The use of liquefied petroleum gas by South African low-income urban households: A case study[1]

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Abstract
At the end of 2005 and in 2006, the Western Cape suffered extended blackouts. The cuts came as a shock and customers were loud in their criticism of Eskom and the City of Cape Town's failure to provide a reliable electricity supply. The utility Eskom's responses included the introduction of an aggressive Demand Side Management (DSM) programme with the goal of saving electricity and reducing the need to shed customers. In Khayelitsha, Cape Town, the DSM programme entailed an exchange and subsidy programme: households were encouraged to swop their two-plate electric stoves for Liquid Petroleum Gas (LPG) stoves. This intervention is the subject of this paper. The results of the study were analysed in terms of the socio-economic characteristics of the sample interviewed, multiple fuel use and transition trends in households in urban areas, changes in behaviour in electricity and LPG use, changing perceptions of LPG and the impact of the intervention. Previous studies in household energy use showed that people perceived LPG to be dangerous saying that it posed a greater danger to the household than paraffin since it might explode. Surprisingly, during the electricity power cuts in 2006, people in low-income communities, readily accepted LPG stoves in great numbers and a year later, up to 89% of the households surveyed, reported still using LPG for cooking.

Keywords: electricity blackouts, energy transitions, demand-side management, Eskom, Khayelitsha, liquefied petroleum gas, low-income households, paraffin, South Africa, energy subsidy and exchange programme

1. Introduction

At the end of 2005 and in 2006, the Western Cape suffered extended blackouts following an electricity supply shortage due to a generation fault at the Koeberg nuclear power plant and transmission line failures. Households in low-and high-income areas experienced power failures and businesses, especially those dealing with perishable products, lost large amounts of money (O'Connor, 2006). Unable to meet the winter demand for electricity in 2006, the national electricity utility, Eskom, the then Department of Minerals and Energy (DME) and various local municipalities embarked on a series of mitigation strategies which included an aggressive Demand Side Management (DSM) programme with the goal of reducing the need to 'load shed'.

In a government funded initiative, driven by Eskom's Demand Side Management, Eskom distributed compact fluorescent light bulbs (CFLs) to households in exchange for incandescent light bulbs at no cost to the household (CFLs are three to four times the price of incandescent light bulbs). According to Eskom, this initiative in one province managed to save 131 MW, enough to power 81 875 average homes (Eskom, 2008). The programme was well-received by households as this was seen as a national emergency and people felt the need to play a role in conserving electricity. However, the sustainability of the programme is still in question, especially among poor households which might eventually go back to using incandescent light bulbs as they are still available on the market at a much cheaper price.

Another initiative spear-headed by Eskom to reduce the electricity load and peak demand, was an exchange and subsidy programme which had as its objective the introduction of LPG for cooking to at least 100 000 households in low-income areas of Cape Town (PMT, 2006). This was done through appointing service providers that collected two-plate electricity stoves from households in exchange

for a two-burner gas stove, a 5 kg or 5.2 kg cylinder, three vouchers[2] worth R30 each, all the required fittings for the stove and cylinder and an introduction to using gas safely. When this process was initiated it was with the belief that most low-income households used electricity for cooking during evening peak times, which, according to Eskom, was between18h00 when people get home from work until about 21h00.

The primary goal of the intervention in low-income households' energy use was to reduce the electricity consumed for cooking during peak periods. It was calculated that to reduce the electricity demand by 50 MW, a target population of 100 000 households would need to exchange their electric two-plate stoves for LPG use. Up until 2006, LPG had not been seriously marketed in low-income areas although it had been discussed and issues around the price of the cylinders and the LPG itself had been highlighted in 2004 and again in 2005 (Mlambo-Ngcuka, 2004a, 2004b, 2005). Traditionally paraffin, candles and wood are considered the fuels of the poor, but the national electrification programme and the introduction of LPG in some areas have seen the energy mix of poor households expand.

