

# Booster Use for Households with Solar Hot Water (SHW)

ALICE SPRINGS

May – Sep 2005

## Summary of Results

24 Alice Springs households with solar hot water (SHW) monitored their electric booster use through the winter of 2005 (May-Sep). Summer monitoring was not undertaken as boosters are rarely ever required during the hotter months in Alice Springs. Six households turned their boosters on for more than 45 days of winter, and appear to have SHW systems that are inappropriate for the amount of use they receive. With these exceptions the remaining households used their booster on average for 10 separate days in the 5 months (using approximately \$17 of power). These results indicate that SHW systems are effective during winter (May to September) for the majority of Alice Springs residents.



Standard Solarhart 302J SHW system

## Types of Boosters

**Manual On/Off Switches** – Common in older systems. When on, this booster effectively turns a SHW system into electric water heater. The use of these boosters throughout winter can use up to \$150 power/ year.

**Daily Timer** – 24 hr timers set to turn a booster on and off each day at certain times. Boosters are unfortunately often on when not necessary and therefore can use up to \$30 of power in winter months.

**Push-Button Timer** – Householder activates the timer button and booster stays on for certain time (often 90 minutes). Costs approximately \$8/year in power if used only in winter when the household requires.

**One-Shot Relay** – Similar to a push button timer, the relay's button is pushed and stays on until water reaches a pre-set thermostat temperature. Costs approximately \$8/year in power if used only in winter when the household requires.

## CASE STUDY

From Nov 2002 to April 2004 CSAT monitored a donated Solarhart 302J at the Alice Springs Cool Living House. The results showed that the SHW system used far less electricity than an electric unit but a timed booster used considerably more electricity than a one-shot-relay booster.

## Background

Solar hot water (SHW) systems are known to work effectively in the ideal solar climate of Alice Springs. Approximately 60% of houses in Alice Springs use solar hot water, mostly Solarhart 302J models, and virtually all boosters are electric due to high gas costs (both installation and ongoing).

CSAT opportunistically monitored the water temperature of one solar hot water system from Feb to Aug 2005. This data is summarised in a CSAT Fact Sheet (*'Solar Hot Water performance in Alice Springs, Results from one system: February – August 2005'*). In summary, SHW temperatures in summer were found to be between 63-82°C and winter temperatures of 29-58°C. The booster was only used 14 times between May and Aug, costing \$22. At SHW temperatures below 60°C, the booster was not used even though at this temperature there is a theoretical risk of Legionella bacteria growth in the hot water tank.

## Climate

Temperatures between May and September 2005 ranged from 5.2°C to 30.3°C with average sunshine of 9.3 hrs/day and cloudiness of 2/8<sup>th</sup>s. The table opposite summarises the climatic conditions experienced throughout the monitoring period.

Month	Air Temperature		Sunshine Average hours/day	Cloudiness	
	Average minimum (°C)	Average maximum (°C)		Average at 9am (8 <sup>th</sup> )	Average at 3pm (8 <sup>th</sup> )
May 05	7.6	26.0	9.6	3	3
Jun 05	6.2	21.0	8.3	2	2
Jul 05	5.2	19.3	8.4	2	2
Aug 05	5.6	22.4	10.1	1	1
Sep 05	13.6	30.3	10.0	2	2
<b>AVERAGE</b>	<b>7.6</b>	<b>23.8</b>	<b>9.3</b>	<b>2</b>	<b>2</b>

Climate data for Alice Springs – May to Sep 2005

## Methodology

24 households took part in the monitoring. Householders were given a monitoring sheet which they were asked to place near their booster switches. Throughout winter 2005, from May to the end of September, householders were asked to note on this sheet every time they turned the booster on and off and the reasons for use. NOTE - CSAT recognises that participating households are likely to be more diligent about their booster use than the average household, demonstrated by their voluntary involvement in this monitoring project.



