

NZ GREEN Grid project example:

Testing power demand: rf_38

Ben Anderson (b.anderson@soton.ac.uk, @dataknut)

Last run at: 2018-07-30 10:22:22

Contents

1	About	2
1.1	Report circulation:	2
1.2	License	2
1.3	Notices:	2
1.4	Citation	2
1.5	History	2
1.6	Requirements:	3
1.7	Support	3
2	Introduction	4
3	Load rf_38 data	4
4	Plot monthly power profiles	5
5	Runtime	5
6	R environment	5
	References	7

1 About

1.1 Report circulation:

- Public - this report is intended to accompany the data release.

1.2 License

This work is made available under the Creative Commons Attribution-ShareAlike 4.0 International (CC BY-SA 4.0) License.

This means you are free to:

- *Share* — copy and redistribute the material in any medium or format
- *Adapt* — remix, transform, and build upon the material for any purpose, even commercially.

Under the following terms:

- *Attribution* — You must give appropriate credit, provide a link to the license, and indicate if changes were made. You may do so in any reasonable manner, but not in any way that suggests the licensor endorses you or your use.
- *ShareAlike* — If you remix, transform, or build upon the material, you must distribute your contributions under the same license as the original.
- *No additional restrictions* — You may not apply legal terms or technological measures that legally restrict others from doing anything the license permits.

1.3 Notices:

- You do not have to comply with the license for elements of the material in the public domain or where your use is permitted by an applicable exception or limitation.
- No warranties are given. The license may not give you all of the permissions necessary for your intended use. For example, other rights such as publicity, privacy, or moral rights may limit how you use the material. #YMMV

For the avoidance of doubt and explanation of terms please refer to the full license notice and legal code.

1.4 Citation

If you wish to use any of the material from this report please cite as:

- Anderson, B. (2018) NZ GREEN Grid project example: Testing power demand: rf_38 Centre for Sustainability, University of Otago: Dunedin.

This work is (c) 2018 the University of Southampton.

1.5 History

Code history is generally tracked via our github repo:

- Report history
- General issues

1.6 Requirements:

This report uses the safe version of the grid spy 1 minute data which has been processed using <https://github.com/dataknut/nzGREENGridDataR/blob/master/dataProcessing/gridSpy/processGridSpy1mData.R>.

1.7 Support

This work was supported by:

- The University of Otago;
- The University of Southampton;
- The New Zealand Ministry of Business, Innovation and Employment (MBIE) through the NZ GREEN Grid project;
- SPATIALEC - a Marie Skłodowska-Curie Global Fellowship based at the University of Otago's Centre for Sustainability (2017-2019) & the University of Southampton's Sustainable Energy Research Group (2019-202).

2 Introduction

The NZ GREEN Grid project recruited a sample of c 25 households in each of two regions of New Zealand. The first sample was recruited in early 2014 and the second in early 2015. Research data includes:

- 1 minute electricity power (W) data was collected for each dwelling circuit using gridSpy monitors on each power circuit (and the incoming power). The power values represent mean(W) over the minute preceeding the observation timestamp.
- Occupant time-use diaries (focused on energy use)
- Dwelling & appliance surveys

We are working towards releasing ‘clean’ (anonymised) versions of this research data for re-use.

This report provides summary analysis of one household as an example.

3 Load rf_38 data

The data used to generate this report is:

- /Volumes/hum-csafe/Research Projects/GREEN Grid/Clean_data/safe/gridSpy/1min/data/rf_38_all_1min_data.csv.
- /Volumes/hum-csafe/Research Projects/GREEN Grid/Clean_data/safe/survey/ggHouseholdAttributes.csv

```
## Parsed with column specification:
## cols(
##   sample = col_character(),
##   hhID = col_character(),
##   newID = col_character(),
##   Location = col_character(),
##   nAdults = col_integer(),
##   nChildren0_12 = col_integer(),
##   nTeenagers13_18 = col_integer(),
##   notes = col_character(),
##   r_stopDate = col_date(format = "")
## )
```

sample	hhID	newID	Location	nAdults	nChildren0_12	nTeenagers13_18	notes	r_stopDate
Unison	rf_38	rf_38	Hawkes Bay	2	2	0	NA	NA

Table ?? shows household attributes such as how many people live in this household.

hhID	dateTime_orig	TZ_orig	r_dateTime	circuit	powerW
Length:5319113	Length:5319113	Length:5319113	Min. :2015-03-25 03:51:00	Length:5319113	Min. :-179.0
Class	Class	Class	1st Qu.:2015-08-28 14:06:00	Class	1st Qu.: 0.0
:character	:character	:character	Median :2016-10-18 01:51:00	:character	Median :
Mode	Mode	Mode	Mean :2016-06-21 10:31:25	Mode	Mean :
:character	:character	:character	3rd Qu.:2017-03-21 06:54:00	:character	3rd Qu.: 170.2
NA	NA	NA		NA	

hhID	dateTime_orig	TZ_orig	r_dateTime	circuit	powerW
NA	NA	NA	Max. :2017-08-22 06:37:00	NA	Max. :6678.4

Table ?? shows a summary of the grid spy 1 minute power data.

