

Cape Quarter PV project

Operation Report

16 January - 4 February 2015



Part of the Aurora Power Group



1. Introduction

This report documents the results of the installed solar PV system at the Cape Quarter Centre, which was commissioned on 16 January 2014. The report shows the PV system yields and returns for the period, 16 January to 4 February 2015.

2. Methodology

The **half-hourly load and PV production, daily average** and **total monthly** energy production has been used to assess the PV system's actual performance compared to the expected performance. The financial savings are calculated on the basis of Energy Savings and Demand Savings.

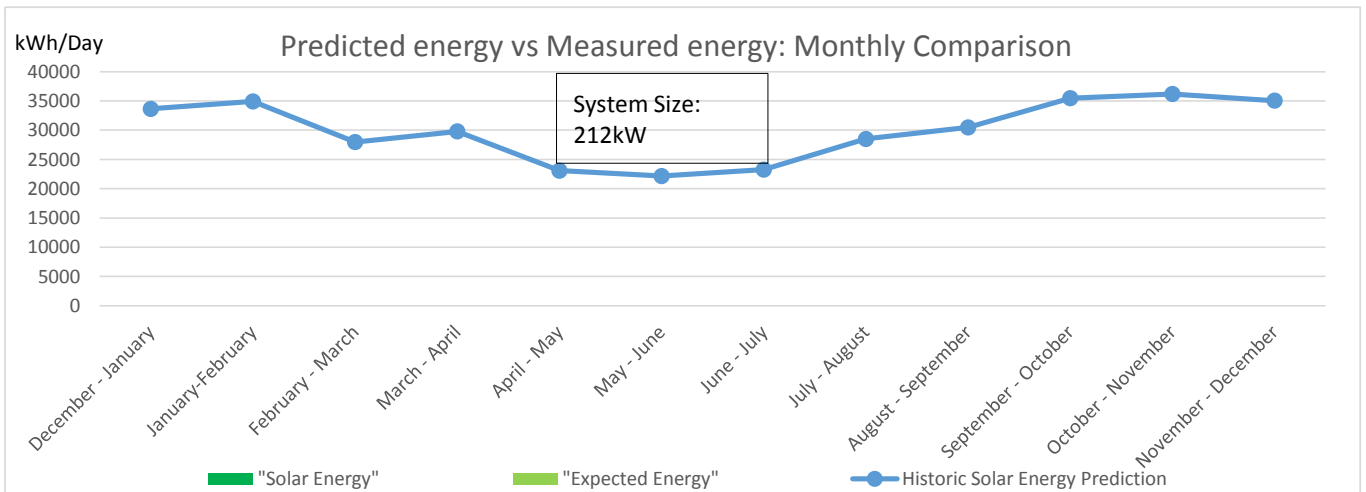
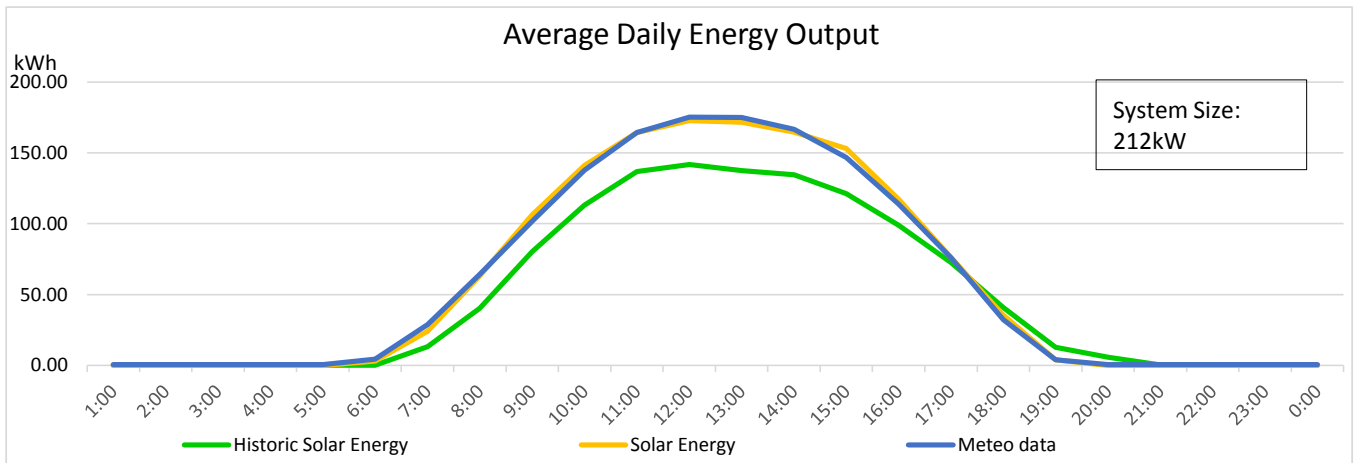
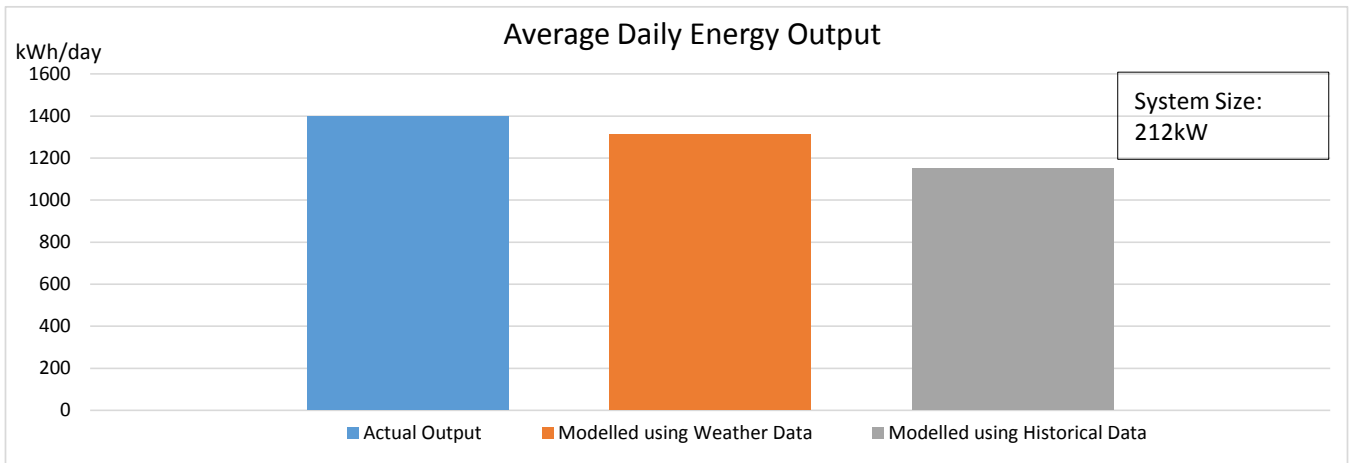
The PV output power is measured using class 0.5 energy meters. This data is used to calculate the electricity savings that our client has made during the billing period.

