

# SAGEN: Energy Efficiency

## Investing in energy efficiency technology: The benefits of solar water heaters for low-income households.

GIZ SAGEN investigated the impacts of solar water heater use on households in Nelson Mandela Bay Metro Municipality. The results and recommendations were shared with the Department of Minerals & Energy to inform the National Solar Water Heating Programme (NSWHP).

### The challenge

Solar water heaters (SWHs) have been hailed as a technology that can have many benefits for different levels of society, such as reducing electricity peak demand, mitigating greenhouse gas emissions, creating employment, increasing the quality of life for users as well as generating monetary savings due to reduced energy consumption. Potential benefits may be real, but there have not been many opportunities to investigate the actual impact of SWHs on user households, especially over an extended period of time.

In 2014, the then Department of Energy announced its intention to review the implementation concept for the National Solar Water Heater Programme (NSWHP), and GIZ was requested to provide support. To gain experience and test processes and procedures, SAGEN and partners implemented a pilot project in Nelson Mandela Bay Metro Municipality, where 200 solar water heaters were installed in low-income households. To review the pilot project, SAGEN commissioned a study that investigated the impact of solar water heater use by low-income households over a period of one and a half years.

### At a glance ...

<b>Objective</b>	To investigate the impact of SWH use by low-income households over a period of 18 months.
<b>Implementation partners</b>	Nelson Mandela Bay Municipality, Basadi Integrated Development Specialists.
<b>Cooperation partners</b>	Department of Minerals & Energy, Provincial Department of Economic Development, Environmental Affairs and Tourism, Eastern Cape Provincial Department of Labour.
<b>Potential impact</b>	Reduction in household energy consumption resulting in energy and monetary savings; Improvement of quality of life and comfort through access to hot water; Reduction of greenhouse gas emissions; Improved infrastructure and municipal service delivery.
	  



Photo: Solar water heater NMB, © GIZ



## Our approach

### Implementing a SWH pilot project to gain experience ...

One of the objectives of the SAGEN SWH pilot project was to implement a mini version of the NSWHP, involving all the planned stakeholders providing required inputs according to their respective mandates, exactly as if a larger programme were being implemented. The pilot project included components of installer training, municipal project management and implementation, household capacity building and training and an impact assessment.

To ensure that households derived the maximum benefit from their solar water heaters, SAGEN in cooperation with the Independent Power Producer's Office (IPP Office) designed a household user guide in seven languages to provide basic maintenance and care instructions to homeowners receiving a solar water heater. The booklet provides enough information for homeowners to care for their systems and to avoid costly maintenance. SAGEN also appointed a service provider to assess the quality of the installations and to identify any faults that may require repairs. During the inspection visits, the service provider offered basic maintenance tips and training to households, based on the information in the booklet, as these preventative actions have been proven to minimise serious repairs and expand the life of the solar water heater unit.

To confirm the impact of the installed solar water heaters, SAGEN commissioned a study that collected and analysed data from 100 households, representing 50% of the households in the pilot project that received solar water heaters. Data was collected over an 18-month period to account for seasonal differences and to allow household dynamics to be considered. The average household in the study consisted of four people, and 50% of the households reportedly relied on Government grants. 94% of households owned the house they lived in and 63% had been living there

between 15 and 20 years. Home ownership was a selection criterion for receiving a solar water heater, as it is argued that ownership increases use and maintenance.

All households in the study had access to electricity and water. The majority of households (100% in summer and 95% in winter) pay their electricity bills, but 94% of households do not pay for water and only 4% could show a water bill. Paying for electricity and other energy sources can impact on how likely it is that the household notices energy savings, while not paying for water and then having access to hot water through a solar water heater may increase water usage.

The results from the impact assessment are important for the DMRE to justify the investment in the national SWH programme.

### Results in figures ...

The results presented by the study emphasised the importance of hot water for households and the impact of energy consumption on household budgets. The study found that prior to the installation of the solar water heaters, 98% of households in winter used mostly electricity, but also wood, gas and paraffin, to heat water. Most households (74%) reported heating between four and eight litres of water per day with conventional fuels. After the solar water heater installation, the use of conventional fuels for water heating was drastically reduced, with 71% of households reporting not heating water using any forms of energy other than their solar water heater in summer. In winter, 49% of households relied exclusively on their solar water heaters for hot water. The reduction in energy consumption in the households resulted in an average saving of R103 per month, a very significant amount for these households.

