



Exemplary Advances

2019 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](#).

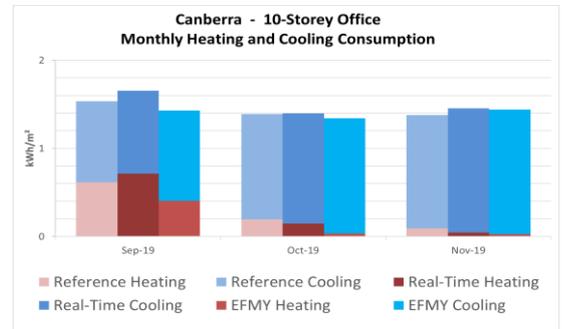
Exemplary Weather and Energy (EWE) Indexⁱ - November 2019

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

2019 November	Canberra		Perth		Sydney	
	Heat	Cool	Heat	Cool	Heat	Cool
10-Storey	N.A.	10%	N.A.	17%	N.A.	-1.1%
3-Storey	N.A.	12%	N.A.	20%	N.A.	-1.6%
Supermarket	-61%	30%	N.A.	27%	N.A.	-4.0%
Solar PV	9.2%		12.9%		15.2%	

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.

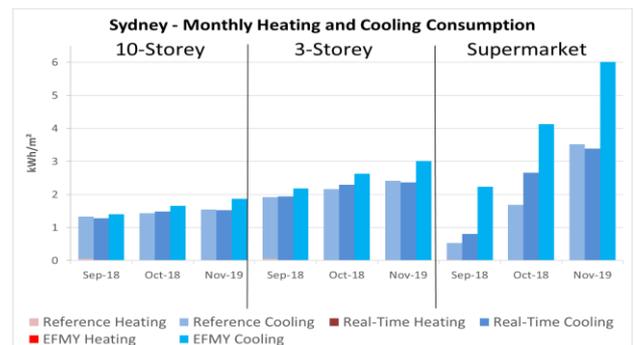
Canberra had a warmer than average weather in November. The mean maximum and mean average temperatures were higher by 3.8°C and 1.7°C respectively. Only the mean minimum was lower by 0.4°C. It was sunnier as well, therefore, the solar PV array had an energy yield of 9.2% higher. Cooling consumptions of all the three commercial buildings were higher than the averages. The 10-Storey office South facing zone had close to 26.7% higher cooling consumption than the norm due primarily to the warmer air temperature. Other perimeter zones also had higher cooling consumption than the norm from 17.5% to over 26% due to the warmer and sunnier weather.



Perth also had a warmer than average weather in November.

The mean average, maximum and minimum temperatures were higher by 1.2°C, 0.3°C and 1.7°C respectively. All three commercial building models had cooling consumptions higher than the averages. It was generally sunnier throughout the day. The 10-Storey office East facing zones had over 33% higher cooling consumption due to the warmer and sunnier weather. North and West facing zone also had higher cooling consumption than the norm – over 25% to 27% respectively. The solar PV array had an energy yield of 12.9% higher in this weather.

Sydney also had a slightly warmer than average weather in November. The mean average and minimum temperatures were higher by 0.3°C and 4.7°C respectively. Only the mean maximum was lower by 4.7°C. The cooling consumption of all three building models were lower than the norm due to the generally lower air temperature during the afternoon. This is



reflected by the cooling consumption of the 10-storey office South facing zone being over 2% lower than the norm due primarily to the lower air temperatures during the office hour. East facing zone also had lower cooling consumption of 1.2% due to the cooler and cloudier weather in the morning. However, it was overall sunnier, therefore, the solar PV array had an energy yield of 15.2% higher in this weather.

Enhancements to the EWE Index

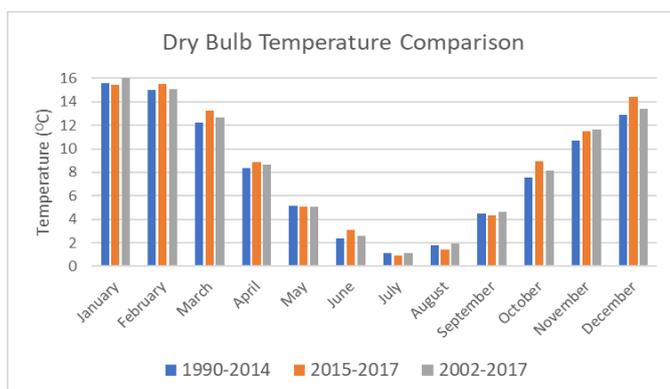
Earlier editions of the Exemplary Weather and Energy Index compared energy consumption in the immediate past month with that of the Reference Meteorological Year ([RMY](#)), an indicative climate data set of 8,760 hours prepared by concatenating the 12 most indicative calendar months. Their indicativeness 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.