While in rural households electricity is still used primarily for lighting, a radio or a small television set and charging a cell phone (Cowan and Mohlakoana, 2004), in urban areas the transition to full electricity use over about ten years has been observed (Annecke et al., 2005). The transition to modern clean fuels is very important for reasons of health and safety. In particular, a recent study found that the air quality in Khayelitsha falls below safety levels and the levels of air pollution are often 70% higher than they are in the central city, (Powell, 2008). Thus, it was of concern that during the blackouts, households did not revert to using paraffin or wood, but made the transition to LPG.

According to Integrated Energy Solutions (IES, 2007), cooking with LPG has a number of benefits for households. These are:

- Gas is an acclaimed and preferred cooking fuel internationally.
- Gas is clean, controllable, fast and efficient.
- The hob heating settings on gas appliances are more precise compared to low-standard electrical hobs.
- With gas, one pays for what one uses. There is no loss of heat unlike with other fuels.
- Gas is safe and has an international safety record unlike electricity and other commercial energy sources.
- It is portable and can be stored safely.
- Gas appliances generally last longer if used correctly (IES, 2007).

It was expected that this intervention would act as a pilot project for extending the LPG market into the low-income sector. Various stakeholders, the Department of Minerals and Energy (DME), Eskom and the Liquid Petroleum Gas Safety Association of Southern Africa (LPGASA) took part in and observed this experiment. The impacts of the programme were assessed immediately after its termination by Eskom (Brand-Baro Matrix, 2007) and LPGASA (Makhabane, 2006). One year later, the purpose of this study was to assess the medium-term impacts that the LPG exchange programme of 2006 had on fuel switching in low-income households and in small and micro-enterprises (SMEs) in Khayelitsha. The study's main objective was to deliver on the following results:

- An update based on primary data of fuel switching in urban areas.
- An analysis of the impact of power outages on small and micro enterprises in Khayelitsha.
- An analysis of the impacts of LPG intervention with regard to perceptions, behaviour change and finances on low-income households and particularly women in Khayelitsha.
- Recommendations emanating from the study results regarding the type of infrastructure needed to support consistent energy supply in low-income areas.

Previous studies in household energy use showed that people perceived LPG to be a dangerous fuel (Mehlwana and Qase, 1998), saying that it posed a greater danger to the household than paraffin because there are chances of it 'exploding', (Cowan and Mohlakoana, 2004). Nonetheless, during the electricity power cuts in 2006, people in low-income communities, readily accepted LPG stoves and a year later, up to 89% of the households surveyed, reported still using LPG for cooking, albeit if not every day.

2. Method

The field study was conducted in Khayelitsha Township in Cape Town, South Africa, in 2007. Khayelitsha is unique: it was established in 1983 as a residential area for 'Africans' under the then apartheid policy (McDonald and Pape, 2002) which maintained strict separation between 'Coloured' and 'African' people in the city. Khayelitsha has grown exponentially as people from the rural areas of the Eastern Cape have streamed into Cape Town to search for employment. Khayelitsha boasts a variety of dwellings ranging from shacks built with a mix of corrugated iron, wood and other materials to freestanding brick houses provided through the government's low-cost housing subsidy scheme and some houses built and bought by residents through bank loans. This means that there are a variety of categories of households ranging from mostly poor (mostly in shack areas) to better-off.[3]

Qualitative and quantitative data was collected

through structured questionnaires and interviews with households and key informants such as the municipal ward councillor of the area, people that worked as part of the team which rolled-out the LPG programme in Khayelitsha and small business owners. In total, 282 households were interviewed. Additional qualitative information was gained from a number of focus group discussions, one of which included the views of people who did not participate in the LPG exchange programme, and another which was held exclusively for small home-based businesses which were affected by the power cuts.

The particular area in Khayelitsha where data was collected is referred to as Municipal Ward number 97 and is divided into three locations, namely: Mandela Park where 88 households were interviewed, Town Two where 107 households were interviewed and Makhaza with 87 households interviewed. These three locations have a mix of both formal (brick homes) and informal houses (shacks). The breakdown of the type of households interviewed is as follows: 214 formal homes, 50 informal homes provided with services such as electricity, sanitation and water and 18 informal homes without service provision.[4] The informal homes without services usually get their electricity connection informally by using extension cords which they connect to homes that may be across the road and have formally metered electricity connections. In turn, these households charge the informal homes a fee, which is usually higher than the electricity price. To illustrate the level of service delivery amongst interviewed households, Table 1 shows the different electricity supply mechanisms and housing types within the sample.

