Work package 2- Historical and recent attitude of stakeholders

Case 18:
Solar home systems (SHS)

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*C*ultural Influences on *R*enewable *E*nergy *A*cceptance and *T*ools for the development of communication strategies to promot*E* ACCEPTANCE among key actor groups

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1. Introduction

In developed countries, renewable energy (RE) technologies are most often introduced for environmental reasons, to reduce GHG emissions mandated under the Kyoto Protocol - which South Africa signed in 2002. The Protocol does not commit non-Annex 1 (developing) countries such as South Africa to any emission targets in the first commitment period (2008 to 2012), however, and it creates no external pressure to reduce emissions. So it is understandable that in this case study the major government concern is not the environment, but access to electricity for the poor in remote rural areas.

RE technologies are not widely disseminated in South Africa, although solar resources are very high and solar technologies are particularly suitable. The general environmental awareness is limited when compared to European countries and it is only recently that the media have been more regularly covering issues such as global warming and its impact on South Africa.

The South African government generally supports RE, and its RE policy stipulates a voluntary target of 10,000 GWh to be supplied from renewable sources by 2013. The target is approximately 10% of the country's electricity demand, of which now less than 1% is met from renewable sources (DME, 2004). Different players in projects and the industry give various explanations and reasons why the market has not responded more positively, often citing high initial capital cost as the major explanation.

The two South African case studies describe solar water heaters (SWHs) (Case study 19) and, in this report, electricity from solar home systems (Case study 18). Both case studies include the impact of poverty on the dissemination and acceptance of the technology.

SHS using photovoltaic panels to generate electricity have been provided as part of the National Electrification programme in remote poor rural areas to which the grid has not been extended, as a substitute for grid electricity, although in fact subsidised SHS were expected to bring light and television services at a much faster rate than they actually did.

2. Country overview

South Africa, like other transition countries, faces the dual challenge of pursuing economic growth and environmental protection. Sustainable energy systems, based on RE resources, offer an opportunity to protect the environment and create economic growth. The implementation of RE technologies faces a major challenge because South Africa has very large coal deposits and the electricity generated from it is amongst the cheapest in the world. The powerful national electricity company Eskom is government-owned and has almost a monopoly of electricity generation; generation is largely by municipalities.

South African energy policies have always been linked to the prevailing political situation. Pre-democracy energy policy and planning were characterised by energy security concerns and racially skewed provision. After 1994 the new democratic government addressed the inequalities of the past and electrification of previously disadvantaged populations a priority area identified in the National Reconstruction and Development Programme (RDP). The highly subsidised National Electrification Programme (NEP) increased electricity coverage from about 36% in 1994 to over 70% in 2002.

Even after being connected to the national grid, many poor households could not use the electricity because they were not able to afford it, and continued to cook with kerosene and wood. The electricity consumption rate among the poor therefore remained extremely low. When gov-

ernment realised that the poor did not fully benefit from the large investment in electrification the Free Basic Electricity Policy was introduced, in 2004. Those connected to the grid now receive 50 kWh free every month, sufficient for lighting, black-and-white television, radiom and occasional basic cooking. The government pays this subsidy to the municipalities.

Poor rural households have least access to electricity, and providing it to them is a great challenge. Extending the grid to every household in the country is not feasible now for technical and financial reasons, and the question arises as to what distance from the grid makes decentralised electricity supply, such as PV systems for each home, the most appropriate solution - even if the grid is gradually expanded. The SHS programme was designed to give more rural people access to limited electricity until such a time that they get grid connections. Solar cells are imported and some of the systems are assembled in the country. The extent to which NGOs and technology providers pushed the programme has not yet been explored.

As part of the NEP, solar electrification projects were implemented in some of the more remote rural areas. As with grid electrification, government heavily subsidised this programme, with recipients of SHSs paying about R120[1], a fraction of the actual cost of approximately R3500 for the system. The service provider owns the SHS and charges a monthly fee of R58 for service and maintenance.

Renewable energy is one of the areas the government pursues in managing energy-related environmental impacts and diversifying energy supplies from a coal-dominated system. As mentioned, there are no external pressures on South Africa to reduce GHG emissions and to disseminate RE technologies. The government's White Paper on Renewable Energy Policy (2004) supports the establishment of RE technologies, targeting the provision of 10,000 GWh of electricity from renewable resources by 2013. This has the potential to create 35,000 jobs, adding R5 billion to the GDP and R687 million to the incomes of low-income households (DME, 2004). Solar water heating and biodiesel have the greatest potential to contribute to meeting the target. RE is to be utilised for both power generation and non-electric technologies such as solar water heating and biofuels. By late 2005 the Department of Minerals and Energy (DME) completed a Renewable Energy Target Monitoring Framework to ensure that progress towards the 2013 target is effectively monitored (DME, 2005).

