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SCU solar "Sunflower" prototype mobile solar generator: DC electrical power generation (PV) and AC electrical supply performance data, installation at Renew Festival 2017.

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Readme Document:

Sunflower Prototype Mobile Solar Generator (PMSG) Data Tables.

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Data included in the published data sets has been collected using a remote data monitoring software system developed by Southern Cross University researchers.

The data is sourced from the DC Solar charge current regulator mounted on the PMSG (Plasmatronics Model no PL40 Pulse Width Modulation Type Solar regulator).

Data is sent from the solar charge regulator to a Plasmatronics PLS2 Data shunt and a Plasmatronics PLI RS232 data connection port. This data connection port connects via RS 232/USB adapter cable to a Raspberry Pi computer running a custom Unix script that collates the data into html format. Data is sent via a 3g modem to a web server that hosts the sunflower data website. This website is accessible at http://sunflower.artohmic.com/

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Data is downloaded from this website in a excel .csv file format and contains 6 data series in 6 columns.

Column A Time of Data collection (not corrected for daylight saving)	Column B Charge Voltage Instantaneous (watts)	Column C battery storage nominal (percentage)	Column D Consumption Instantaneous (Watts)	Column E Charge Cumulative (watt hours per 24 hour time period)	Column F Consumption Cumulative (watt hours per 24 hour time period)	Column G Battery Voltage (volts DC)

Notes on Data series

Column A: Time of data collection.

Data is collected approximately every four seconds while generator is operational. This four-second interval is due to the latency of digital communication associated with the low baud rate of the rs232 digital data connection. Small data Errors also occur when no data is collected. This is indicated by blank fields in columns B to G. As the number of data points in each collection is high, meaningful data has been able to be collected on the hourly charge and power output of the prototype mobile solar generator.

Column B: Charge Voltage Instantaneous (watts).

This value represents the input charge at each given data point. This charge can come from either the the 6 photovoltaic panels each rated at 200 watts with a nominal value of 24Volts(DC) or a mains electricity backup charger installed on the PMSG .

It is important to note that the nominal maximum input charge value based on the rating of the PV panels is 1200 watts. Actual maximum value can vary from rated nominal maximum value by up to 10 per cent.

This value represents the actual surplus power generation that is not offset by power consumption. If power generation and power consumption are equal then a value of 0 would be recorded even though power is being generated from the PV solar array.

Important note.
Values found in this column represent double the actual instantaneous charge value. Values in this column must be halved to obtain actual charge measurements at each given data point. This is due to the Sunflower DC circuit design that located the data measurement shunt on the Load side of the circuit

rather than on the charge side. In this configuration the Plasmatronics PLS 2 shunt controller is measuring twice the actual charge value. For a more in depth explanation of this anomaly please see the following link. http://www.ata.org.au/forums/topic/3863.

Column C: Battery storage nominal (percentage)

This value represents the relationship between cumulative charge and cumulative consumption at each given data point..

This value can be expressed as a ratio of electrical current consumed against electrical current generated and is expressed in amp-hours based on a nominal battery pack storage of 800 amp hours@24VoltsDC.

For example, If the battery pack contains a charge current of 800 amps and over a given time period the solar array generated 200 amps of DC current and the inverter consumes 250 amps of DC current then the battery percentage reading would be a result of the total current left in the battery pack, in this case 750 amps or 93.75 per cent.

This percentage does not clearly reflect the actual storage level of the battery bank. The percentage of instantaneous power available is a complex calculation and this data point is only a rough guide to the actual percentage of power available. A more accurate measure is the DC voltage of the battery bank given in Column G .

Column D: Consumption Instantaneous (watts)

This value represents the output DC power supplied to the 3 kilowatt DC to AC Pure sine wave inverter at each given data point. It is important to note that the nominal maximum instantaneous VAC power output of this inverter is 9000 watts.

This value represents power consumption that is not offset by power generation. If power consumption and power generation are equal, then a value of 0 would be recorded even though power is being consumed.

Column E: Charge Cumulative (watt hours per 24 hour time period).

This value represents the cumulative surplus power generated by the PV array at each given data point.
This value is measured in watt-hours.
This value resets every 24 Hours and the time of reset depends on the start time of each data collection series.
Important note.
Values found in this column represent double the actual cumulative charge value. Values in this column must be halved to obtain actual charge measurements at each given data point. This is due to the circuit design that located the data measurement shunt on the Load side of the circuit rather than the charge side. In this configuration the Plasmatronics PLS 2 shunt controller is measuring twice the actual charge value. For a more in depth explanation please see the following link.
http://www.ata.org.au/forums/topic/3863.

Column F Consumption Cumulative (watt hours per 24 hour time period)

This value represents the cumulative power consumed by the DC/AC Inverter at each given data point.
This value is measured in watt-hours. This value resets every 24 Hours. The reset time depends on the start time of each data collection series.

Column G Battery Voltage (volts DC)

This value measures the voltage of the Sunflower PMSG DC electrical circuit at each given data point. This value represents the state of residual charge in the battery pack and the input voltage from the 1200watt DC Photovoltaic array.

The Battery pack in the Sunflower PMSG is made up of 8 pairs of 400amphour@24vdc Lithium Phosphate battery cells (16 in total) connected in series. Nominal voltage of each cell in the battery pack is 3.25 volts. This voltage value will change if the unit is connected to a load (AC inverter) or a charge (DC Solar or DC Mains powered charger). 24 volts is considered the minimum safe operational voltage value. This value is the best indication of available energy (DC charge current) left in the battery bank. The battery bank is considered "full " when the value of column g = 29.4 volts (no connected load). This is considered to be equivalent to the maximum 100 per cent charge available. The battery bank is considered "empty" when charge value = 24 volts (zero per cent) or the minimum safe charge value required to supply continuous single phase 240VAC.