Temporal Analysis of Weather Data - Cabramurra

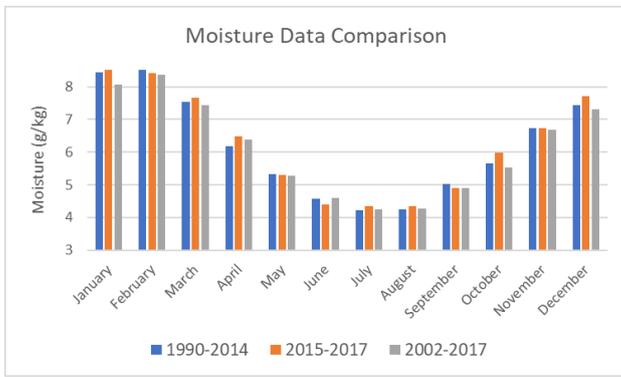
Exemplary has prepared updates to its set of [201](#) Australian sites most recently published for the quarter century of 1990-2014. Especially in the context of a changing climate, we are routinely processing data from subsequent years and comparing this with the prior decades. Most recently, this has 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](#)).



Considering the comparison of the RMY Months of Cabramurra, the new batch of the processed data has seen changes in eleven of the months in the whole data of the RMY with three weighting criteria. At least 75% of the months have alterations in the P10 and P90 data, with P10 data having the year of the month December change from 2009 to 2015 and P90 having changes for the months of January, April and May.

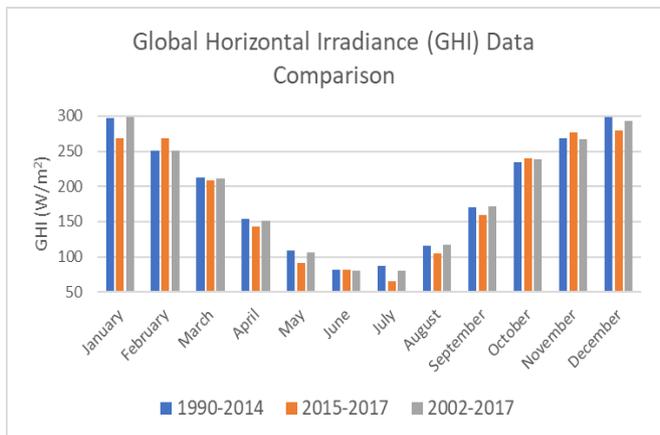
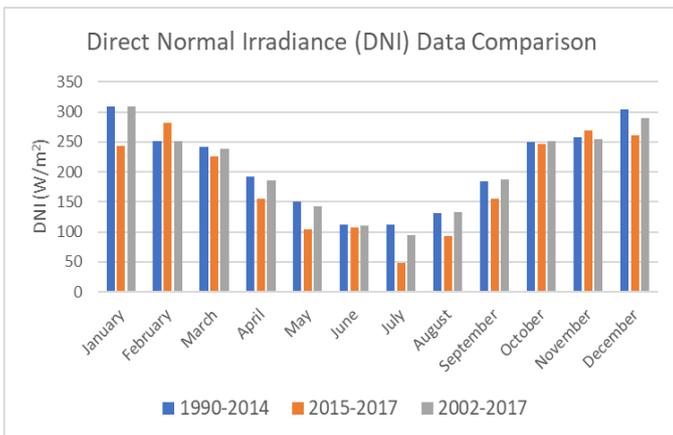
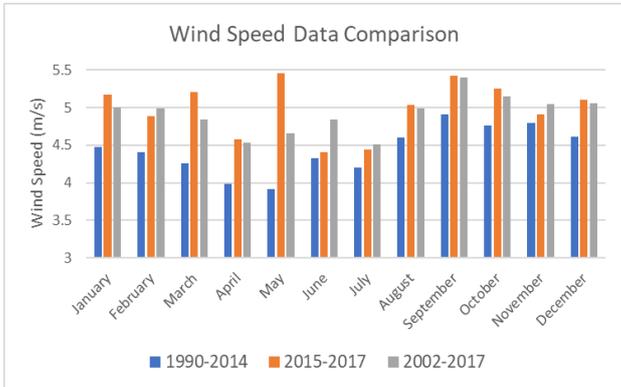
RMY-A data underwent changes in five of its months with only November having a recent year: 2016. RMY-B had changes in four of its months with three of them bring allotted years from the 2015-2017 year range. RMY-C similarly had five changes in its months with four of them having the recent years. A point of interest in these RMY updated data is that there are no months with years from the 1990s.