South Africa experiences high levels of solar radiation, with average daily solar radiation of between 4.5 kWh and 6.5 kWh per square metre. This resource is relatively predictable and well distributed throughout the country with some regional variations.

The provision of hot water using solar technologies has the benefit of saving households money over the long term and mitigating GHG emissions associated with fossil fuel usage. SWHs are also the least expensive means of heating water for domestic use on a life cycle cost basis because solar energy is free (Austin & Morris, 2005).

3. Case study: Solar home systems in South Africa

South Africa is committed to provide universal access to electricity by 2012 (Mlambo-Ngcuka, 2004). Grid electricity is the general approach and about 70% of households are already connected. For the remaining households the Energy White Paper indicates that government will determine an appropriate mix between grid and non-grid technologies, and 'in remote rural areas where the lowest capacity grid system cannot be supplied within the capital expenditure limit, this situation will provide a natural opportunity for Remote Area Power Supply (RAPS) systems to be supplied' (DME, 1998). In 1999, about 51% of rural households were still without electricity and it became clear that the supply technology had to be re-evaluated. Photovoltaic

[1] € 1 is equivalent to R9.30 (April 2007).

SHSs were selected to provide a basic service to those households that cannot be grid-connected within acceptable cost parameters (Kotze, 2000).

Figure 3.1 *Solar home system mounted on a pole next to the house, as roof structures are often not suitable for supporting the system*

A pure commercial model and a utility model were considered for supplying SHSs to rural households and, innovative in the South African context, it was decided to select the utility model and to involve the private sector (Kotze, 1997; 1998). The programme grants private companies the rights to establish off-grid energy utilities in designated concession areas. This utility service provision is a fee-for-service model including the maintenance of the off-grid energy systems by the utility, which has exclusive rights to government subsidies to cover most of the capital costs for five years. The fee-for-service agreement will last for 20 years (Afrane-Okese & Thom, 2001).

Figure 3.2 *Indoor light from solar home system*

It was clear from the beginning that the poor rural households for which the systems were intended would not be able to afford the initial capital cost, and a government subsidy of R3500

for each installed system was included in the programme for the first five years. The subsidy was paid directly to the service provider. The customer had to pay R110 as an installation fee and a cellular phone charger was offered for an additional R20.

In 2004 the government introduced a subsidy for free basic electricity for grid-connected households, equivalent to 50 kWh per month. SHS users in the concession areas received an equivalent monthly subsidy of R40, reducing the fee charged for maintaining and servicing the system to R18 per month for each household.

It is still doubtful if very poor rural people can afford even this highly subsidised service of PV just for lighting and media use. A survey of 348 households in the Eastern Cape Province compared access to electricity of both off-grid and grid and income and found that the poorest households (average monthly income R819, equivalent to about € 90) remained without any supply of electricity. Only households in the highest income group (R2307 per month) could afford solar electricity, and grid users in neighbouring areas where grid electricity was provided had an average income of R1860 (ERC, 2004). There is also the question of whether and for how long the government will feel it can afford the high capital subsidy for each system.

Table 3.1 *Concessionaires, concession areas and total number of installations, June 2004*

Concessionaire	Concession Area	Total number of installations
Nuon-Raps (NuRa)	Northern Kwa-Zulu Natal	6541
Solar Vision	Northern Limpopo	4758
Shell-Eskom Replaced by 3 smaller companies in 2005/6	Northern parts of the Eastern Cape and Southern Kwa-Zulu Natal	5800
EDF-Total (KES)	Interior Kwa-Zulu Natal	3300
Renewable Energy Africa (REA)	Central Eastern Cape	0
Total		20,399

Source: Willemse, 2004; ERC, 2004.