3. Results

3.1 Table of Results

Table 1: Results for the period: 16 January - 4 February 2015

Performance Metrics	Amount
Solar Energy (kWh)	27927
Expected Solar Energy (kWh)	26230
Historically Predicted Solar Energy (kWh)	22999
Demand reduction (kVA)	156
Historical Demand Reduction (kVA)	76
Average Daily Radiation (Wh/m ² /day)	7991
Historical Daily Radiation (Wh/m ² /day)	6863
PV System Relative Performance	106.47%
Actual/Historical Energy Output	121.43%
Actual/Historical Demand Output	205.73%
System Downtime Losses (kWh)	0
Performance Ratio for 16 January - 4 February 2015	81%
Expected Performance Ratio	76%

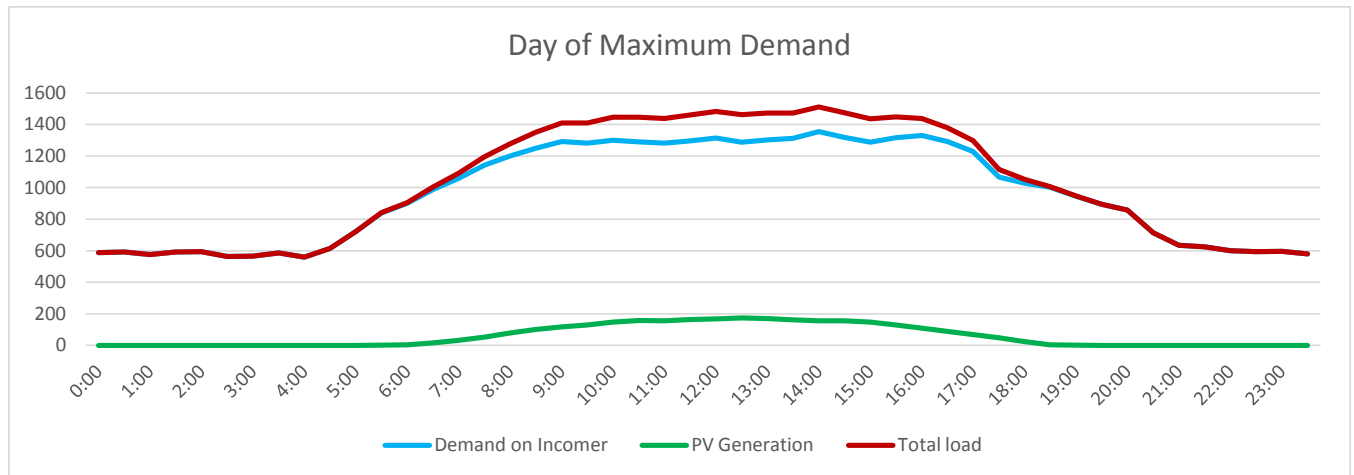


4. Financial Savings

4.1 Demand Savings

The installation of the PV system resulted in a reduction of the peak demand of 156 kVA.