The structured questionnaire was divided into three sections. The first section explored issues of household energy use prior to widespread electricity blackouts in 2006. These questions relied on the respondents' memory in recalling their energy use activities of a previous year. The second section of the questionnaire explored people's energy use during the electricity blackouts in 2006, where the main aim was to assess how LPG (and other fuels) was used by households in Khayelitsha. The third section then looked at household's current energy use patterns and expenditure on fuels.

3. Findings

Not unexpectedly, those who participated in the study were poor although not uniformly so: 20% lived on less than R500 (US$80.3) per month which is below the poverty measure of R1 200 (US$193)[6] while the majority, 36% of households surveyed in this area of Khayelitsha earned between R501 (US$80.5) – R1000 (US$160.7) per month.

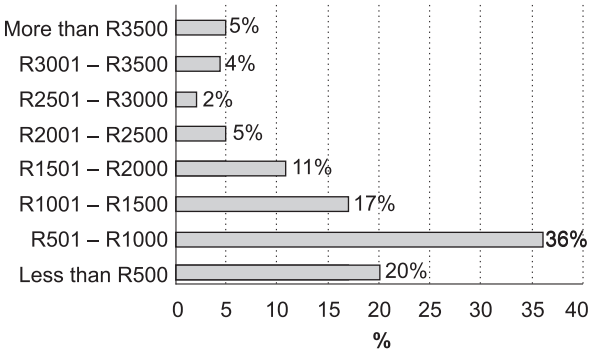

Figure 1: Total income of the household per month
Source: Annecke et al., (2008)

Many households living in poverty in South Africa depend on social grants. This study's sample was no different to the country's reality: 73% (205 households) of households interviewed received a government grant and for some households this was the only form of income. Of those receiving grants, 65% were getting child support grants, 20% received old age pension payouts, 13% received disability grants and 2% foster care grants.

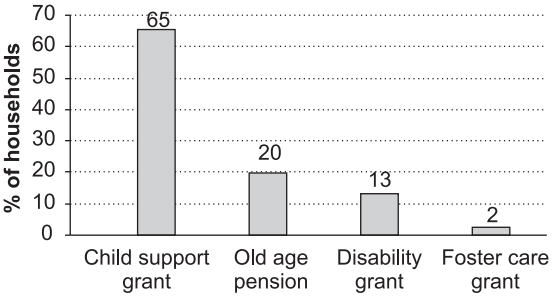

Figure 2: Types of grants received by households
Source: Annecke et al., (2008)

Table 1: Electricity connections in formal and informal houses
Source: Annecke et al., (2008)

	Formal house		Shacks	
Electricity	Frequency	Percentage	Frequency	Percentage
Metered	193	91%	58	85%
No electricity at all	13	6%	0	0%
Extension cord	7	3%	10	15%
Total[5]	213	100%	68	100%

Despite their apparent poverty, most households owned several electric appliances: a two-plate stove, refrigerator, kettle, radio and television sets. These households also ensured that they have paraffin appliances such as the one-burner wick stove[7] and / or heater which are used when they want to save electricity especially when they are cooking slow cooking staple foods such as samp and beans.

4. Before the blackouts

Since we were interested in the transition from electricity to LPG we asked about attitudes to and use of LPG prior to the blackouts. The surveyed households revealed that before the blackouts in 2006 they used very little LPG. In fact, out of all the surveyed households, only nine out of 282 said that they had used LPG regularly before the electricity blackouts. Before the blackouts, 87% of the surveyed households used electricity for cooking while paraffin was used for space heating by 84% of the households and by 12% of the households for water-heating. Interestingly, although most households reported using electricity for cooking, surveyed households spent more money on paraffin than electricity every month. This could mean that paraffin use for cooking was under reported, or that paraffin is much more expensive that electricity to cook with (which would concur with the findings in Cowan and Mehlakoana 2006).