4. STEP ONE: Vision of the solar home system project

South Africa's high solar radiation means that the PV technology to generate electricity can be used almost anywhere in the country. PV technology is modular, allowing for upscaling or downscaling. PV systems of various sizes can meet a range of electricity needs but are not economic for thermal applications. The government's vision to supply photovoltaic SHS through the private utility model was as follows (Kotze, 2000):

- It would speed up universal access to electricity as envisioned in the Energy White Paper since non-grid electricity service had become increasingly cost-effective in remote areas.
- It could attract larger, better organised private companies with their own sources of financing.
- It would facilitate and rationalise electrification planning, funding and subsidisation at national level, allowing regulation and financing mechanisms to maximise targets and optimise resource allocation.
- It had the potential to reduce equipment costs (through volume discounts), transaction costs, and operation and maintenance costs (through economies of scale).
- It ensures service to customer over a long period of time (e.g. 20 years).
- The utility would own the hardware as assets, which should facilitate the raising of capital on the money markets, while the strong financial and maintenance controls characteristic of the private sector should facilitate the channeling of international development funding.

- This should facilitate relocation of technologies that may arise over time as the grid reaches more remote areas.
- It was expected that the service providers would adopt a delivery model that promotes a range of fuels such as gas or kerosene, in addition to SHS or mini-grid systems. This energisation model has been motivated by the realisation that electricity often does not meet all the energy needs of rural people who, after electrification, tend to continue to rely on multiple fuels.
- Most rural dwellers that have access to grid electricity are usually not able to afford higher consumption of electricity and they tend to use it mainly for lighting, radio and monochrome television, services that can be equally provided by SHS. The service level that is subsidised under the non-grid electrification programme was set at 50 Wp.

The main disadvantages of the utility route were considered to be that the systems were installed at the clients' premises under their control but not under their ownership since the utility owned the systems and they were therefore prone to vandalism, neglect and misuse.

The service level of the subsidized SHS is limited and SHS technology is not very flexible and is limited in its application. The major energy requirement of poor households is cooking, for which PV systems do not provide energy, and higher-power media appliances such as color televisions usually require a larger PV system than the standard 50 Wp SHS, as does refrigeration.

Other weak points of the SHS utility model are that the systems are expensive, requiring large subsidies in order to be affordable for the rural households and a reasonable commercial venture for the supply utilities. Maintenance in very remote rural areas with poor roads can be problematic. The payment of regular monthly service fees is difficult for households with low and irregular incomes. (In one of the concessions, the utility provided SHS to only those households with proof of regular income, effectively excluding the poor.)

SHS, the concession approach and the fee-for-service model are replicable in any rural area without grid electricity supply. A basic maintenance service is required and the battery has to be replaced at least every three to four years.

Solar concessions are not financially viable without the capital subsidy for new installations and the operational subsidy. The government seems to be deciding the replicability question by limiting the funds available for capital-cost subsidy and in 2005 government stopped paying the subsidy altogether. The future payment of the monthly operational subsidy is also doubtful. Unless something changes, the whole SHS programme may slowly come to an end.

5. STEP TWO: What were the various expectations of the case?

5.1 What types of interests/actors became involved in renewable energy initiatives at the level of the case?

The off-grid concession approach is being tried in four quite remote rural areas, chosen in relation to the national grid and in four provinces (Eastern Cape, KwaZulu-Natal, Mpumalanga and Limpopo) in areas where it is unlikely that the grid will soon reach. However, some household, which had opted for a SHS have recently been connected to the grid, suggesting that electrification plans have either changed or have not been clearly communicated to the SHS providers.

The Eskom-Shell Joint Venture in the Eastern Cape was the first concessionaire to install SHS and others followed, learning from their experience.

The major stakeholders directly involved in the programme are the customers and the service providers. Eskom and municipalities are the licensed electricity providers and they have to demarcate areas in their license area in which the off-grid service providers can operate and where grid electricity is not going to be provided in the near future. Transparent electrification planning is necessary and should be communicated to the SHS service providers. The Department of Minerals and Energy is to facilitate the process, formulate policy and administer the capital subsidy for the systems and their installation. The Department of Provincial and Local Government is charged with providing services and channeling the free basic electricity subsidy to the service providers. The Electricity Regulator approves the installation of the systems according to the set standards. Service providers are paid the capital subsidy only after by the Regulator has approved the installation. The commercial providers of PV systems sell, install and manufacture components.

There are high capacity development needs in the villages where SHS are installed. Training local technicians to do O&M services creates some employment in disadvantaged rural areas, reduces the cost of the service and meets the villagers' expectations of getting jobs with the project.

Four companies are at present operating on a fee-for-service model in the four concessions. Regulatory, institutional and contractual arrangements for off-grid energy services have been worked out as the part of the programme. Among the achievements is the publication of a service standard for non-grid electricity customers. The standard outlines the service activities and the minimum standards for measuring the quality of service provided by the non-grid service providers. The standards give the National Regulator a basis for evaluating quality of service to non-grid customers.

