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## Lwandle Hostels to Homes Solar Water Heater Project

SouthSouthNorth Africa, *South Africa*

### Summary

In 1997, a small community of a few hundred poor urban families living in a former municipal workers' hostels in Lwandle, near Cape Town, South Africa decided they would spend a portion of their once-off housing subsidy for new housing in providing warm water through the use of solar water heaters. The community covered some 30% of the price of installation of the solar water heating systems (the rest of the housing subsidy being used to increase privacy and provide water borne sewerage). The remaining 70% of the initial costs was covered through a loan by the municipality which was recouped through an incremental increase in rental. In all, 300 plus households received excellent quality SWH systems built locally and installed by trained local artisans. The residents were angry about the rental increment, but the municipality feared electrical water heating arrears and thus took a perceived lower risk in raising the loan to cover the costs.

The back-up systems and warm water metering (pay as you use) initially requested in early scoping meetings with the community were not installed. Maintenance has not been conducted in ten years since installation. Questions about sustainability remain for the largest solar water heater development in South Africa. However, the close attention to decision making in the delivery of the SWHs has been translated into a keen sense of ownership of the solar water heaters, 95% of which are currently in place and working. Much of this is due to the methodology which focussed on aspects of technology receptivity to achieve ownership through exercising technology choice based on an understanding of the life-cycle financial implications of the various options. In the light of this, and other more recent experiences, the City of Cape Town has set targets of 10% of houses having solar water heaters by 2010 making use of the climate mechanisms. This commitment was made in 2003/4 and registered as part of the International Programme of Action at Renewables 2004 in Bonn.

End-user area	Target Audience	Technical
<input type="checkbox"/> New buildings	<input type="checkbox"/> Citizens	<input type="checkbox"/> Energy efficiency
<input checked="" type="checkbox"/> Refurbishment of buildings	<input checked="" type="checkbox"/> Households	<input checked="" type="checkbox"/> Heating
<input type="checkbox"/> Transport and mobility	<input type="checkbox"/> Property owners	<input type="checkbox"/> Cooling
<input type="checkbox"/> Financial instruments	<input type="checkbox"/> Schools and universities	<input type="checkbox"/> Appliances
<input type="checkbox"/> Industry	<input type="checkbox"/> Decision makers	<input type="checkbox"/> Lighting
<input type="checkbox"/> Legal initiatives (municipal regulations, directives, etc)	<input checked="" type="checkbox"/> Local and regional authorities	<input type="checkbox"/> CHP
<input type="checkbox"/> Planning issues	<input type="checkbox"/> Transport companies	<input type="checkbox"/> District Heating
<input type="checkbox"/> Sustainable communities	<input type="checkbox"/> Utilities	<input checked="" type="checkbox"/> Solar energy
<input type="checkbox"/> User behaviour	<input type="checkbox"/> ESCOs	<input type="checkbox"/> Biomass
<input type="checkbox"/> Education	<input type="checkbox"/> Architects and engineers	<input type="checkbox"/> Wind
<input type="checkbox"/> Other	<input checked="" type="checkbox"/> Financial institutions	<input type="checkbox"/> Geothermal
	<input type="checkbox"/> Other	<input type="checkbox"/> Hydro power
		<input type="checkbox"/> Other



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## Introduction

In 1996 a community living in Municipal Hostels on the outskirts of the Cape Town Metropole made an application to receive their individual once-off housing subsidy. Their application proposed the upgrading of the hostels to allow for greater privacy, water borne sewerage, and provide hot water for ablutions. Energy Transformations cc, a consultancy, was requested to provide consultancy on the hot water request.

Steve Thorne was invited by the developer to undertake a process to decide upon the warm water solutions, and to initiate a process for implementation. Together with Fikiswa Mahote, a process was launched that involved intensive work shopping of the various technologies that could meet the warm water service needs, including working with a group of energy advisors, appointed by the community, to understand the costs and performance of the various options. The community had specified that the solution should provide warm water on a pay as you go basis. Pilots of various technologies were installed to test the robustness and quality of supply of various electric, solar, gas and kerosene options. Eventually, solar water heaters were chosen and installed. The metering, solar water heater back-ups and a number of other associated possibilities were not installed. The community contributed a proportion of the costs and the municipality raised a loan from the Development Bank of Southern Africa for the balance.