Analysing the new RMY-A data, significant increase to mean temperature of 0.81 degrees was observed. Moisture also increased by 8.74%, while a decrease was noticed in the wind speeds, GHI and DNI averages by 2.42%, 1.86% and 4.16% respectively.

Comparing 1990-2014 with 2015-2017 showed an increase in mean temperature of 0.46 degrees, an increase to moisture of 1.36% and a moderate increase to wind speed of 12.5%. GHI decreased by 4.14% and DNI decreased by 12.43%, which is quite significant.

While analysing the 1990-2014 with 2002-2017 data, an increase in mean temperature of about 0.34 degrees was found. Moisture decreased by 1.25%, while wind stayed at a moderate increase of 10.78%. The decreases to GHI and DNI were less significant, being 0.49% and 1.92% respectively.



Further to this temporal analysis of weather data for **Cabramurra** between the widely-used current set of data (1990-2014) with the recently developed new batch of weather data (1990-2017), each issue of **“Exemplary Advances”** will see a similar 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](#) and future editions of **“Exemplary Advances”**.

ANU Energy Update and Solar Oration 2019

Exemplary intern Nihal Hameed reports on 2 December 2019

The ANU Energy Update 2019 is an annual event organized by the Energy Change Institute ([ECI](#)) of the Australian National University. It was a platform wherein the industry professionals, experts from academia, government officials, political leaders, students and even normal citizens could be vociferous about their views and ideas mainly about bringing in a paradigm shift in the energy industry and exporting renewable energy from Australia.

The event kicked off with Professor **Ken Baldwin**’s introductory speech in which he cited Australia’s progress in transforming to clean energy usage and how Australia can make a mark in the world as a major clean energy exporter. He also mentioned about the ANU grand challenge research program which focuses on procuring knowledge about creating renewable energy export opportunities through

powering the production of conventional export products like mineral ores. The Keynote presentation was then delivered by **Audrey Zibelman**, CEO of Australian Energy Market Operator ([AEMO](#)) who talked about the need for a decarbonized, decentralized and digitized electricity grid in Australia and the hurdles that are on the way like reliability concerns and pricing schemes. Next, Dr **Ian Cronshaw** from the International Energy Agency ([IEA](#)) gave a special presentation analyzing the 2019 World Energy Outlook they published. He conveyed the pressing issue of insufficiency of measures to contain the global CO₂ emission to achieve the 1.5°C average temperature rise target set by the Intergovernmental Panel on Climate Change ([IPCC](#)).

Post Lunch, the sessions dealt with National Hydrogen Strategy and Future Energy Markets. These sessions were followed by interesting Panel Discussion and Question & Answer sessions. Firstly, Dr **Alan Finkel** gave an optimistic overview of Hydrogen that could revolutionize the power and transport sector without impacting emission concerns and be a transport medium for clean energy resources in Australia. Dr **Fiona Beck**, Senior Lecturer and Research Fellow at ANU talked about the carbon dioxide emission associated with production of Hydrogen and potential use of Carbon Capture and Storage (CCS) for abating the carbon dioxide produced in this process. **Ed Gaykema**, Project Manager at [ActewAGL](#), elucidated the Hydrogen testing project as part of their ACT gas network decarbonization initiative. **Andrew Dickson**, Development manager at Asian Renewable Energy [Hub](#), talked about the Pilbara Hydrogen Hub, envisioned to produce Hydrogen through solar and wind resources available for the purpose of export as a clean energy fuel powered with clean electricity. The following Future Energy Market Summit session addressed the various dimensions that should be taken care while designing the electricity market with an increasing number of electricity generators and the requirement to provide a robust and resilient system which has a high reliability factor. Dr **Tony Chappel** (Chief External Affairs Officer, AEMO), Professor Frank Jotzo (Crawford School of Public Policy), **Chloe Munroe** (Professorial Fellow, Monash University) and **Drew Clarke** (Board Chairman, AEMO) gave their views and had a healthy conversation during panel discussion on the topic.