Table 2: Pre-blackouts: Average amounts paid for energy per month per household size
Source: Annecke et al., (2008)

	Size of the household		
	1–4 people	*5–8 people*	*9–12 people*
Paraffin	R 248.37	R 287.11	R 205.21
Electricity	R 70.55	R 93.00	R 80.23
LPG	R 5.41	R 3.14	R 3.14
Candles	R 4.53	R 11.11	R 6.80

Prior to the blackouts an average household with 1–4 people spent R248.37 (US$39.93) per month on paraffin which was much higher than other fuels available at that time. At the time of the survey, the price of paraffin was R6.50 a litre, and a household with 1–4 people consumed approximately 38 litres of paraffin per month.

5. During blackouts

Since the primary reason for the introduction of LPG was to reduce peak demand, we asked respondents at what time they cooked the evening meal and how long it took. Most of the households (74%) cooked in the late afternoon, between 16h00-18h00. Table 3 below shows that the cooking times for households surveyed changed after the LPG intervention with 84% of the households cooking their main evening meals later than they used to. The main reason given for the change in cooking times is that respondents found it easier and quicker to cook when using LPG.

Table 3: If the cooking time changed, did you cook earlier or later than usual?
Source: Annecke et al., (2008)

How did the time change?	*Count*	*Percentage*
Earlier	24	16%
Later	129	84%
Total	153	100%

During the electricity power cuts, 51% of households surveyed relied on paraffin for various tasks, rather than LPG and electricity which were often not available. It did not help the image of LPG that during the power cuts, there was also a shortage of LPG caused by an 'unplanned shutdown' in one of the refineries which supplies bulk commercial buyers. At the same time, there was a maintenance shutdown of a fuel refinery in Cape Town. This caused a significant increase in the price of LPG. It was most difficult for low-income households to adjust and many reverted to paraffin use.

6. Post 2006 blackouts

The use of LPG by surveyed households continued even after the power cuts had ceased. When asked why they had continued using LPG, households said that they now prefer LPG because it is clean and quick to use. There were no fears of using it anymore as they mentioned that they were given sufficient training on how to use it and were careful with it at all times, including not allowing children to operate the stoves.

Up to 49% of the surveyed households said that their energy expenditure had risen compared to the time before they had started using LPG for cooking in their homes. This can be attributed to the fact that these households continued using other energy sources such as paraffin and electricity whilst using LPG. Only 23% of the households said that their energy expenditure was the same as prior to blackouts and 27% reported that they were spending less money.

As far as the price of LPG is concerned, respondents' experience of this fuel has taught them that it is expensive. In 2006, 47% of respondents thought LPG was expensive and 22% thought it was very expensive (69% altogether). In 2007, 44% thought gas was expensive and 30% thought it was very expensive (74% altogether). This signifies that the number of people who think gas is expensive has increased by 5% since they started using it. Conversely, of the same group, in 2006, 29% thought gas was cheap while in 2007, fewer, 26% thought LPG was cheap.

Table 4 below shows people's perceptions of LPG prices in 2006 when they were not using the fuel for cooking and after they had started using it during and after the electricity blackouts. It shows that most of the surveyed households thought and still think that LPG is an expensive fuel compared to what they are used to paying for paraffin and electricity.

Table 4: Affordability of LPG before and after blackouts
Source: Annecke et al., (2008)

Do you think LPG is:	*Before*	*After*
Cheap	29%	26%
Expensive	47%	44%
Very expensive	22%	30%
Never thought about	1%	0%

During the focus groups, several people complained that it was very expensive to cook with LPG compared with electricity. They said those that still had their two plate stoves stopped using LPG and those that had exchanged their electrical two-plate stoves for the LPG stoves went to buy new ones. The price of refilling a LPG cylinder (5 kg) is R55-R60 depending on where one refills it. The participants said that this did not last long and it also depended on how much one cooked in a month. One woman said that her cylinder lasted only a week because she has to cook for a family of six every day. She said that when she buys electricity for R50, it lasts for two weeks and she uses it for cooking everything and rarely uses paraffin to supplement her electricity supply (Annecke *et al.,* 2008).