In all 341 solar water heaters were installed as a first phase to provide warm water in communal (ablution blocks) and semi-communal (2 to 3 dwelling units) applications. The second phase of providing metering and back-up systems was not undertaken. The changes in city government meant that the City of Cape Town was required to take ownership of the Hostels and ensure that the systems were maintained. Unfortunately this did not occur, and 10 years later despite no regular maintenance an estimated 5% of the systems appear removed or damaged. Maintenance is desperately required if the technology receptivity is to be complete.

## Objectives

The objective of the project was to achieve the lowest cost option for the delivery of warm water and including a pay-as-you-use metering, backup to the solar and to secure the balance of financing required. A second objective of the project was to achieve sustainability in the receptivity of water heating technologies through active involvement in the economic and financial analyses of options leading to selection and through that ownership.

## Methodology

The methodology employed was a framework for technology receptivity, which engaged the community in learning about the costs and benefits of various options to meet their warm water service requirements. The framework includes the following elements.

### *1. Develop a shared vision*

The community must share articulated vision of their development.

### *2. Identify opportunities for knowledge exchange*

The development of opportunities for knowledge exchanges with other individuals, groups, and/or communities, who may have had positive or negative experiences of addressing similar development visions.

### *3. Establish a facilitation team*

From the recipient community a team can be selected that has a comprehensive set of skills and capabilities. The team could be enhanced by development agents.

### *4. Set learning objectives and plan how to achieve these*

In undertaking an exchange of knowledge or a development project, the objectives of the learning to make informed decisions must be set. Learning should build respectfully on indigenous knowledge. A plan of activities must be established to achieve the objectives.



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#### 5. *Demonstrate the technologies*

The technologies that have a reasonable chance of achieve the objectives should be demonstrated either through show, tell or experience. If this is not possible, a visit to a location to hear and see where the technology is being employed would have to suffice.

#### 6. *Identify interested early adopters (who may become champions)*

Amongst the beneficiaries will be those who are interested and capable in leading in experimenting, adapting and using the new technologies. These people must have an interest in sharing their knowledge openly and generously with the facilitation team, beneficiaries and, if involved, the development agent.

#### 7. *Receive and respond to hardware, software, and orgware technology innovations.*

The facilitation team (and development agent/technology supplier) must be able to receive critical information concerning the technologies and undertake measures to ensure that they work.

#### 8. *Ensure technologies are maintained in good running order.*

Once the technologies have been adapted and are working well they must be maintained in good running order, until full ownership can be achieved and external experts can withdraw.

The consultant met with the community and proposed a receptivity process by which the technologies could be tested and decisions made. So the first step was to identify and articulate the problem and an idea of the solution. After meeting with the broader Lwandle community and discussing the hot water issue, a smaller group of energy advisors were selected to engage with the consultant and provide an interface with the community. The learning objective was to understand which hot water technology would provide the most appropriate in providing a hot water solution to pay-as-you-use hot water provision. The strategy was to learn about the costs and services provided by the range warm water options.

Meetings provided the forum for the energy advisors to learn about the various fuel and appliance combinations and their comparative prices for the provision of the hot water service. The advisors learned how to calculate the levelised or lifecycle cost of providing a shower. On the basis of the exposure to pilots and comparative analysis, the community selected solar water heaters. Systems were installed in the gymnasium, a semi-communal application providing for 2 to 3 dwelling units, and in the communal showers. The demonstrations provided a chance for the users or early adopters to learn first hand about the solar water heaters. Strong opposition to kerosene in-line heaters was voiced on the basis of the lingering smell people endured in handling the fuel after showering.

After 9 meetings held over the period of 6 months in 1997 the community had selected a two step process by which solar water heaters were to be installed in communal and semi-communal ablution facilities. The first phase was to install water heaters. The second phase was to install back-up heaters, hot water metering and a voucher system for the collection of income that would cover the costs of water supply, including the costs of the capital equipment and any back-up fuel.

