Exemplary Advances

2020 February ***"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] - January 2020

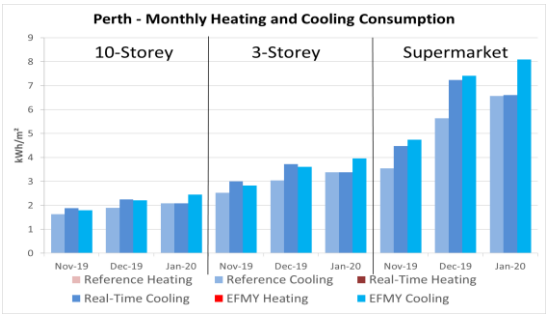
Monthly tabulation and commentary relative to the climatic norm – the Reference Meteorological Years

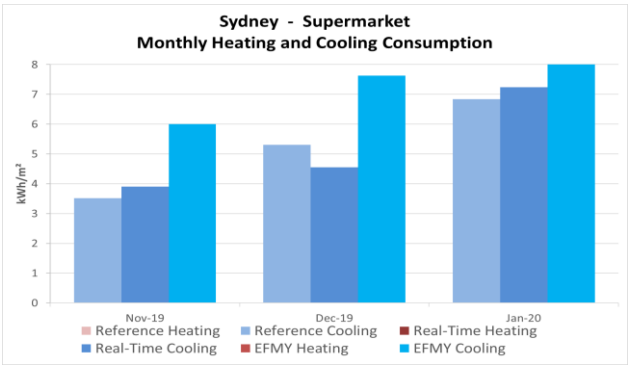
2020 January	Canberra		Perth		Sydney	
	Heat	Cool	Heat	Cool	Heat	Cool
10-Storey	-	-	N.A.	0%	N.A.	0%
3-Storey	-	-	N.A.	0%	N.A.	1%
Supermarket	-	-	N.A.	1%	N.A.	6%
Solar PV	-		4.9%		3.5%	

The Exemplary Real Time Year weather files (RTYs) 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 – Data Not Available for the month of January in Canberra. See the article "CSIRO Black Mountain campus hit by Hailstorm" below.

Perth had slightly cooler than average weather in January in terms of air temperature. The mean average and minimum temperatures were both lower than the averages by 1.0°C and 1.3°C. Only the mean maximum was higher by 0.4°C. All three commercial building models had cooling consumptions approximately the same as the averages. It was also sunnier. The 10-storey office East facing zones had 4.7% higher cooling consumption than the norm despite the generally cooler air temperature, due to sunnier weather in the mornings. The solar PV array had an energy yield of 4.9% higher in this weather.





Sydney had warmer than average weather in January. The mean average and maximum temperatures were higher by 0.1°C and 3.0°C respectively. Only the mean minimum was lower by 0.4°C. The cooling consumptions of the two office building models were about the same as the averages. Only the supermarket model had relatively higher cooling consumption due to its long operating hours. The 10-storey office East facing zones had higher cooling consumption due to the warmer air temperature in the mornings. However, the air temperature rise lessened in the afternoon, therefore, the North and West facing zones had lower cooling consumptions. It was sunnier so the solar PV array had an energy yield of 3.5% higher.

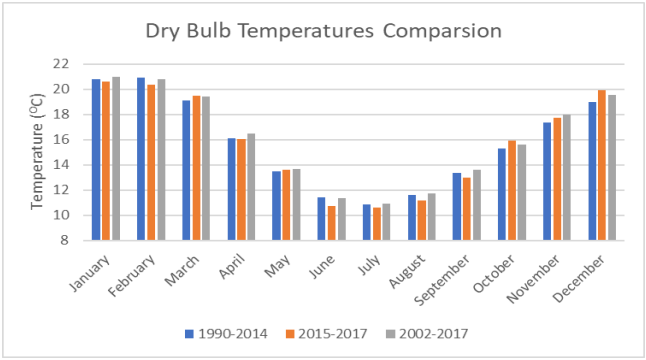
Temporal Analysis of Weather – Melbourne – Cloudier and More Humid