Residents of Khayelitsha with formal electricity connections receive 50 kWh of electricity free of charge, once a month referred to as the Free Basic Electricity/Energy (FBE) subsidy. This is a subsidy provided by Government and Eskom. Initially this subsidy was meant to serve poor households that could not afford to use their electricity supply because of lack of funds to pay for it. According to studies conducted to emphasize the need for this subsidy, it was concluded that this 'free electricity' would 'provide the energy necessary for basic lighting, ironing and use of TV and radio, as well as occasional use of an electric kettle or hotplate', (University of Cape Town, 2002). Due to administrative difficulties in implementing this subsidy to poor households only, it was decided by Eskom to roll-out the subsidy to all households in Khayelitsha.[8]

During a focus group discussion, participants were asked if they preferred FBE for the electricity service or LPG at subsidized prices. A young man in one of the focus groups expressed the general sentiment when he said that the advantage of using electricity was that they could get the 50 'free units' through the FBE programme. He said: 'With LPG, not enough vouchers were handed out, so that now we have to use our own money to refill the cylinders. The other problem is that not everyone received the vouchers when the exchange of appliances took place.' Everyone agreed that getting FBE helps a lot as not many people can afford to buy electricity units every month.

When asked about what subsidies households would prefer, most of the respondents, 73% (or 205 households) said they would rather have Free Basic Electricity than an equivalent free basic gas, 27% (or 77 people) would rather have the subsidy for free basic gas. This is shown is Table 5.

Table 5: Choice between free basic electricity or LPG
Source: Annecke et al., (2008)

	Count	*Percentage*
Free basic electricity	205	73%
Free basic LPG	77	27%
Total	282	100%

While the focus group participants acknowledged the benefits that people continue getting from Free Basic Electricity, they complained that the units seem to be getting fewer and fewer as the years progress. In other words, the electricity costs were getting higher every year making it difficult for people to afford. The group also complained that electricity vendors no longer sell electricity for R5 (US$0.88), arguing that R5 is all they could afford and that in order to get the free units one has to buy some electricity. According to Eskom and other electricity service providers, this should not be the case and customers were allowed to get their 'free electricity' without having to purchase any. A woman participating in the focus group insisted that customers must be able to get their free units without buying extra, but also acknowledged that they (those without money) needed to be patient because electricity vendors serve those who have cash first.

When respondents were asked whether gas or electricity is cheaper to cook with (see Table 6), most (77%) thought quite correctly, that electricity is cheaper to cook with than LPG, and 22% thought gas was cheaper than electricity.

Table 6: Cost of LPG compared with electricity
Source: Annecke et al., (2008)

Is LPG cheaper to use or electricity?	*Count*	*Percentage*
Electricity cheaper	218	77%
LPG cheaper	63	22%
Both	1	0%
Total	282	100%

7. Positive change in attitude to LPG use

The researchers were interested in how and when the new customers used their gas and how their experiences shifted their perceptions and prior assumptions. Changes in attitudes to LPG use were recorded as well as preferences with regard to LPG and electricity. Despite the apparently more positive attitude to electricity described above, a year after the introduction of LPG (July 2007), when asked about current energy use, a large majority, 89% of households, said they were still using LPG for cooking (although not necessarily every day), and only 11% said they had stopped using their LPG stoves. This shows substantial loyalty to LPG. It also indicates that 11% of the stoves and cylinders are redundant in households and LPG stockists are urgently trying to retrieve the unused cylinders since they are needed to supply new and interested households.

The respondents were also asked about what energy source (paraffin, LPG, electricity and candles) they used in the mornings, during the day and in the evenings. They were asked how often they bought each of these, and in what quantities. Most LPG use occurred in the late afternoon and evenings with some use in the mornings and, electricity, where available, was used during the day for radio/television and boiling water.

