SOLAR ENERGY AND HOUSEHOLD ENERGY DEMAND

Mr PRAJAPATI PARTHKUMAR , Dr RAMADAS NARAYANAN
Central Queensland University, Bundaberg, Australia

INTRODUCTION

- Solar energy is used to meet hot water and electricity demands of a households in Australia.
- Solar hot water system (SDHW) and Solar PV system is used for this purpose but It comes with challenge of limited roof space available.
- The different options' outputs and cost depends on the location, size, energy cost and feed-in-tariff, usage pattern, utility rates and efficiency of the systems*.
- Mathematical modeling analysis for different combination of both systems to determine cost-effective option which meets both hot water and electricity demand of a typical household in Australia..

METHODOLOGY

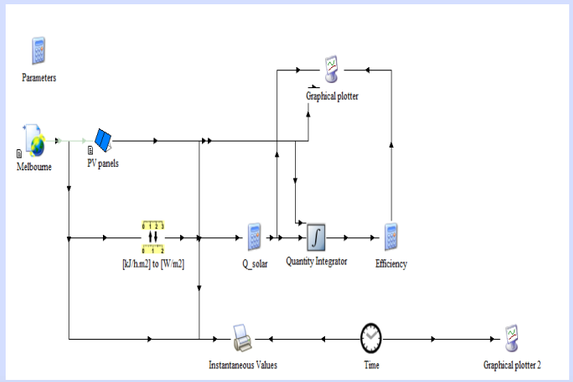
The following cases are considered for analysis to meet both demands for average household in Melbourne with available roof area of 10 m^2.

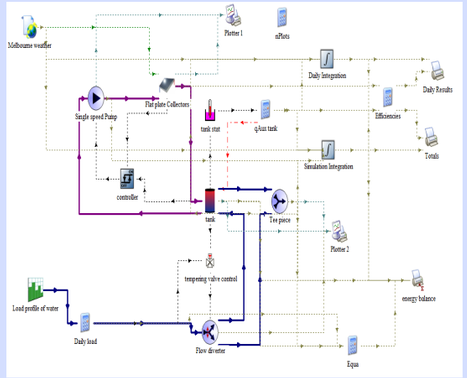
Case-1: Solar PV panel system only on whole rooftop area available.

Case-2: 3 m^2 area for solar thermal collectors and 7 m^2 area for solar PV system combination.

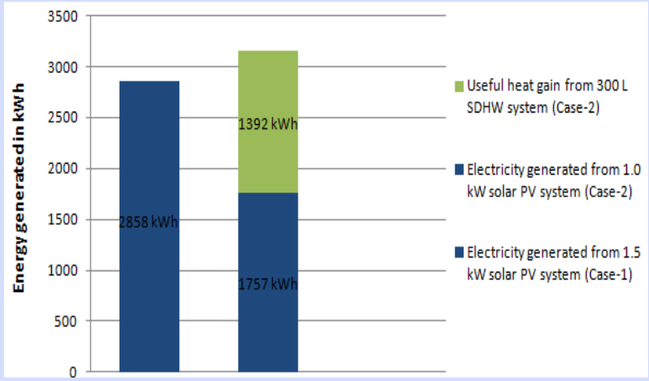
Simulation predicts results of electricity generation and hot water production for an year and economic analysis considers the prevailing electricity costs and feed-in tariffs.

MATHEMATICAL MODELING USING TRNSYS





RESULTS



ECONOMIC ANALYSIS

Data collected	Only 1.5 kW solar PV system	1.0 kW solar PV system and 300 L SDHW system combination
Total Electricity generated from solar PV system	2858.22 kWh	1757 kWh
Electricity requirement per year	9000 kWh	9000 kWh
Total bills for household (1 year)	A$ 2092	A$ 2092
Savings in electricity bills	A$ 665	A$ 408
Electricity saving from SDHW	-	1392 kWh
Savings in electricity bill from SDHW	-	A$ 323
Total saving	A$ 665	A$ 731

CONCLUSION

Solar hot water system and solar PV system in combination is found to be the cost-effective option to meet both electricity and hot water demands of a typical household in Melbourne.

*Seungho, L, David, W, & Wasim, S, PI 2014, 'Electricity Demand Profile of Australian Low Energy Houses', International Conference on Sustainability in Energy and Buildings, PP. 91-100.