Comparison of Solar PV vs Solar Thermal Hot Water Systems to Provide Energy Solutions for Strata Buildings

ENOCH KWEI: Master of Electronic and Computer Engineering/ Ecteronic and Energy Engineering

INTRODUCTION

Currently, 80% of the global energy is produced from fossil fuel. This fossil fuel is a limited source of energy and a major contributor to climate change and global warming. Strata buildings have limited roofing space and it is important to find the right energy generation technology to suit the space. Wattblock, an Energy Efficient company and is currently focused on finding solutions to aid in the reduction of the energy bills of Strata buildings.

Solar Energy Systems for domestic as well as for commercial use have extensively increased from a couple of years.. The main reason behind increased use of solar energy for domestic and commercial purpose is because sun is the renewable energy source and is inexhaustible . Solar energy conversion comes in two dimensions; the first is Photovoltaic, or PV energy conversion, where the sunlight is directly converted to electricity using solar panels. The second is a solar thermal energy generation, which uses collectors and concentrators to convert sunlight to heat, which is used for water and space heating and industrial power generation.

PURPOSE

To conduct a detailed study on the various types of solar energy systems and identify an appropriate and efficient methodology to conduct comparison on the two most commonly used solar energy systems - Solar PV and Solar Thermal Water Heating System.

TECHNOLOGIES

Solar Photovoltaic (PV)

Solar Water Heater (SWH)

METHODOLOGY

The simulation software tool RETScreen was used for this study. The technical, financial, and environmental parameters were evaluated and weighted in an ascending order of importance. ranking from, technical to environmental to financial considerations.

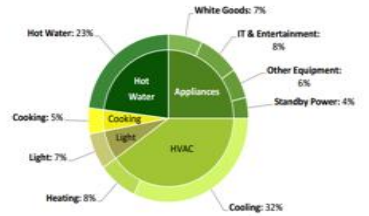
Case study

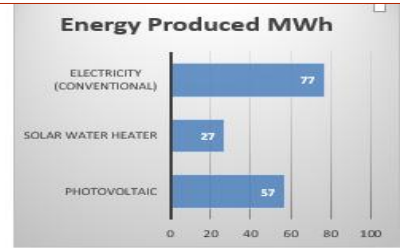
Roof space = 200 m^2

Number of rooms in a building = 38 rooms

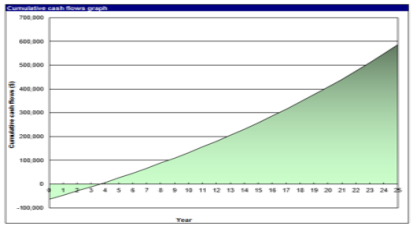
Annual energy consumption = 77 MWh (Mega – Watt hour)

Energy Model		
System	Photovoltaic	Solar Water Heater
Type	Mono-Silicon	Evacuated tube
Power Capacity	35 kW	35kW
Total Number of Units	110	41
Space Occupied	180m^2	87m^2
BOS	Inverter 30 kWh	200 L Thermosyphon system

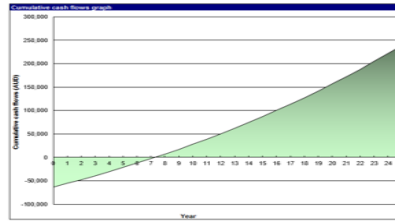




PV Cash Flow (Equity Payback)



SWH Cash Flow (Equity Payback).



RESULTS AND DISCUSION

	Technical Analysis		Environmental Analysis		Financial Analysis		
Technology	Space Occupied m^2	Energy Production MWh	Net annual GHG Reduction tCO2	Total Annual Cost $	Annual Savings $	Simple Payback years	NPV
Solar PV	180	57	54.2	3,068	19,171	3.9	$585,721
Solar Water Heater	87	27	25.3	17,839	28,989	8.4	$239,588

CONCLUSION

Both PV and SWH heater on Strata residential buildings are technical, economically, and environmentally feasible.

However solar PV provides better advantages than solar thermal water heater (SWH) and hence, should be the technology considered on limited roof Strata residential buildings.

1. PV system as a source of power for domestic hot water, excess fed to common area load.
2. Consideration of hybrid solar photovoltaic/ thermal (PVT) systems: system require half space to produce same amount of energy of PV and SWH.

WATTBLOCK