

SHOULD I BUY A SOLAR WATER HEATER OR A HEAT PUMP?

By Riaan Honeyborne, ITS Solar

January 2014

With the price of electricity and the awareness to sustainable living sharply increasing, the popularity of renewable energy technology for heating water has also sharply increased. But, as with many products on the market, one can find considerably contradicting claims with regards to the different technologies used for water heating. Many of these claims and advertisements are nothing more than marketing “blah” and have no facts behind them.

At ITS we have therefore decided to try and shed some light on specifically the saving that a homeowner will get from a solar water heater and a domestic hot water heat pump.

A BACK GROUND TO THE TECHNOLOGIES

Let's first touch on some basics with regards to *solar water heaters* and *heat pumps*.

Solar water heaters use the radiation from the sun to generate heat. The size of the solar panel will determine how much energy can be collected from the sun. So if we for example have a 3m² solar panel connected to a 150L geyser this might give us 150L of 60°C water at the end of a warm sunny day but, during cooler days with less sunshine, it might only be able to heat the 150L to 35°C.

In this case we would need an electrical element to heat the water further. If we have a solar panel that is only half the size (1.5m²) we would only get out half the energy and an electrical element will need to do the rest.

Also if we assume we have 150L of 60°C water at the end of a warm sunny day and we use hot water in the evening, the water will more than likely be cold in the morning and so if someone would like to take for example a shower in the morning, an electrical element again will need to heat the water to a useable temperature.

From the above it should be clear that solar water heaters do rely on electrical elements to provide hot water at all times. In our experience a high efficiency properly sized solar system will typically provide up to a 50% saving on the energy required for hot water.

The sad truth however, is that most solar systems in South-Africa are undersized and therefore will provide much less than a 50% saving on the water heating bill. I see so many houses where families of 3 or more are living having just a 2m² solar panel on the roof.

Most likely the company that sold it to them promised them big savings but it is simply physically impossible.

Please also note that if a high efficiency properly sized solar water heater gives a saving of 50% on your water heating bill this will not result in a 50% saving on your total electrical bill unless the geyser is the only electrical device in your house.

South Africa's leading **heat pump** supplier

Tel: 086 133 3406 | Fax: 086 505 0707 | Email: info@itsolar.co.za | Web: www.itsheatpump.co.za

Domestic hot water heat pumps work slightly different. The heat pump uses a small amount of electricity to extract a lot of energy from the surrounding air. So a heat pump is also using the energy from the sun but only indirectly and so it can work day and night, winter and summer. The efficiency of a heat pump is called the COP. A COP value of 4 means that the heat pump produces four times as much thermal energy as what it uses electrically - in other words a 75% saving on the water heating bill.

Unfortunately the COP of a heat pump is dependent on the ambient temperature and the water temperature and so, in a practical domestic hot water system using a high efficiency heat pump, a more realistic annual COP value is 3. A high efficiency heat pump like the ITS-4.7HDP takes about 1.5 hours to re-heat a 150L geyser, which is used in most households in South Africa. This enables you to always have hot water at a fraction of the cost no matter when or how much water you use.

SOME PRACTICAL EXAMPLES

My neighbors are a family of 4 (husband, wife and 2 young boys) that use water very conservatively. Measurements we have done on their 200L geyser show an average consumption of 16kWh/day. They would like to save on their electricity bill and the most cost effective way is to install a solar water heater or a heat pump.

Let's first look at the solar water heating option. On a 200L geyser most solar installers will put a 3m² solar panel (flat plate or evacuated tube). A top of the range high efficiency 3m² solar panel that is perfectly mounted will provide a maximum thermal output of 7kWh/day (based on the South-African national average solar radiation of 23MJ/ m²/day).

At an Eskom tariff of R1.73/kWh this will equate to a saving of R27380 over 5 years (using an estimated 12% increase in year one and two and 8% for years three to five). A high quality solar system like this will cost them about R14000 for a retrofit system (solar panel connecting to the existing geyser) and about R21 000 for a complete system (solar panel plus new solar ready geyser). Pricing estimations is for a fully installed system and with the Eskom rebate already deducted.

