Return on Investment for Sydney Solar Systems

Dr Martin Gill
Director OPPM Pty Ltd

The installation of a solar system is a long term financial investment. This article uses current solar system prices and tariffs to calculate the financial return on investment for Sydney households. The article finds for the majority of households a solar system is not a sound financial investment.

Introduction

The installation of a solar system reduces the annual electricity bill. The larger the solar system the larger the savings. Unfortunately focussing on short term savings often overlooks the upfront costs and the long term return the household receives from their investment.

Return on Investment (ROI) calculations consider both annual savings and the initial purchase price. ROI calculations reveal there is an optimum solar system size maximising the financial return the household receives. Installing too large or too small a solar system reduces the long term ROI.

The ROI calculation requires the household's electricity use (particularly during daylight hours), solar system output, solar system cost and applicable electricity tariffs. Most households do not have this information making it difficult to determine the optimum solar system size.

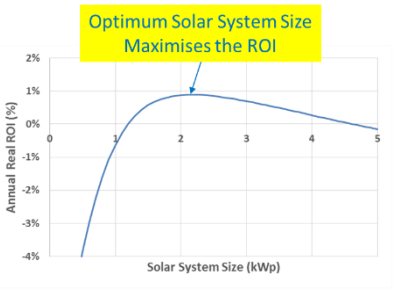
This article uses actual measurements of electricity use and solar system output from 300 Sydney households to calculate the ROI. It finds over 90% of the households installing a solar system do not recover the initial purchase price within 10 years.

Return on Investment Calculation

The Return on Investment (ROI) for a solar system is calculated as:

$$ROI = \frac{Value\ of\ Electricity\ Savings - Purchase\ Price}{Purchase\ Price}$$

The following figure plots the ROI for a Sydney household against solar system size:

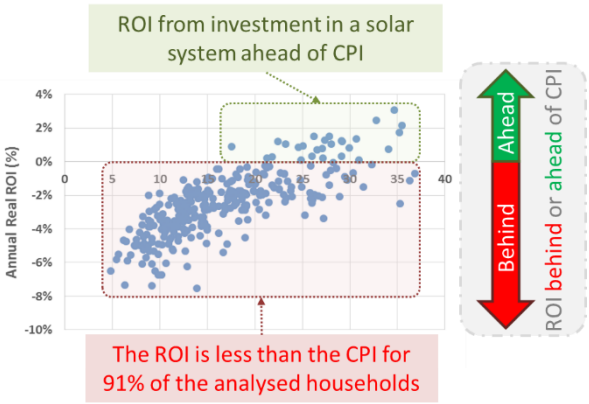


ROI plotted against solar system size

The above figure shows there is an optimum solar system size. The optimum solar system size is related to the amount of electricity the household uses (during daylight hours).

Anticipated ROI

The following figure plots the ROI for 300 Sydney household assuming they install a solar system of optimum size:



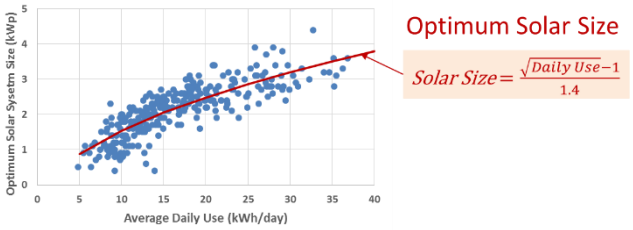
Annual Return on Investment for the 300 households

Sound long term financial investments should aim to provide an annual ROI ahead of the Consumer Price Index (CPI). The Real ROI in the above figure has been adjusted for the CPI. Values above 0% represent solar systems providing a sound long term investments.

The figure notes that only 9% of the households receive a long term financial benefit from their investment in a solar system.

Optimum Solar System Size

The following figure plots the results of calculating the optimum solar system size for the 300 Sydney households:



Optimum solar system size plotted against average daily use

A simplified equation for a line of best fit is provided. This equation allows households to estimate the optimum solar system size based on the average daily use shown on their electricity bill.

Solar installers generally offer systems in a number of standard sizes. It is suggested that households choose the first standard solar system size above the system size given by the equation (as shown earlier in this article the ROI decreases relatively slowly for systems larger than the optimum size). The following table provides suggested Installed Sizes for a range of Average Daily Uses.

Average Daily Use (kWh / day)	Optimum Size (kWp)	Installed Size (kWp)
5-10	1.2	1.5
10-15	1.8	2.0
15-20	2.4	2.5
25-30	2.6	3.0
30-35	3.3	3.5

Discussion of Results

Two factors contribute to the lower than expected number of households receiving a positive ROI on their investment in a solar system.

Electricity prices have fallen.

In July 2014 the NSW energy market was deregulated. Households can now choose from several tariffs offering lower electricity prices than before deregulation. These lower prices decrease the value of electricity generated by the solar system lowering the ROI.

The installed price of solar systems has risen.

Analysis shows since Dec 2013 the average price of a 2.5kW system in Sydney has increased 8.5% (devaluation of the Australian Dollar against the US$ might explain this). The higher purchase price lowers the ROI.