Note that:

- the original dateTime (`dateTime_orig`) and TZ (`TZ_orig`) have been retained so that the user can check for parsing errors (see <https://github.com/dataknut/nzGREENGridDataR/issues/2>) if required;
- `r_datetime` is the correct dateTime of each observation in UTC and will have loaded as your local timezone. If you are conducting this analysis outside NZ then you will get strange results until you use `lubridate` to tell R to use `tz = "Pacific/Auckland"` with this variable;

4 Plot monthly power profiles

This section plots overall mean power (W) per minute per month for each circuit to show:

- patterns of missing data (no lines)
- patterns of consumption
- possible dateTime issues (where consumption patterns seem to be strangely shifted in time)
- possible PV installation

Figure 1 shows the plot for this household (`rf_38`). Can you see anything interesting or unusual?

5 Runtime

Analysis completed in 52.73 seconds (0.88 minutes) using knitr in RStudio with R version 3.5.0 (2018-04-23) running on x86_64-apple-darwin15.6.0.

6 R environment

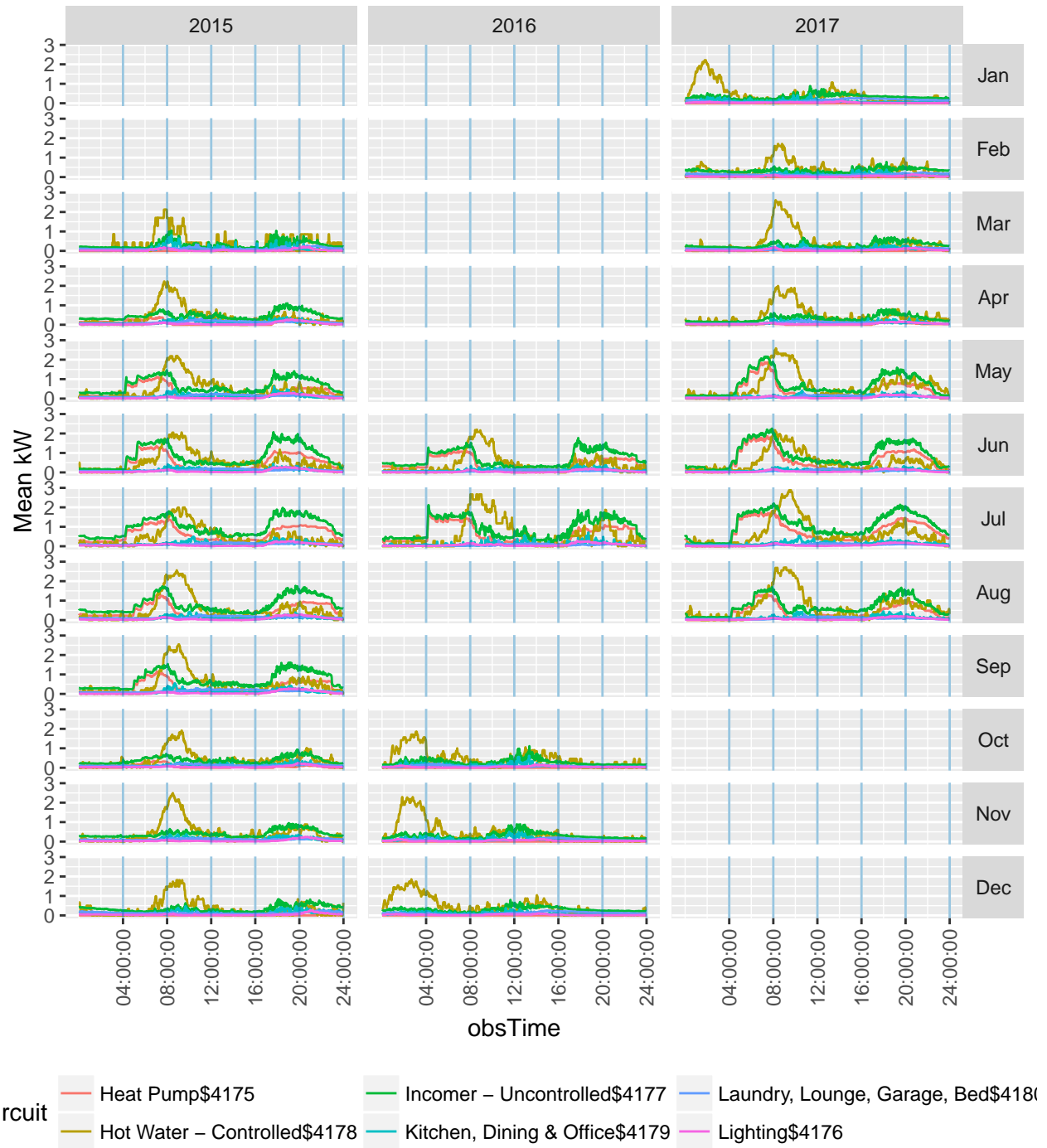
R packages used:

- base R - for the basics (R Core Team 2016)
- data.table - for fast (big) data handling (Dowle et al. 2015)
- lubridate - date manipulation (Grolemund and Wickham 2011)
- ggplot2 - for slick graphics (Wickham 2009)
- readr - for csv reading/writing (Wickham, Hester, and Francois 2016)
- knitr - to create this document & neat tables (Xie 2016)
- nzGREENGridDataR - for local NZ GREEN Grid project utilities

Session info:

```
## R version 3.5.0 (2018-04-23)
## Platform: x86_64-apple-darwin15.6.0 (64-bit)
## Running under: macOS High Sierra 10.13.6
##
## Matrix products: default
## BLAS: /Library/Frameworks/R.framework/Versions/3.5/Resources/lib/libRblas.0.dylib
## LAPACK: /Library/Frameworks/R.framework/Versions/3.5/Resources/lib/libRlapack.dylib
```

Montly mean power profiles by circuit plot: rf_38



gridSpy data from 2015-03-25 03:51:00 to 2017-08-22 06:37:00
obsTime = Pacific/Auckland

Figure 1: Demand profile plot

```
##
## locale:
## [1] en_GB.UTF-8/en_GB.UTF-8/en_GB.UTF-8/C/en_GB.UTF-8/en_GB.UTF-8
##
## attached base packages:
## [1] stats      graphics  grDevices  utils      datasets  methods   base
##
## other attached packages:
## [1] knitr_1.20      readr_1.1.1      ggplot2_2.2.1
## [4] lubridate_1.7.4 data.table_1.11.4 nzGREENGridDataR_0.1.0
##
## loaded via a namespace (and not attached):
## [1] nzGREENGrid_0.1.0 progress_1.2.0   tidyselect_0.2.4
## [4] xfun_0.1         reshape2_1.4.3   purrr_0.2.5
## [7] lattice_0.20-35  colorspace_1.3-2 htmltools_0.3.6
## [10] yaml_2.1.19      rlang_0.2.1      pillar_1.2.3
## [13] glue_1.2.0       sp_1.3-1         readxl_1.1.0
## [16] bindrcpp_0.2.2   jpeg_0.1-8       bindr_0.1.1
## [19] plyr_1.8.4       stringr_1.3.1    munsell_0.5.0
## [22] gtable_0.2.0     cellranger_1.1.0 RgoogleMaps_1.4.2
## [25] mapproj_1.2.6    evaluate_0.10.1  labeling_0.3
## [28] highr_0.7        proto_1.0.0      Rcpp_0.12.17
## [31] geosphere_1.5-7  openssl_1.0.1    backports_1.1.2
## [34] scales_0.5.0     rjson_0.2.20     hms_0.4.2
## [37] png_0.1-7        digest_0.6.15    stringi_1.2.3
## [40] bookdown_0.7     dplyr_0.7.5      rprojroot_1.3-2
## [43] grid_3.5.0       tools_3.5.0      magrittr_1.5
## [46] maps_3.3.0       lazyeval_0.2.1   tibble_1.4.2
## [49] crayon_1.3.4     pkgconfig_2.0.1  prettyunits_1.0.2
## [52] assertthat_0.2.0 rmarkdown_1.10   R6_2.2.2
## [55] ggmap_2.6.1      compiler_3.5.0
```

References

- Dowle, M, A Srinivasan, T Short, S Lianoglou with contributions from R Saporta, and E Antonyan. 2015. *Data.table: Extension of Data.frame*. <https://CRAN.R-project.org/package=data.table>.
- Grolemund, Garrett, and Hadley Wickham. 2011. “Dates and Times Made Easy with lubridate.” *Journal of Statistical Software* 40 (3): 1–25. <http://www.jstatsoft.org/v40/i03/>.
- R Core Team. 2016. *R: A Language and Environment for Statistical Computing*. Vienna, Austria: R Foundation for Statistical Computing. <https://www.R-project.org/>.
- Wickham, Hadley. 2009. *Ggplot2: Elegant Graphics for Data Analysis*. Springer-Verlag New York. <http://ggplot2.org>.
- Wickham, Hadley, Jim Hester, and Romain Francois. 2016. *Readr: Read Tabular Data*. <https://CRAN.R-project.org/package=readr>.
- Xie, Yihui. 2016. *Knitr: A General-Purpose Package for Dynamic Report Generation in R*. <https://CRAN.R-project.org/package=knitr>.