Exemplary has prepared updates to its set of 201 Australian sites most recently published for the quarter century of 1990-2014. Especially in the context of a changing climate, we are routinely processing data from subsequent years and comparing this with the prior decades. Most recently, this has been done for the three years 2015-2017 and the change analysed through the increments over time of the five key weather elements. For completeness, we have also compared the potential new climate data season of 2002-2017 (the most recent available 15-year data sets – long enough to smooth out the perturbations of the ~11-year Sunspot Cycle).

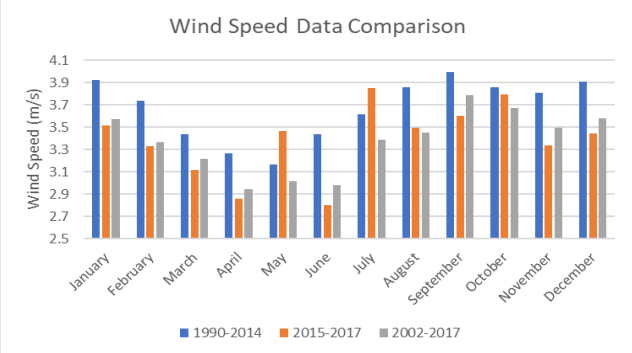
This Temporal Analysis has been carried out for the eight capital cities plus Alice Springs (Arid) and Cabramurra NSW (Alpine) so as to cover the gamut of the Climate Zones in the Building Code of Australia (BCA) - now part of the National Construction Code (NCC).

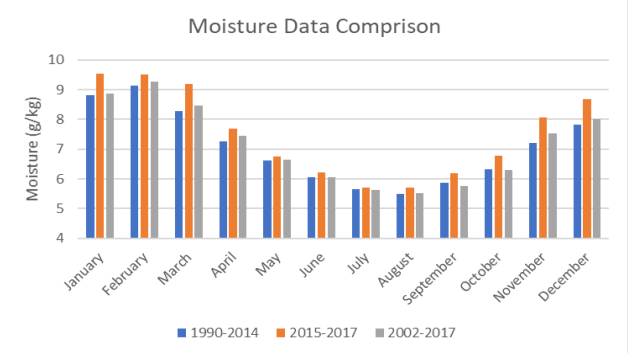
A glimpse of the Temporal Analysis of weather data of Melbourne was provided in the March 2019 edition of ***"Exemplary Advances"***. Further to subsequent data processing of the weather data, a complete temporal analysis of Melbourne weather data is intended through this issue.

The RMY data, P10 and P90 data saw considerable changes between the newly processed data and the previous version. Even though a total of 14 months in the three RMY data with have been updated, interestingly none of those months are from the 2015 to 2017 period. Same is the case with P10 months: eight months in the P10 data set had a change in its year however the updated years are not the recent ones. While the P90 months had changes in nine of them, four of the months have received a year from the 2015 to 2017 period, namely February, July, October and December.



Comparing the new months for RMY-A, the data doesn't appear to be significantly different from the months of the previous RMY set. It is observed that the new mean DB, Moisture, GHI and DNI for each individual months to be within ± 6% range of previous data set with the exception of Wind Speed whereby mean speed showed drastic increase of 66% in May 1993 (new month) in comparison to May 2009 (old month) and a 27% decrease in September 2005 (old month) in comparison to September 1990 (old month).



