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Geospatial and Temporal Visualisation of Low-Voltage Energy Network Data

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Energy network data is often considered temporally, with time-series analysis being a common manner of investigating events and trends. Recent events in the National Energy Market (NEM), such as the late 2016 South Australian Blackouts [1], have drawn attention to the variances in network conditions in different regions of Australia. Analysis of these events geospatially as well as temporally is thus important. Presenting this information can be difficult, as it requires the viewer to observe at least four dimensions of information: two spatial, one temporal, and at least one measurement dimension.

As a provider of energy monitoring, Solar Analytics has a large collection of low voltage (LV) network data, capturing important parameters including distributed solar generation, energy consumption, grid voltage and frequency. Presenting these in both an interpretable and statistically meaningful manner requires several challenges to be overcome. Due to the population distribution of Australia, which primarily lies in small pockets near the east coast, presenting this data on national maps can often be misleading, underrepresenting the amount of variation in highly populated regions while increasing the apparent impact of less populated regions. Various nuances must be kept in mind when tackling such issues, such as aggregation of data and anonymity.

Spatio-Temporal data lends itself to animated presentation, as the temporal dimension can be provided as the change in a plotted geospatial dataset as the animation progresses [2]. This speeding up (or slowing down) of events that can take place over hundreds of kilometres uses our intuitive sense of the progression of time to help in understanding the information. Static visualisations are also useful, but typically use another method of demonstrating a fourth dimension in the data. This may be done using some form of aggregation, ranging from simple statistical methods such as the mean of a measurement to more complex cluster analyses. Both types of visualisations will often use multiple layers of symbology, including shape, size and colour of data points, allowing the representation of further dimensionality.

Methods for visualising various forms of LV energy network data will be presented, highlighting both long term trends and short events. Static and animated visualisations will be used and compared. Finally, challenges in the presentation and interpretation of such data will be discussed.

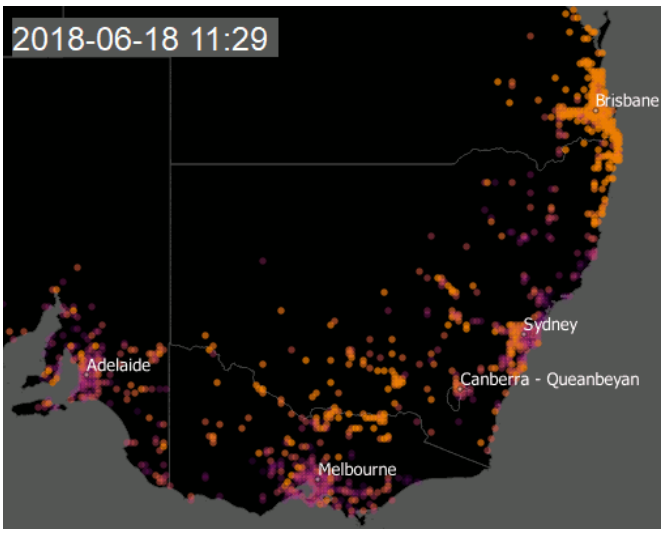

Figure 1: Still from animation of aggregated PV performance

References

1. AEMO, 2017, 'Black System South Australia 28 September 2016 – Final Report'

2. Harrower, M. and Fabrikant, S, 2008, 'The Role of Map Animation for Geographic Visualization', Geographic Visualisation, John Wiley & Sons, Chapter 4, p49-65