Strong negative perceptions of LPG were held prior to the exchange programme: 65% of respondents thought that LPG was dangerous or very dangerous and 60% thought it was difficult to use, 69% thought it was expensive or very expensive and 55% thought it was not easily available. Over half – 54% – of respondents recognized LPG as a clean burning fuel (although 43% thought it was smelly).

Perceptions of the dangers of LPG changed virtually overnight. The offer of a free brand new stove and all attachments proved irresistible and rowdy queues formed early in the mornings at the swop depots. The respondents received instructions with their new gas stoves and were informed about the safety features – the auto-start and cylinder that can be turned off completely. The education campaign accompanying, the exchange programme, in combination with the free gift and experience of using gas, rapidly changed people's minds. This was also accompanied by the prospect of not having electricity. Whereas only 35% of respondents said that they had thought gas was safe in 2006 (prior to the exchange programme), a year later, in July 2007, 85% of respondents reported that they thought LPG was safe. Only 15% thought it was dangerous or very dangerous; 90% of respondents thought it was easy to use, and 86% thought it was a clean fuel.

Table 7: Perceptions of safety of LPG before and after the blackouts
Source: Annecke et al., (2008)

Do you think LPG is:	*Before*	*After*
Safe	35%	85%
Dangerous	40%	11%
Very dangerous	25%	4%

Once households started using LPG, experience had shown that LPG was less easily available than they had previously thought (see Table 8): 29% of respondents said it was very scarce, 41% said it was not easily available, that is in 2007, 70% said LPG is not readily available compared with 55% who thought LPG was not available in 2006. This was also influenced by the LPG shortages that the country experienced during the electricity power cuts, which was due to a shutdown in production at the refinery in the Western Cape.

Table 8: Availability of LPG
Source: Annecke et al., (2008)

Do you think LPG is:	*Before*	*After*
Easily available	43%	29%
Not easily available	33%	41%
Very scarce	22%	29%
Never thought about it	2%	0%

The category which showed the largest change was that of the user-friendliness of gas. Whereas prior to the intervention and education campaign, 60% of the respondents thought LPG was difficult to use, a year later, in 2007, 90% of respondents said LPG was easy to use. This result contributes to understanding LPG use and people's perceptions which have clearly changed compared to previous years where households in low-income areas refused to use LPG (see Table 9).

Table 9: User-friendliness of LPG
Source: Annecke et al., (2008)

Do you think LPG is:	*Before*	*After*
Easy to use	37%	90%
OK	2%	5%
Difficult to use	60%	4%

Respondents' perceptions of LPG also changed with regard to it being clean and odourless. The number of people who thought LPG is clean increased from 54% to 86% and the number of people who thought LPG is smelly decreased from 43% to 14%, indicating a positive shift in attitude to LPG.

8. Comments and conclusions

Further observations can be summarized as follows:

Multiple fuel use and transition trends in urban areas

One of the impacts that the power outages and the subsequent introduction of subsidized LPG is likely to have had, is to disrupt the transition (not necessarily negatively) to full electricity use that was occurring in low-income urban areas. The 282 respondents to the survey, who represent a variety of household sizes and conditions typical of the kind found in Khayelitsha, still use multiple fuels although there was a clear shift towards full electricity use (lighting, cooking, heating and cooling as well as radios and televisions).

Prior to the blackouts, respondents were generally satisfied with their access to energy through the electricity supply and the FBE allowance. Two-thirds of all households were unprepared to cope with the extended blackouts of 2006 despite the fact their areas experienced blackouts predominantly in the windy summer season.

Durability and sustainability of the LPG intervention

Prior to the LPG exchange intervention of winter 2006, over 80% of the sampled households were using electricity for lighting, cooking, water heating, refrigeration and radio/television. There was some paraffin use, primarily for space heating, but very little LPG use. The intervention caused a disruption of this pattern and created a LPG market where there had been very little demand, and, with certain conditions, this market looks set to expand. While it would appear that 44% of the sampled households are using predominantly electricity again, substantial inroads have been made by LPG. However, paraffin remains important in the fuel mix for space heating. The intervention was successful in terms of raising awareness around the safe use of LPG.