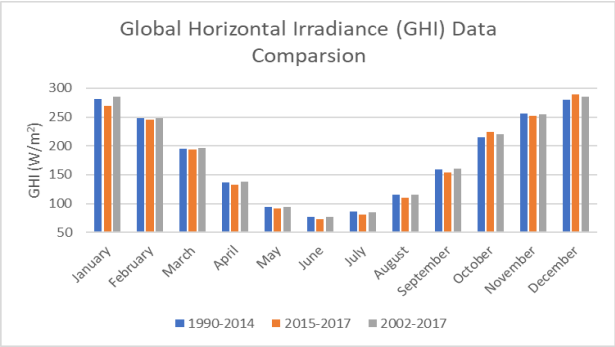


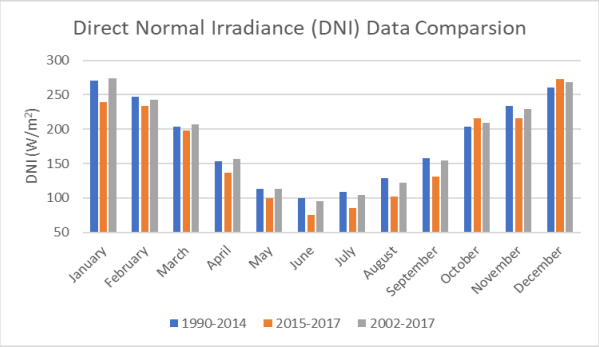
Comparing the 1990-2014 and 2015-2017 data, only a negligible increase in mean temperature of 0.0064^{O}C could be noticed and also an increase of 6.54% was seen in the average of moisture data. The wind speeds, GHI and DNI saw a decline by 7.66%, 1.2% and 7.93 % respectively.

While analysing the 1990-2014 with 2002-2017 data, an increase in mean temperature of about 0.24 degrees was found. Moisture increased by 1.15%, while wind speeds had a decrease of 8.04%. The GHI and DNI had a decrease of 0.9% and 0.13% respectively.

The above data comparison manifests that a significant difference in the wind speeds while a stark difference in the solar radiation received was not observed.

Similar to this temporal analysis of weather data for **Melbourne** between the widely-used current set of data (1990-2014) with the recently developed new batch of weather data (1990-2017), the previous issues of ***"Exemplary Advances"*** had seen a comparison for each of the other nine sites around our country to assist readers to consider the need to update the weather and climate data they use for their simulations and other analyses. Look out for them in past editions of ***"Exemplary Advances"***.





CSIRO Black Mountain campus hit by Hailstorm

Canberra was affected by a severe hailstorm on the 20th of January this year which caused widespread damage especially in the vicinity of the central city and the suburbs of Belconnen. Even though the storm was short lived, the fierce nature of the storm with up to 116 km/h winds and golf-ball-sized hail (4-5 cm) damaged numerous cars parked in the open. The consequence of hail also includes the wreckage caused to many rooftop solar panels on residential houses and the CSIRO site in Black Mountain. A few broken solar panels on the Black Mountain site forced the administration to cut off the solar power generation there serving various stakeholders including the CSIRO. Most of the weather instruments were reported safe however the wind speed and direction apparatus and the pyranometer used to measure the solar irradiance was damaged. Their lab also had to be shut down due to security reasons after a few windows were smashed by the hail.

Exemplary expressed its commiseration to the CSIRO officials for this loss and are hoping for a speedy restoration of the CSIRO site in Black Mountain and the data that flows from it.

Enhancements to the EWE Index

Earlier editions of the Exemplary Weather and Energy Index compared energy consumption in the immediate past month with that of the Reference Meteorological Year (RMY), an indicative climate data set of 8,760 hours prepared by concatenating the 12 most indicative calendar months. Their indicativeness is tuned to their application through the weightings given to the pertinent weather elements to give RMY-A (solar given 50% weighting), RMY-B (solar given 33% weighting) and RMY-C (solar given only 17% weighting).

The EWE Index is now also calculated in comparison with the Ersatz Future Meteorological Year (EFMY) for 2050 and graphically compared with those relevant monthly values. Our EFMYs are generated in accordance with *"Future climate data for 100 prospective Australian solar energy sites"* Report by John M Clarke, Craig Heady and Dr Leanne Webb, CSIRO Marine and Atmospheric Research, September 2014.

[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.