With a high quality domestic hot water heat pump working at average South-African ambient temperatures you will conservatively get a COP of 3. With a COP of 3 they would on average save 10.66kWh/day and therefore R41740 over 5 years. A heat pump like this would cost them about R15000 fully installed.

The Jones's are also a family of 4 but they are more liberal with their water use. They are using an average of 30kWh per day on their 200L electrical geyser. Since a 200L geyser can only store 200L of hot water, connecting a bigger solar panel on will not necessarily result in a bigger saving. But the Jones's do have people in the house during the daytime and so we can go for a bigger 4m² high efficiency panel. This solar panel will give an average of 9.3kWh/day and therefore a saving of about R36500 over 5 years. The 4m² solar system will be about R2500 more than the 3m² system pricing given above.

Should the Jones's decide to rather go for a domestic hot water heat pump, we can use exactly the same unit as my neighbors. Again working on a very conservative COP of 3 then the Jones's will save 20kWh/day and therefore R78250 over 5 years.

South Africa's leading **heat pump** supplier

Tel: 086 133 3406 | Fax: 086 505 0707 | Email: info@itsolar.co.za | Web: www.itsheatpump.co.za

CONCLUSION

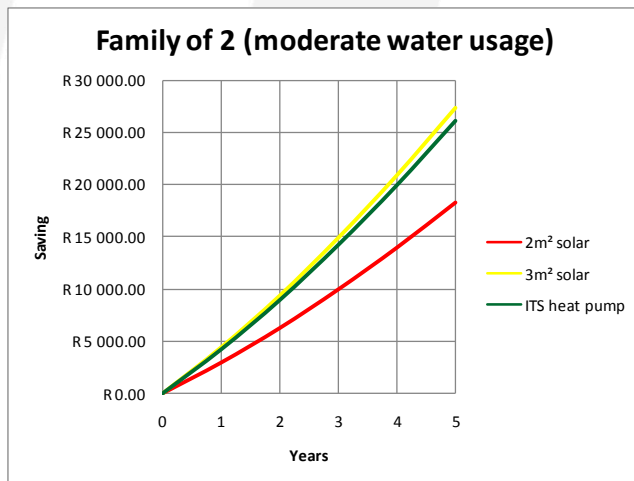
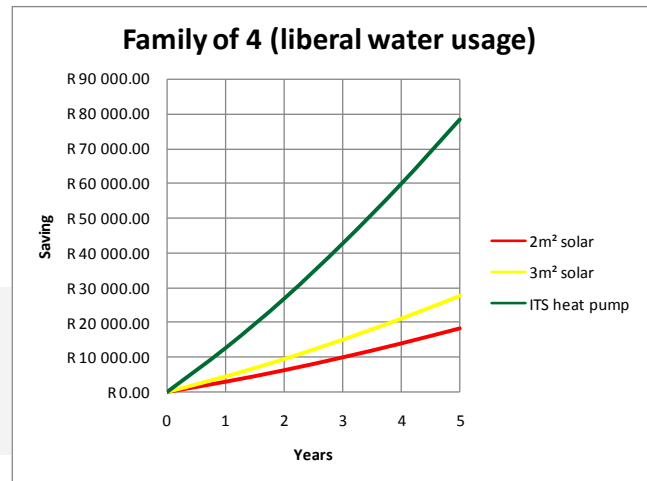
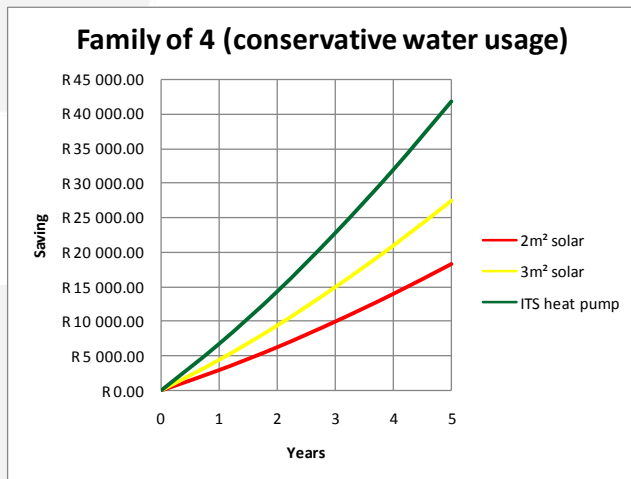
From the examples above it can be seen that even for a family that use water conservatively the heat pump will pay for itself in just over 2 years and provide a much bigger long term saving than a solar system. The solar panel savings calculated above also assumes that the solar collector panels are mounted Solar- North with the optimal inclination. Variances in the facing and inclination of the solar collector panels will decrease the systems output.

