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A brief investigation into the energy reduction impact of a solar assisted air conditioning unit supplied by Solar Cool SA.

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Introduction:

With the growing concerns of increased electricity tariffs in South Africa many of the residential, commercial and industrial property owners and investors are taking a keen interest in lowering their overheads by reducing their energy bills. This can be achieved by using energy efficient alternatives for lighting, heating, cooling and cooking. Solar assisted air conditioning has been introduced to the South African market by Solar Cool and has shown significant potential to reduce HVAC energy costs.

An energy comparison of two air conditioning units identical in capacity was undertaken for Solar Cool. The first is a 12000 Btu, variable drive air conditioning unit and the second a 12000 Btu, Solar Cool air conditioning unit which is assisted with solar evacuated tube collectors. The testing of the two HVAC systems was done in the server room of East London Vinegar in order to verify whether the one air conditioning unit performed more efficiently than the other.

Method:

Electrical energy measurements were logged on the two air conditioning units. These electrical measurements were logged with an Egauge EG 3000 data logging unit. Both units were identically installed in the server room and were both programmed to maintain the room at a constant temperature of 21 degrees Celsius. The variable drive air conditioning systems' electrical energy was measured every 5 minutes for 65 days from the 22nd Sep 2013 to the 25th Nov 2013. The variable drive air conditioning unit was then replaced with the Solar Cool air conditioning unit. The electrical energy consumed was also measured every 5 minutes with the same data logger and was done for 26 days from the 27th Nov 2013 the 22nd Dec 2013.

Results:

The following data presented in the figure below are the daily averages for the two air conditioning units.

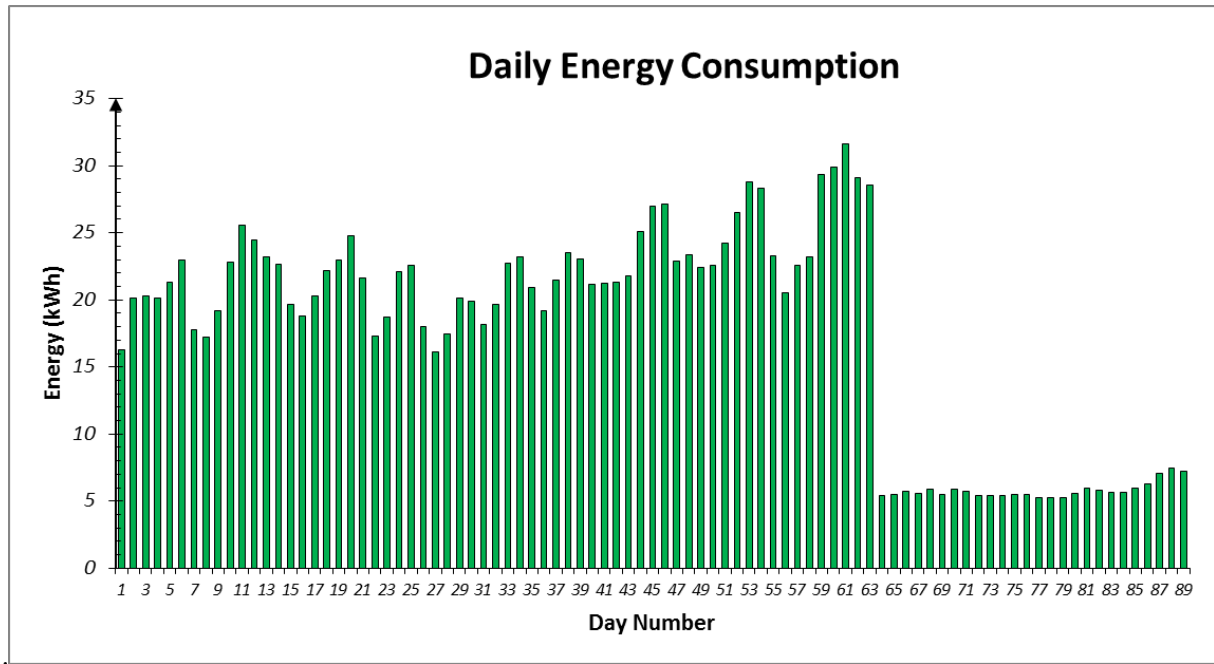


Figure 1.A Electrical Energy Consumed by the air conditioning units over the time period of the study.

Seen in the figure above is a decrease in energy consumption from when the Solar Cool unit was installed.

The following chart is the accumulation of energy consumed by both air conditioning units over the time period stated above.