#### **Financial resources and partners**

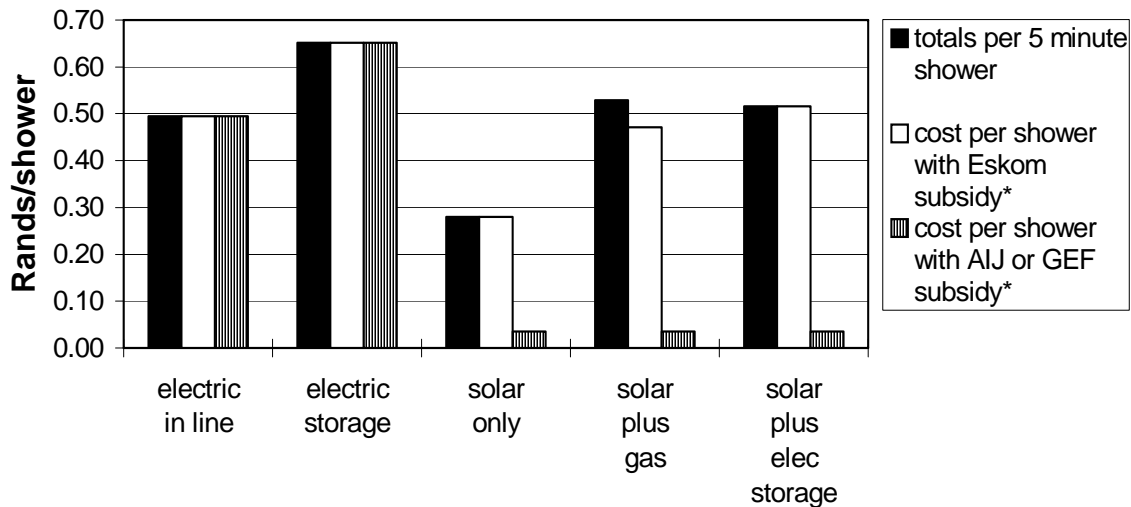
The financial resources for the project came from the once off housing subsidy, and a loan secured by the Helderberg Municipality from the Development Bank of Southern Africa. The project attempted to raise Demand Side Management funds through the National Utility, Global Environment Facility and Activities Implemented Jointly funds provided by a donor. None of these attempts were successful. The project managers, Wilson Bailey Homes controlled the resources and contracted Energy Transformations to undertake the warm water provision in the project.

#### **Finding / Outcomes**

The graph below describes the levelised costs for a 5 minute shower at 45 Degrees Centigrade for a range of water heater combinations. The solar only option is a different level of service to the others that provide hot water on demand.



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### Water heaters

The community Energy Advisors engaged with the consultant and played an important role of communicating ideas and their understandings of the project components. One of the energy advisors has subsequently started working the United Nations as a Junior Project Officer in West Africa.

### Lessons learned and repeatability

The fact that the Municipality would guarantee a loan from the Bank was an interesting outcome that appeared to be driven by a fear that Lwandle hostel dwellers would go into arrears on their electricity accounts. The perversity of this outcome could provide opportunities for applications of renewable energy services that often suffer from higher first costs but lower operational costs than the conventional, but that deliver lifecycle benefits. The lesson may only apply to communal decentralised applications where the responsibility for payment is shared and the housing stock is not owned by the recipients of the services. The lesson here is that the solar water heaters reduced risk to the municipality, and incidentally provide a way of hedging against fluctuations in fossil based fuel prices and availability.

The intensive Technology Receptivity methodology undertaken ensured a sense of ownership of the decisions and eventual outcome. The sense of ownership of the solar water heaters, by the municipality (that is the landlord of Lwandle) was not taken up. This is a problem that could jeopardise the eventual outcome as could the absence of pay-as-you-use metering and back-up. To be fair, there was a change of local governance subsequent to the project in which an ordered transfer of responsibility may not have been undertaken. Nevertheless, 10 years on the responsibility for maintenance and the second phase should have happened. The process of building informed technical capacity within the community using trusted intermediaries to choose their solution has widespread potential for replication in a range of technology applications using basic participatory techniques and a respect for local knowledge and interest on which financial assessment techniques can be built. The methodology appears particularly interesting for decentralised service applications. Well overdue is an assessment of the technology and the residents perceptions as well as a technical audit (to inform maintenance actions) will provide a verification of the success or otherwise of the outcome of the methodology.

The relative success of the process, inspired further investigation into the financing of a number of renewable energy and energy efficiency technologies for low income households gaining access to modern energy services for the first time. The promise of the Clean Development Mechanism and real investment in demand side management, gave shape to the Kuyasa project that employs solar water heaters, thermal performance improvements and efficient lighting. REEEP partnered on a study that is



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giving shape to an institution that will focus on a programme of improvements in greenfield and retrofit housing throughout South Africa, embodied in the Sustainable Housing Finance initiative.

**Contact for more information:**

Project Web Site: [www.southsouthnorth.org](http://www.southsouthnorth.org)

Organisation / Agency: Energy Transformations the consulting arm of SouthSouthNorth Africa

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