## General Trends

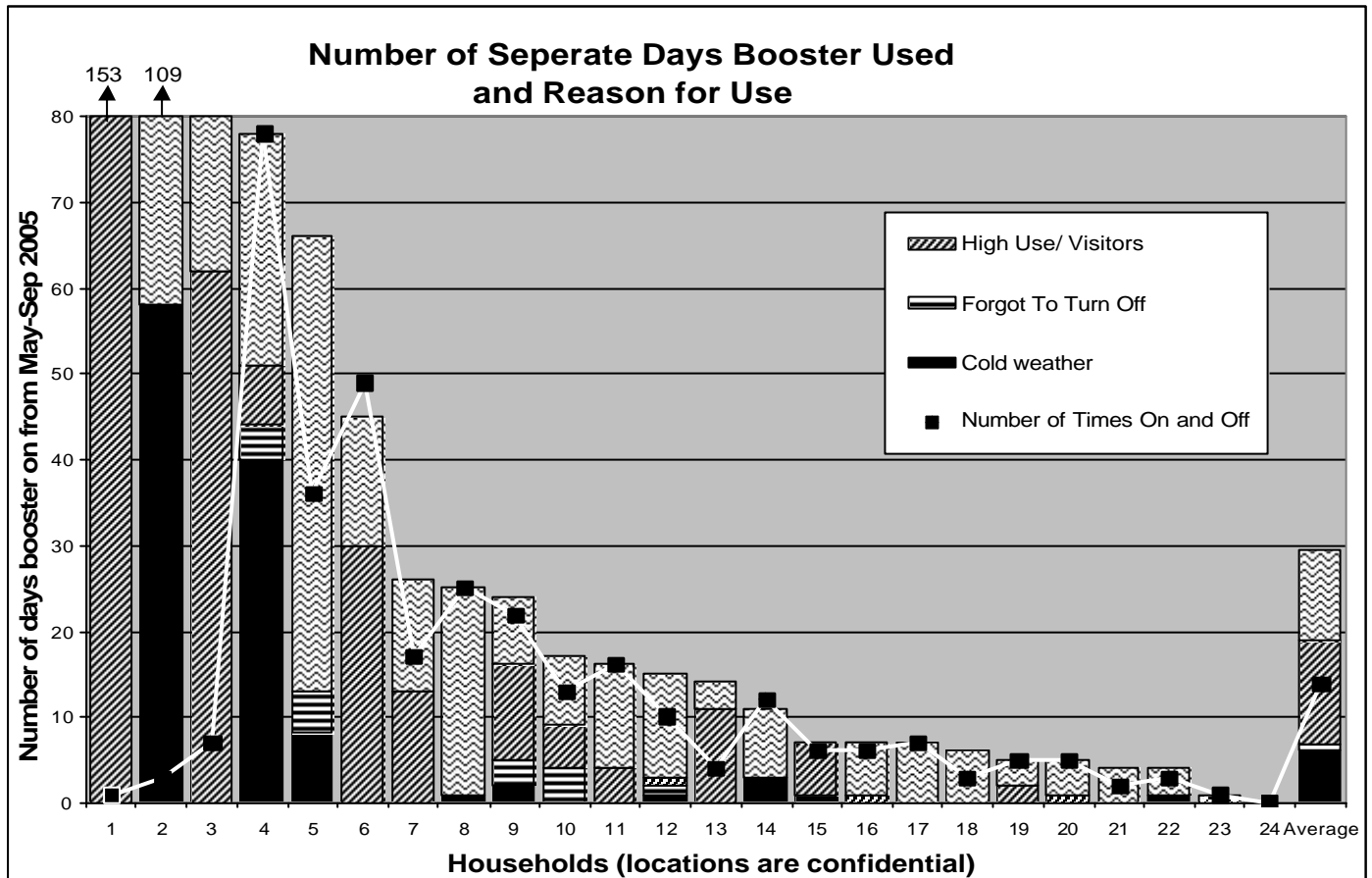
The majority of participants lived in houses with 2 panel SHW systems, 1-6 years old. Except for one house with a push button thermostat, all of the houses had manual on/off thermostat type boosters, with no shading over solar panels - a typical Alice Springs scenario.

The graph on the opposite page indicates the number of days on which a booster was used in winter 2005 for all households. These average usage figures do not indicate the exact amount of time that boosters were used but gives a comparative figure of the number of separate days the booster was

in use. Reasons for booster use varied amongst residents but was most often as a result of cloudy, overcast weather (on average, 11 days per household) when there was insufficient sunshine to ensure adequate water heating.

Visitors and high water use were also reasons for turning on boosters (10 days on average for each household), often in combination with overcast weather. The white line on the graph indicates the number of times the booster was turned on and off. Six residents kept their boosters on for all or most days in winter (more than 45 days). However the majority of residents were actively turning their boosters on and off, mostly on a daily basis, so the number of times the SHW system was turned on and off is generally very close to the total number of days the booster was in use.

Including the six households where the booster was on for the majority of winter, 30 days was the average days that boosters were in use over a 5 month period (153 days). Without these six households, the average use was 10 days, equating to approximately \$17 of power per winter period.



**Comments from participants**

*"Over winter, no booster is needed for 3 people, but we leave the booster on if 5 people are in the house. When there is 4 people in the house we have to turn the booster on and off, which is where a one shot boost or a timer would be most useful"*

*"Our system (180L Beasley with single panel) does not cope well in winter and when the booster is on. I suspect the booster kicks in before the sun has had a chance to heat up the panel."*

Type of residence	? 24 houses
Number of solar panels	? 18 households with 2 solar panels ? 6 households with 1 solar panel
Age of hot water system	? Ranged from 1-15 years ? Majority between 1-6 years
Shading over solar panels	? 16 households had no shading ? 8 households had some shading
Booster type	? 1 push button thermostat ? 23 manual on/off thermostats

**Summary of household solar hot water specifications**

**Conclusions**

The results of this monitoring indicate that for the majority of Alice Springs residents, a standard SHW system is adequate for winter hot water consumption except on a small number of days. For residents who needed the booster on throughout winter, their systems may be an old or inefficient system. These residents should consider a larger SHW system or alternatively install a booster on a daily timer to reduce electricity consumption over winter. Further investigations are required into how long boosters stay on every time they are activated and how often boosters which are permanently on, cycle on and off.