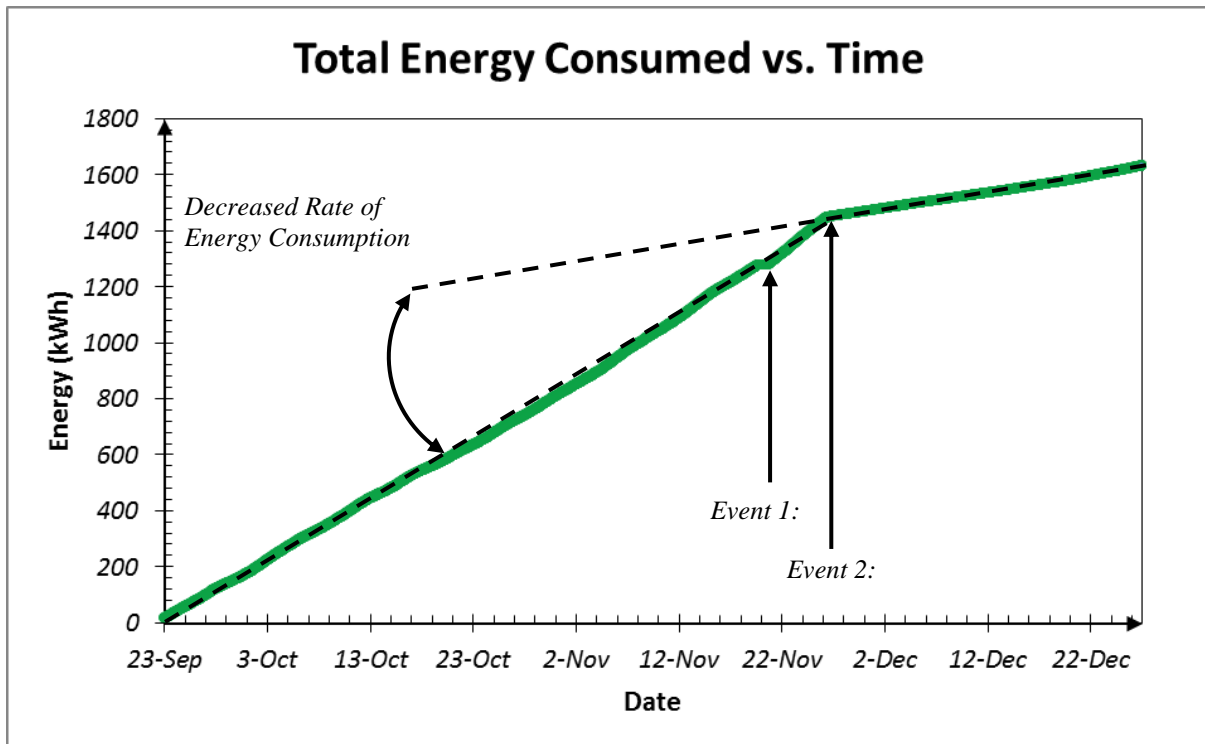


Figure 1.B Electrical Energy accumulation by the air conditioning units over the time period of the study.

Shown in the figure above are two events. Event 1 occurred due to a power failure and no energy was consumed by the air conditioner. The data on the day which event 1 occurred was ignored. Event 2 is the swap over to the Solar Cool air conditioning unit. Visually it is clear that the rate at which the Solar Cool unit consumed energy was much lower than the variable drive air conditioner.

The following table lists the results of the investigation. Listed in the results are the average daily electrical consumption and savings, minimum daily electrical consumption and savings and the maximum daily electrical consumption and savings.

Table 1.A Summary of the results

	Average Daily Consumption (kWh)	Percentage Savings (%)	Maximum Daily Consumption (kWh)	Percentage Savings (%)	Minimum Daily Consumption (kWh)	Percentage Savings (%)
Variable drive Air Conditioner	22.0	73.6		66		76.4
Solar Cool Air Conditioner	5.8		7.2		5.2	

The results show that the Solar Cool air conditioner by Solar Cool saved between 66 and 76.4 percent of the electrical energy required to maintain the server room at a constant temperature.¹

Summary:

A study was done on two air conditioning units to quantify the energy consumption and the energy savings of the newly introduced solar air conditioning unit. Results show that if a variable drive air conditioning unit is replaced by the similar sized Solar Cool air conditioning unit that 66 - 77% and on average 73.6% of the electrical energy consumed may be saved.

Yours Sincerely



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¹ NOTE: No normalisation was done for ambient air temperature, however the daily average ambient air temperature was high during peak summer when the solar assisted air conditioner was monitored. This could have an effect on the net savings implying that the savings are conservative.