The evening session was the **Solar Oration** delivered by **Fleur Yaxley**, a senior executive in the renewable energy industry. She discussed the challenges she had faced while working for setting up the largest wind farm in the southern hemisphere in Chalicum Hills in Victoria. She then went on to detail the growth of both wind and solar in Australia after her involvement in the Wind farm project. She discussed both the technological changes as well as the economic changes that has occurred in the market and briefed us about the future aspects of the renewable energy market.

In Summary, the ANU energy update surely provided a comprehensive outline of the present renewable energy industry and the future trends that could be expected. The extensive involvement of the audience with the speakers and informal chats with professionals showed the deep interest of even the layman in the progress of the renewable energy industry and hence gives an optimistic sign of readiness of people to work towards a greener future.

Asia Pacific Solar Research Conference (APSRC) Report

The Australian PV Institute ([APVI](#)) hosted its 6th Asia Pacific Solar Research Conference ([APSRC](#)) in Canberra 3-5 December 2019 and incorporated Renewable Heating and Cooling Forum sessions in collaboration with the Australian Institute of Refrigeration, Air conditioning and Heating ([AIRAH](#)) with separate sessions on “*Emerging trends and global opportunities*”, “*Renewable Heat*” including a presentation by **Marko Pintar** from [GreenLand](#) Systems on their sun tracking concentrating solar thermal collectors “*New high efficiency, low cost solar thermal heating system for commercial and industrial applications*” and a session also on “*Renewable Cooling & Storage*”.

There was also a one-day stream based on International Energy Agency ([IEA](#)) advances with update sessions for each of PhotoVoltaic Power Systems ([PVPS](#)), Solar Heating and Cooling ([SHC](#)) and User Centred Energy Systems ([UCES](#)). There was also a full engagement of the Australian Centre for Advanced Photovoltaics ([ACAP](#)) in its own focused afternoon stream.

Plenary speakers included [IT Power](#)'s Dr **Keith Lovegrove** giving a [presentation](#) on "Renewable Energy Options for Industrial Process Heat".

Exemplary's Director of Buildings, **Trevor Lee**, gave a [paper](#) on "Weather Data and Climate Data: Updates and Enhancements" in the session on *Deployment & Integration - Resources, Forecasting & Networks*. It was there that the Chair, Dr Roger Dargaville (Monash University) announced the death on the previous Saturday of Dr Ian Grant. Dr Grant was on the program to deliver the last paper of that session.

Vale Dr Ian Grant

By **Peter May** from the Bureau of Meteorology (slightly edited)

Ian was trained as a space physicist, earning his bachelors and masters degrees at Melbourne University and PhD at Latrobe University. After two post-docs in Canada he returned to Australia to work at CSIRO Atmospheric Division in Aspendale (bayside suburban Melbourne) where he used ground-based instruments to validate satellite derived radiation parameters. His experience with satellite data led to a position in the Bureau of Meteorology's ([BoM](#)) Satellite Section starting in 2003, where he developed numerous applications of satellite data including the Bureau's operational solar radiation, grassland curing, and vegetation index systems. These key national real-time datasets are today used by industry, agriculture, emergency management, government, and many others.



Ian's scientific expertise in solar radiation estimation was recognised not only by the solar energy community but also internationally. Ian was a member of the International Energy Agency expert working group to advance estimation and forecasting of solar radiation including from satellite. He was also a member of the Committee for Earth Observing Satellites Working Group on Calibration and Validation ([WGCV](#)) where he co-led the focus area on radiation and albedo. Ian's protocol for validation of solar radiation was recently accepted and put into the work plan for the working group. Last year Ian hosted a visit from [NASA](#) scientists to adapt a scheme for correcting atmospheric effects to improve land remote sensing for [Himawari](#) data.

Ian was a quiet achiever, extremely modest and always helpful but his work had massive impact underpinning key services. He was generous with his time and knowledge, and has helped not just his team mates but many people across the Bureau and with external customers to use satellite data and products better. He was enormously respected by all of his colleagues at the Bureau and at CSIRO and end users of the Bureau's satellite products (such as **Exemplary Energy**). He was a great friend to many of us. He will be sorely missed.

He was also an active contributor to the Terrestrial Ecosystem Research Network ([TERN](#)) who have published a short eulogy covering his valued contribution to their work.

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.