So far the rollout has often been delayed by institutional and contractual challenges between government and service providers and it is unlikely that the target will be achieved within the next years if the capital subsidies are not paid and installation rates are not increased.

5.2 In what ways did they claim to speak for particular 'publics'?

Apart from the government the major two publics are the service providers and the rural poor. As part of the RDP the government wanted to fulfill its obligation to provide basic services to the historically disadvantaged population particularly poor rural people. At the same time it had to set framework conditions and guarantee subsidies to attract private business to participate and take up the concessions. The service providers speak for their company, their employees and shareholders.

Table 5.1 *Actors and expectations involved in the solar home system project*

Actor	Expectation	Speaking for 'publics'
Energy ministry	Implementing 'electricity for all'	People without access to energy services, poor rural communities, redressing the injustices of the past
Municipalities as electricity distributors	Provide access to limited electricity through solar home systems	Communities without access to electricity
Regulator		Quality of installations Approval of systems Protecting customers
SABS	Setting standards for solar home systems	Mark of approval for SHS manufacturers and installers
Eskom	Communicate electrification plans to SHS providers Gain experience with off-grid electricity roll out	Electrification planning Integrate off-grid electricity generation into the system
Service providers	Provide affordable electricity in remote rural areas and grow their business Create a business model for rural electrification and prove its viability, Innovate some aspects such as electricity metering for SHS	Business model development for SHS in rural areas Technology development Employees' and shareholders' interest
Customers	Accessing off-grid electricity	Interacting with the service providers to adapt the system to their circumstances
Villagers and village chief	Finding employment with the project Technical and business training Lighting increases security in area	Improve infrastructure Create employment and training Increase security
Equipment companies	Develop new competencies Create new equipment components Gaining a market share	Employees and shareholders

5.3 What were their expectations of the renewable energy initiative?

The major expectations of the government were to speed up universal access to electricity. The programme targets 300,000 households for SHSs, 50,000 for each of the initial six concession areas. Since the SHS only provides electricity for lighting, B/W television and radio it was expected that the service providers would also provide fuels for thermal use such as gas and kerosene. Such fuels are often not available in remote rural areas.

Providing affordable, safe and clean energy to the rural poor is one of the difficult issues of rural development. Service providers are expected to prove that their business models are viable and can energise the countryside. (If the model is economically viable and socially acceptable it can be applied to the billion people all around the world who have no access to electricity.)

6. STEP THREE: Understanding 'participatory' decision-making: negotiating expectations

6.1 How, when and on what basis were the different expectations negotiated?

In 1998 Eskom and Shell Renewable South Africa announced a joint venture with the objective to provide 50,000 households with SHSs in the next five years. This project was widely publicised and politicised and might have influenced the DME to speed up its off-grid electrification programme (Afrane-Okese, 2004). In the beginning of 1999 the DME consulted with potential stakeholders, chose the concession model, and advertised the call for proposals. The wide publicity generated by the Eskom Shell Joint Venture created interest in the PV industry and 28 proposals were received. Out of these six were selected and added to the Eskom-Shell Joint Venture.

Part of the programme was to build capacity and to work out the institutional, legal, contractual and regulatory arrangements for the off-grid energy services. This is one of the reasons why the initial phase was very slow.

6.2 What (mix of) mechanisms (formal and informal) were used? (systems of interaction)

There were extensive negotiations between government and service providers. The capital subsidy became a problem when government limited the number of systems it subsidised. It is expected that negotiations to renew these payments to service providers will be announced in the near future. The fact that the service providers continued to operate in the last two years without receiving any capital subsidies indicates that their business model is quite robust. Not all local governments paid the monthly service subsidy of free basic electricity and some paid it intermittently.

Table 6.1 *Forms of participation in the solar home system concessions*

Type	Organizers	Involvement	Purpose
Policy development and planning	Energy ministry	Experts and stakeholders	Create framework conditions for solar electricity roll out
Selecting service providers for the SHS areas	Energy ministry	Experts	Select companies which roll out solar home systems
Further policy and strategy development	Energy ministry	Experts and stakeholders, Regulator, service providers	To develop strategies to roll out and finance solar home systems
Community meetings	Service providers	Customers, local representatives	Communicate the project, the technology and the service contract to customers
Informal communication	Customers	Service providers	Complain about the system not working to expectations, ask for clarification how the system and the service contract work

6.3 How were the interests of various actors aligned?

The interests of the various actors (government, service providers, customers) were diverse, and ultimately only some of the interests were aligned. For example there was a general interest specifically expressed by government that service providers sell other energy products in their energy shops, while only some do so.