Before the installation of the solar water heaters, 84% of



households reported borrowing money regularly to cover household essentials and only 8% of the households indicated that they were not concerned about household costs. After installation, 2% of households stopped borrowing money for household essentials and 30% of households reported not being worried about covering essential costs. The households confirmed they used less electricity and the savings acquired assisted with the provision of necessities such as buying food and paying school fees. Importantly, households reported that they had cut down on taking loans and borrowing money. The savings brought about by the solar water heaters therefore not only increased available household budget but also provided peace of mind in making ends meet, and 95% of households stated that the solar water heaters improved their lives.

In terms of water use, the study ascertained that water consumption may have increased in some households after the solar water heater installation. On average, 58% of households reported using “much more” water than before, especially in winter, when 61% of households reported using much more water. On the other hand, 30% of households reported using less water than before the installation of the solar water heaters, making it hard to conclude that access to solar water heaters increases water consumption. It is, however, plausible that household water consumption may increase due to suppressed hot water demand, and it is recommended that information on water management be included in any household information communication campaign launched during an installation project. The topic of the impact of solar water heaters on household water consumption also warrants further investigation, as it may be possible that monetary savings resulting from the installation of solar water heaters may be reduced or negated by increased expenditure on water.

During focus group discussions, households mentioned that prior to the installation of the solar water heaters they

suffered one or more ailments per year, specifically colds, flu and coughing. The households felt that since they were using less wood and paraffin, their state of health improved. Given the reduced use of fuels that cause indoor pollution, households experienced improved health and well-being due to reduced respiratory ailments.

The majority (90%) of households were satisfied with their solar water heaters, although satisfaction reduced from summer to winter when water temperature is lower due to lower ambient temperatures – 42% in summer were “very happy” compared to 6% in winter. Overall, households were satisfied, and only 1% of households reported technical problems. All SWH beneficiaries indicated their willingness to pay for the maintenance of their systems. Households noted that they would be willing to contribute between R10-R20 per month towards a maintenance fund. The willingness to contribute towards maintenance is important, as funding maintenance posed a challenge in previous programmes and the issue is still under investigation in the NSWHP.

### ... and in stories

Women as housekeepers and caregivers noticed reduced time spent in preparing children to get to school and less time spent in doing household chores as a result of readily available hot water. The study collected qualitative inputs from households through focus group discussions.

Mrs Leki Schoeman is a 79-year-old woman who lives in a four-room house and has two shacks in the yard. In total they are 14 people in her household, including her children and grandchildren, and they all use hot water from the solar water geyser. She reported that prior to the installation of the solar water heater, the children used to be late for school, as they had to take turns to bath while waiting for the kettle to boil water.

“Bekunzima ngaphambi kok’ba sifumane i-geyser. Abantwana bebelinda iketile. Ngalonto bebefika emva kwexesha esikoloni”  
– “Life was difficult before the SWH installation. The children had to take turns boiling water with a kettle; and as such, they arrived late at school”.

Boiling water for bathing also depleted her electricity credit because of the large number of people who need hot water. She also noted that after the solar water heater installation, she completed her household chores much faster. She appreciated the time and monetary savings from the solar water heater and expressed her appreciation for the installation.

Nosipho Noiyana, a 57-year-old woman, also felt that life was difficult for the children in the morning before having a solar water heater. She was excited about how her solar water heater made life easier for her family. She said the installation of the geyser also saved her money because she used to buy a lot of pre-paid electricity before:

“Ndiziva ndibhetele kakhulu njengoba ndine-geyser. Kwakunzima ndinemayo ngoba uthi ufaka umbane, uvele uphele. Umbane uyahla njengoba kune-geyser”

– “I feel much better now that I have a geyser. Before this, it was hard because as soon as you buy prepaid electricity and load it, its credits get used up quickly. My pre-paid electricity lasts longer now that I have a geyser.”

In summary, the impact assessment concluded that the use of solar water heaters positively impacted on recipient households through the reduction in energy consumption and resulting monetary savings. It also saved time and improved the feeling of well-being through having hot water readily available. On the other hand, whereas previously the consumption of water was repressed owing to the lack of hot water, households consumed more water because hot water was readily available. A well-designed communication programme should include information about the use and saving of water.

## What next ...

SAGEN will continue to provide strategic support to the Department of Mineral Resources and Energy in the planning of the NSWHP. The lessons learned and products generated from the pilot project have been presented to the DMRE for consideration in its planning.

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