With the Jones's the heat pump will pay for itself in about 1 year and 2 months while the solar system will take about 3.5 years.

The life expectancy of both the solar system and the heat pump is very similar and is estimated at 10 years but in both cases we know of systems that are running for more than 25 years and still going strong. Both solar systems and heat pump need to be serviced annually to ensure optimal performance. Servicing is basically just cleaning the system and making sure everything is working correctly.

A solar system can provide a bigger saving than a heat pump but for that the solar system needs to be oversized and water usage patterns needs to be adjusted. Typically you need double the volume of hot water that what you would need for a normal electrical geyser or a heat pump system.

The 3 graphs below show the saving a heat pump, a 2m² and a 3m² solar panel will provide:



For more information on the technical detail and calculations behind these examples please go to www.itssolar.co.za

ABOUT ITS

ITS is a professional manufacturer and international supplier of solar hot water systems and heat pump technologies with more than 25 years of experience in the various technologies.

With their head quarters in Cape Town, South Africa and depots throughout South Africa and neighboring countries, supplying a large network of dealers / franchises with their advanced water heating systems.

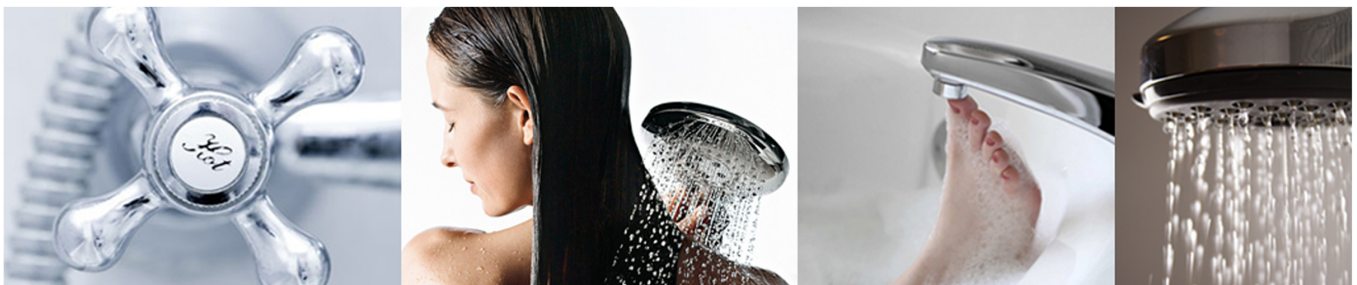
The ITS business model focuses strongly on technological progress and has a flexible and scalable production system putting ITS in a position to quickly respond to customer demands and to promptly implement product innovations. This allows the company to easily keep up with the pace of the dynamic market trends in the renewable energy water heating industry.

Supplying over 400 companies – from Eskom, retailers, distributors, solar installers and pool maintenance companies – ITS prides themselves on their unrivalled knowledge and technical expertise in the water heating industry and are pioneers in this regard.

ITS is a member of the SESSA solar water heating division as well as the South African heat pump supplier association.

Website: www.itssolar.co.za

Email: marketing@itssolar.co.za



South Africa's leading **heat pump** supplier

Tel: 086 133 3406 | Fax: 086 505 0707 | Email: info@itssolar.co.za | Web: www.itsheatpump.co.za