The companies faced major development problems such as poor roads, no transport, no or poor communication. Providing such services is government's responsibility and in this case the lack of basic services in the concession areas contributed to the cost to the service providers. Some houses are inaccessible by car and the installers had to carry the equipment into the valleys (Afrane-Okese, 2003). The absence of basic services affects the rural people because it makes income generation and running small business very difficult. There is no access to markets and people find it hard to generate income to pay for their electricity service. These are problems of context and development affecting the project although they are not related to the acceptance of the technology. In effect the technology is acceptable because the areas have limited basic infrastructure. The SHS will provide light, and television will connect the households to the wider world.

6.4 What issues arose from these processes?

When the concession areas were awarded, the service providers thought that the basis for allocating the concessions was the fact that electrification was not to reach the area in the near future, but some SHS clients were later connected to the grid. There appears to be a lack of transparent electricity planning and communication. When clients are expecting grid electricity they are generally not willing to accept SHSs.

Some customers complained that SHSs are only given to poor people, the perception being that PV systems are an inferior technology for the poor. This negative image and the limited power supply were two of the reasons why only 57% of the surveyed households would recommend SHS to others, while 96% recommended grid electricity.

The withdrawal of the capital subsidy is a major issue threatening the viability of the business plan and questions government's commitment to this RE model whereby the service providers were pioneering a new business model embedding the technology into the local economic, social and institutional structure. Some had invested heavily in the new venture.

Some impoverished rural municipalities had other more urgent expenditures and were not able to pay the service subsidy and some paid it irregularly, leaving customers stranded. Customers either had to pay the full service fee or, if they were able to do so, service providers repossessed their systems. This uncertainty of service subsidy also affects the business plan of the service provider.

20,000 clients paid the monthly service fee for the last six or seven years and the percentage of defaulters appears to be no higher than in other similar programmes, indicating an acceptance of the technology and the way it is provided. In some areas, households did not continue with payments, and in such cases the service providers repossessed a few of the installed systems.

As said above, some customers were unhappy with the limited energy and the 'poor' image of the technology. Some did not fully understand the limitations of the SHS as well as their obligations of the service contracts.

7. STEP FOUR: From visions to actualities

7.1 How was the vision translated into action?

In the Eskom-Shell concession the first phase of the project was quickly implemented because 'promises needed to be fulfilled and many pressures towards service delivery to the deprived people existed' (Afrane-Okese, 2003). From February 1999 to March 2000 about 6000 SHSs had been installed. The company ran into many problems, Shell and Eskom pulled out and the company was liquidated. Three smaller companies have taken over the concession area and have been providing the services for the last few years. This indicates that the business model is viable, provided the necessary adaptations to accommodate local conditions are made.

Accurate installation figures are difficult to get. It is estimated that 20,000 to 30,000 SHSs had been installed under the concession programme by 2004. Assuming an average household size of 4.5, this would imply that about 90,000 people have benefited so far.

7.2 Did this result in adapting the initial objectives of the vision?

Some of the objectives of the initial vision were achieved. Many had to be altered or completely changed. It appears that the service providers evolved and adapted the details of their original business models successfully, because they have stayed on and are still in business in spite of the fact that government has not paid capital subsidies for two years.

The objectives of the government vision were also adapted. The very poor were excluded because they could not afford the initial installation fee and the monthly service fee. Government thought that the larger companies would be in a stronger financial position to pioneer the new project but one of the largest companies, the Eskom Shell Joint Venture, pulled out after heavy losses and was replaced by three small companies which are still in business.

The technology was adapted and electricity prepayment meters were specially designed and attached to the photovoltaic systems.

7.3 How did this occur over time?

The rural electrification project provided 20,000 to 30,000 households with electricity from SHS. These households would not have had electricity without the project. The initial target to roll out 300,000 SHSs was not achieved in the planned timeframe but if government renews the payment of the capital subsidy this target may still be met in the future.

The Eskom-Shell Joint Venture was the first company to install the SHS and many lessons were learnt in this phase and some of the agreements between the various actors were adjusted. The absence of basic services in the remote rural areas was a major factor increasing the cost of the installation and maintenance. The hope that the utility model would attract larger companies has not been fulfilled.