Peak Demand excl. Solar (29 January 2015)	1512 kVA
Peak Demand with Solar (29 January 2015)	1355 kVA



At the current municipal demand charge of 187.27/kVA, the peak demand saving results in a demand saving of R 29 280.29.

4.2. Energy Savings

The PV system produced 27 927 kWh during 16 January - 4 February 2015. At the energy tariff of 0.6293/kWh this results in a financial saving of R 17 574.46.

4.3. Energy Generation Charge

A total of 0 kWh of energy was exported during the 16 January - 4 February 2015 period.

4.4. Total Savings

The total monetary savings for the 16 January - 4 February 2015 period is R 46 854.75.

4.5. Comparison to expectations

Table 2: Cumulative saving compared to expected savings.

Month		16/01 - 4/02	Monthly (Extrapolated)
Energy	Expected	R 14 473.08	R 22 433.27
	Actual	R 17 574.46	R 27 240.41
Demand	Expected	R 14 232.52	R 14 232.52
	Actual	R 29 280.29	R 29 280.29
Selling	Expected	R 0.00	R 0.00
	Actual	R 0.00	R 0.00
Total	Expected	R 28 705.60	R 36 665.79
	Actual	R 46 854.75	R 56 520.70
Performance relative to expected		163.2%	154.2%

5. Miscellaneous feedback

5.1 Nothing to report

6. Conclusions

- 6.1 The overall financial saving achieved during the billing period amounts to R 46 854.75 which is 63.23% higher than predicted.
- 6.2 During the billing period the PV System received higher than expected radiation by 16.44% based on historical data.
- 6.3 The PV System overperformed by 6.47% based on the measured irradiation.
- 6.4 Module degradation has not been accounted for in the calculations
- 6.5 Demand savings during this period were higher than expected by 105.73% based on historic trends.

7. Definitions

- 7.1 **"Actual/Historical Demand Output"** means
$$\frac{\text{Demand Reduction (kVA)}}{\text{Historical Demand Reduction (kVA)}}$$
- 7.2 **"Actual/Historical Energy Output"** means
$$\frac{\text{Solar Energy (kWh)}}{\text{Historical Solar Energy (kWh)}}$$
- 7.3 **"Average Daily Radiation"** is total in-plane radiation measured on-site during the billing period divided by the number of days in the billing period (wH/m^2)
- 7.4 **"Demand Reduction"** is the reduction in the Peak Demand Charge as a result of the PV System during the billing period (kVA)
- 7.5 **"Expected Performance Ratio"** means
$$\frac{\text{Historic Solar Energy (kWh)}}{(\text{Historical radiation} \times \text{PV Module Efficiency} \times \text{Area of installed PV})}$$
- 7.6 **"Expected Solar Energy"** is the energy (kWh) expected to be produced by the PV system with the measured site irradiance data. This figure is calculated by using the measured in-plane irradiation multiplied by the Expected Performance Ratio.
- 7.7 **"Historical Daily Radiation"** is the total historic in-plane irradiation during the billing period divided by the number of days in the billing period
- 7.8 **"Historical Demand Reduction"** is the simulated Demand Reduction using Historic Weather Data and available load data.
- 7.9 **"Historically Predicted Solar Energy"** is the amount of energy (kWh) expected, using Historic Weather Data.
- 7.10 **"Historic Weather Data"** means a collection of 20 years of irradiance and temperature data used to predict the energy yield from the PV System
- 7.11 **"Peak Demand Charge"** means the highest half-hourly averaged power drawn from the council supply during the billing period
- 7.12 **"Peak Demand excl. Solar"** means the maximum demand if the effect of the PV is excluded
- 7.13 **"Peak Demand incl. Solar"** means the maximum demand if the effect of the PV is included
- 7.14 **"Performance Ratio"** means
$$\frac{\text{Solar Energy (kWh)}}{\text{In-plane radiation} \times \text{PV Module Efficiency} \times \text{Area of installed PV}}$$
- 7.15 **"PV System Relative Performance"** means
$$\frac{\text{Solar Energy (kWh)}}{\text{Expected Solar Energy (kWh)}}$$
- 7.16 **"System Downtime Losses"** means total amount of energy lost due to the system not operating