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Visualising Daily Solar Supply

0.1 Establish the Field (166 words)

Solar supply can come from photovoltaic (PV) generators on homes, businesses or large power stations.

Solar and renewable energy is a growing market in Australia. The Australian Government Clean Energy Regulator writes in The Renewable Energy Target 2018 Administrative Report that the number of small and mid-size PV installations is increasing, and 86% of the 361 newly accredited power stations are solar PV.

Because of this accelerating growth, it is therefore important to have access to current data on solar supply. Future planning and decisions depend on a good understanding of the current state of the solar landscape.

For daily solar supply specifically, the Australian PV Institute (APVI) provides time-series data by postcode.

The Australian Renewable Energy Agency (ARENA) provides funding to energy projects, including solar, and supports the APVI project.

It's important that the current state of solar supply is able to be visualised in an accessible way. This captures the rapid change as supply increases, and can be used to guide in future planning.

0.2 Summarise previous research (248 words)

Visualisation is often used in some capacity to assist in solar projects. The scope of previous research covers diverse fields such as urban power grid design[1] , geospatial analysis of solar density potential[4] , study of solar uptake rates and policy considerations[3] , and software tools for planning all aspects of solar projects[2] . Because there are such a wide range of considerations on the whole, it is important to have accessible data visualisation that covers relevant and up-to-date information.

A virtual model of daily solar supply will help fill in that gap. All of these research areas are concerned with planning and design factors. Being able to sift through large amounts of data is relevent to future planning and current solar project undertakings.

Previous research in the field is gong to help shape our project. Even if it's not directly related we can see how some data is being used, and what

issues are being addressed, as well as which tools are being used.

Visualising the data will be a new and innovative presentation of sources that are already existing, using the APVI data sets. This will be presented in a new way that is shaped by the needs of various sectors in solar project design. Most importantly, it will show a geographic distribution of solar power supply.

This visualisation could be further extended to show data from other sources that are required and available. Because the source data is freely available, it is accessible to anyone.

0.3 Prepare the current research (162 words)

When visualisations are used in the literature, they relate specifically to individual projects, or perhaps illustrating power grid networks. The data visualisations provided by APVI are time series plots delineated by postcode area. There is a gap here to create a 3D visualisation that composes the data by geographic region, and shows the current supply.

There has been research towards predicting solar output, and projects are funded through ARENA to predict solar output using sky view cameras. There is a gap here to provide solar supply predictions using freely available open data, such as an online source of weather and visibility forecasting.

Statistics on the solar supply could also be used for prediction and analysis. The supply for each region on each day of the year can be used to provide an estimate of how much solar supply is available in the area. This could be correlated with GIS studies that determine what the solar output denisity could be in that region.

0.4 Introduce Research Goals and Plan (137 words)

The primary goal of the current research is to produce a 3D visualisation of daily solar supply.

This can be constructed in an iterative way. Start with the layout of supply data by geographic region.

Other factors could be added to the visualisation in this way. We can add other data sets that are useful to compare to the solar supply. For example we can show the previous rate of supply compared with the current day, how the supply changes with season and weather effects, predicted future supply based on current uptake and future renewable energy targets.

Navigation features can be added to be able to control the data and the view. Features can be added, for example zooming in and out, searching for a postcode or a city and switching between a number of different datasets.

Bibliography

[1] Agnew, S., Smith, C., and Dargusch, P. Causal loop modelling of residential solar and battery adoption dynamics: A case study of queensland, australia. *Journal of Cleaner Production 172* (2018), 2363 – 2373.

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[4] Rylatt, M., Gadsden, S., and Lomas, K. Gis-based decision support for solar energy planning in urban environments. *Computers, Environment and Urban Systems 25*, 6 (2001), 579 – 603.