The expectations of the government that electrification planning, funding and subsidisation would be rationalised have not been fulfilled so far. In some areas grid electricity arrived unexpectedly after SHSs were installed and some of the systems were relocated. Other fuels such as gas and kerosene were not offered in all concessions, although this may occur in the future because it seems to be good business.

Government so far only subsidised 20,000 to 30,000 systems instead of the 300,000 originally envisaged. The service providers consequently installed fewer systems than they had originally

planned - the larger companies 6000 to 8000 and the smaller companies probably much less and it is doubtful if any economies of scale can apply.

Some customers wanted larger systems and some of the service providers adopted a flexible approach and provided them.

Generally the service providers have ensured continued services to their customers for five to seven years. The companies generally succeeded in establishing financial and maintenance controls.

8. Key lessons of the transition process

In developed countries RE technologies are most often introduced for environmental reasons to reduce GHG emissions. In this case study the major concern is access to electricity for the poor in remote rural areas and not the environment.

Although the SHS technology is easy to use, the introduction of PV technology in remote rural areas has often been compared to providing space age technology to the least developed populations. In many cases the technology gap and the problems related to service delivery had not been identified as one of the potential major barriers to successful implementation and social acceptance. This knowledge gap extends into two directions. The service provider does not understand the needs and conditions of the customers and the customers do not understand the technology and the often complicated agreements that go with it. The methods for supplying the technology, negotiating government subsidies, etc., are not simple and have led to widespread uncertainty. The provision of SHSs has to be backed up by information and training, customer responsive service and maintenance and long-term contractual subsidy agreements with government.

SHS owners are happy having electricity for lighting and media but they still have to use other sources such as fuelwood, kerosene or gas for their greatest energy need, cooking. The monthly SHS service fee has been R58 per household for electric lighting and media only - a high cost for very poor households. The poorest of the poor can afford neither the initial installation fee nor the monthly service fee. In line with its policy of free basic services for the poor, government subsequently proposed a further monthly subsidy of R40/month for SHS users, reducing their monthly payments to R18/month. This makes SHS electricity more affordable to a wider range of poor rural households; but it is difficult to implement this subsidy, because it has to be administered at another government level, local government (in this case, some of which are poor rural district municipalities). Local government leaders may not endorse SHS subsidies if they have higher priority spending needs in their areas. As a result, the R40/month SHS operational subsidy proposed by national government has only reached a few of the concession areas. In one area, this subsidy was started, then stopped, causing quite serious problems for customers and the service provider. Customers residing in different municipalities find it hard to understand why their neighbour receives a monthly subsidy while they do not get any.

In all cases, the installation of SHSs has been highly subsidised by the government (R3500 or more per household) and the subsidy may be better used extending the grid. The individual and collective benefits of grid electricity supply are greater than the benefits of SHS services. Nonetheless, SHSs have their niche in very remote rural areas, which cannot be reached by grid electricity in the medium to distant future.

The project did not facilitate income generation. Productive end uses for PV systems are known in other parts of South Africa. The addition would have enhanced social acceptance and affordability.

The programme was effective in delivering electricity to the rural people, despite the poorest being excluded. However, considering that the technology, delivery mode, financial and institutional arrangements have been new and in many cases untested, all stakeholders have learned during the process and it is hoped that the next phase of implementation will be easier. It remains urgent to provide energy services to the poor, but PV systems are only suitable in very remote rural areas where the grid will not reach in the future.

The reaction to SHS and the mode of delivery has been ambivalent. The collective benefits include greater security at night because houses and shops are lit. The individual customers are pleased with the limited applications of SHS and enjoyed having lights, watching TV and listening to the radio. They are disappointed that they cannot cook and use heavy electric machinery and consider this a drawback as compared to grid electricity. They still have to pay more for other fuels such as wood, kerosene and gas for their thermal needs such as cooking. Many also do not fully understand the fee-for-service model and are often ignorant of the government capital subsidy. In the Eastern Cape study only 57% of SHS-users would recommend a SHS to others while 96% of grid-connected households would recommend grid electricity to others (ERC, 2004). SHS were rolled out in remote rural areas, which are generally poor. Some customers felt that the solar systems which have a much more limited range of applications than grid electricity were an inferior technology given only to the poor. This perception created a negative image of the technology.

The service providers showed that their business model to provide photovoltaic electricity to the rural poor was adaptable to the local conditions. They embedded it by and large successfully into the local environment. It appears to be a feasible model for rural electrification, which could be applied elsewhere.

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