Details of the Analysis

ROI Calculations

ROI calculations in this article are performed over 10 years. While the solar panels are guaranteed to last 25 years solar inverters are usually guaranteed for less than 5 years. ROI calculations for periods beyond 10 years should include the cost to replace the solar inverter. As a general guide the installation of a new inverter is approximately 30% of the initial purchase price.

Evidence suggests households are reluctant to replace failed inverters. This is based on recent results of a utility program contacting customers to inform them their inverters had failed. Reportedly only 10% took up the offer to have the inverter replaced.

Solar Output and Electricity Use

The output of quality solar panels decreases each year. This article has assumed that quality solar panels are installed so output decreases by 0.5% per year.

This analysis also assumes that household electricity use declines at the same rate as the degradation of the solar panels. In recent years household electricity use has been declining (largely due to government energy efficiency initiatives). Assuming that solar panel output and household use decrease at the same rate simplifies the ROI calculation.

Electricity Tariffs

The value of the electricity produced by the solar system depends on the tariff. Households keen to manage electricity costs should choose the tariff offering the lowest cost. On all tariffs the electricity supplied to the household is identical (c.f. unlike insurance where consumers must carefully consider differences in the cover).

In the deregulated energy market NSW households are able to choose from a range of different tariffs. This article used the Energy Made Easy website to find the tariff offering the lowest cost when all discounts are included. The following table summarises the selected tariff:

Tariff used for the analysis (including GST)

Tariff	Price (cents per kWh)
Peak	40.59
Shoulder	14.85
Off Peak	9.207
Feed in (Credit)	5

The installation of a solar system results in annual savings in two different ways.

Household uses generated electricity

The major saving arises from electricity produced by the solar system which is used by the household. On the selected tariff generated electricity used by the household is worth either 14.85 or 40.59 cents/kWh (depending on the time of day).

Credit earned for unused generated electricity

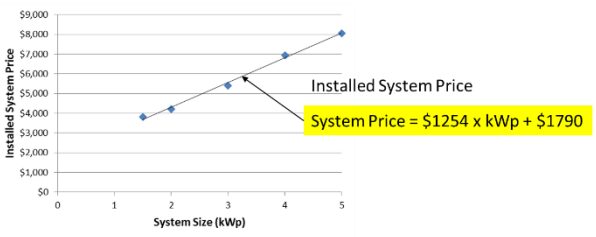
The household also receives a credit for solar generation excess to their requirements. This excess electricity flows to the network and is worth 5 cents/kWh (the feed in price).

The ROI calculations assume electricity prices rise at the same rate as the CPI. This assumption is based on recent determinations by the Australian Energy Regulator limiting electricity price rises for at least the next 5 years to a rate lower than the CPI.

Warning: The Energy Made Easy website does not (currently) include the output of solar systems when comparing tariffs. Until this feature is added consumers must manually adjust entered input values and add anticipated feed-in credits to compare solar tariffs.

Solar System Prices

The Solar Choice website tracks average solar system prices. Plotting the average installed price of solar systems in Sydney for September 2015 reveals.



Average Installed Solar System Price in Sydney (Sept 2015)

The installed price includes government rebates provided via small-scale technology certificates (STCs). The Solar Choice website indicates in Sept 2015 the STCs were valued at $810/kWp.

Source of Interval Data

The analysis presented in this article uses 30 minute interval data from 300 households in the Ausgrid (Sydney) region. The Ausgrid website suggests "*The customers in this dataset do not represent a statistically relevant sample of residential customers in the Ausgrid network area and have not undergone detailed checks for occupancy*". The analysis uses household average daily use to address both of these concerns.

Conclusion

This article considers the Return on Investment (ROI) Sydney households can expect from the installation of a solar system. It found even when households install a solar system chosen to maximise the ROI, less than 10% receive a financial return ahead of inflation.

This result is due to recent falls in electricity prices and increases in the installed price of solar systems.

It is noted that households may choose to install a solar system for reasons beyond the financial return on their electricity bills, including environmental concerns or for property capital improvement. This article provides guidance to the solar system maximising the ROI they receive.

Comments or Questions?

The author is happy to receive comments or questions about this article. He can be contacted at martin@drmartingill.com.au

Citation

References

Source of Interval Data ausgrid.com.au

Energy Made Easy Website energymadeeasy.gov.au

Solar Choice Website solarchoice.net.au

Version History

Version	Date of publication	Comments
V01	25/10/2015	Limited Release

About Dr Martin Gill

Dr Gill specialises in the provision of advice and data analysis to the energy industry. As a consultant he has prepared advice for government regulators, distributors, retailers, consumers, asset operators and equipment vendors.

Dr Gill has lead teams researching and developing new products across a broad range of industries, including advanced communication modems, burglar alarms, high voltage fault monitors and power quality analysers. One of his teams developed the first in home display and web-portal providing Australian customers the ability to view their electricity use. This innovation was recognised with the Green Globe Award, NSW Government's Premier's Award and Best New Product by the Australian Electrical and Electronics Manufacturers Association.