bureau, together with strategic partners, is undertaking a project to deliver these enhancements by early 2021. Further information about the final products and how to access them will be provided in late-2020.*

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.

Community Energy for Goulburn – Solar PV Farm

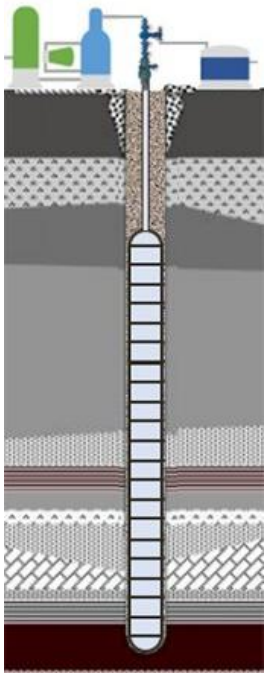
Exemplary Energy is pleased to report its engagement with another community owned solar farm: this one in Goulburn, NSW. The Co-op was formed in mid 2020 by a local community association, Community Energy for Goulburn Inc (CE4G) established in late 2014 to build the community owned solar farm.

It was decided that a co-operative (Goulburn Community Energy Cooperative) was the most democratic form of ownership because each vote does not depend on the number of shares held. Whether an investor holds 400 or 4000 shares, he or she still only has one vote. No-one can use their voting power to support a vested interest.

The proposed farm on a 2.2 Ha site beside the Melbourne-Sydney rail line has a design AC output of 1.2 MW at 33 kV with a design and construct contract with Komo Energy which includes battery capacity of 800 kWh and discharge power of 400 kW. The cost of the solar farm is projected to be $4.2M including a grant from NSW Government of $2.1M. They are currently raising 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 it is now open to residents of the rest of NSW and the ACT.

New Intern – Chithral Kodagoda Manujaya

The team at Exemplary has expanded with the addition of two new interns from the Australian National University (ANU). This edition we would like to introduce you to Chithral Kodagoda Manujaya. Chithral is currently in his final semester of Masters of Engineering in Renewable Energy at the ANU. He completed his Bachelors in Mechanical Engineering at Anna University, Chennai, India, in 2016 and then worked as a project engineer in the Solar division of Fentons Pvt. Ltd., Sri Lanka, for two years. During this period he was involved in all phases of installation and commissioning of commercial PV systems. With over 2 MW of PV installed capacity under his belt and his interest in renewable energy, his experiences will be valued greatly here at Exemplary.



Hydrogen storage initiative – Ardent Underground

Ardent Underground is a new initiative in hydrogen storage that ITP Thermal has co-founded with partners Abegeldie Complex Infrastructure. The concept uses ''blind bore shaft drilling'', a proven technique from the mining industry. The idea offers a modular approach to producing a lined rock cavern. Individual shafts will store 50t or more of hydrogen at pressure. It promises to be many times cheaper than any above ground solution and more modular and site independent than a salt cavern. *"Hydrogen storage is the necessary buffer between variable renewable hydrogen production and use for production of ammonia for export, large scale transport refuelling or dispatchable electric power production,"* said ITP Thermal's Dr Keith Lovegrove.

[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.