Other factors influencing the sustainability of LPG use are a lack of maintenance and repair facilities in Khayelitsha and limited accessories and imaginative expansion programmes. The LPGASA will need to improve customer service if they are to expand and sustain a market in Khayelitsha. An SME owner and LPG stockist has been asked repeatedly for gas braaiing accessories by food sellers, but despite the supplier wanting to 'expand into catering' they have not spotted this opportunity. Similarly gas refrigeration offers food sellers an alternative to electricity but no incentives to swap have been provided.

Women as managers of domestic energy

The study confirmed the importanc of women as mangers of domestic energy who not only do the cooking but also pay for gas and electricity and carry the gas home. It was important to track cooking times to see if these changed with the introduction of LPG, and if so how. Over half of respondents, 54%, said that they changed their cooking time with the introduction of LPG, and this meant they cooked *later* than before they had LPG. It remains to be seen whether, if and when these households revert to electricity for cooking, they will have changed their cooking times permanently and shifted demand to later in the evening. If so, the LPG intervention would be responsible for a behaviour change where none was desired.

Women have been successfully trained to act as stockists of gas cylinders. However, the profit margins are very low on low turnovers – R5 a refill and about 100 cylinders a week so this cannot be their only business, whereas the drivers hired to do the deliveries are men and earn regular wages. Women should also be trained as drivers too and be given further opportunities.

Peak demand and demand side management

Managing peak periods of electricity demand is likely to remain a critical function of the ESI for the medium term. The use of LPG by low-income households contributed to decreasing the peak: a decrease of 20 MW was achieved rather than the 40 MW targeted, since the most energy intensive activity, cooking, is done before peak. There is some politically conservative thinking which is of the opinion that low-income households should not be 'allowed' to cook with electricity. This thinking is prevalent among planners and engineers who see the national electrification programme (the addition of low-income households to the grid) as draining generation power, adding to the peak demand and creating a burdensome load on the distribution system. On the other hand, it could be argued that the poor, as one of the most vulnerable groups and in need of most assistance, have first right to electricity as the cheapest energy service for cooking and water heating. The Free Basic Alternative Energy policy should see LPG subsidized as electricity is, in which case households will be able to exercise greater choice in energy services.

The households surveyed had made particular efforts to conserve electricity in the ways that Eskom had advised. There had been a precedent for saving electricity in the CFL campaign, so many residents were aware of the need to save electricity. The most common ways of saving were boiling only as much water as needed, limiting the number of lights and appliances used and limiting cooking times. These savings campaigns and messages should be repeated at least twice a year in order to maintain customer's interest and awareness.

The different means of communication: radio, councillors' meetings, loud hailers, and television worked well in combination and should continue to

be used as complementary to each other.

LPG suppliers' perspective

Representatives from LPG distributors involved in the LPG programme were interviewed. They complained about a lack of infrastructure, but praised the safety awareness campaign for being effective. They said they had learned how to do it even better.

Negotiating a venue was difficult because people are afraid of having so much gas near their houses.

Impact on home-based small and micro-enterprises

SMEs are the backbone of township life, but LPG has not displaced electricity as the primary energy for business purposes. SMEs lost hundreds of rands when their fridges defrosted and their stocks decomposed. But more importantly, the delicate balance between owner and customer which depends on credit being extended and repaid was upset through giving debtors reasons (warm beer, smelly premises, bad food) to take their business elsewhere and decline to pay their debts because of the 'poor service'. This created a double debt or financial loss to enterprises that are in no position to withstand shocks.

The LPG intervention resulting from power failures changed peoples' perceptions about a fuel that they had previously thought of as dangerous. This showed that with a well planned awareness raising and education drive on energy sources, people are open to change and can embrace fuels that are cleaner. Despite LPG price increases, low-income communities still continue using LPG which shows confidence on the fuel. At the same time, there is a need for change in policy making and implementation regarding the implementation of free basic energy so that LPG use may be subsidised. Many poor households rely on commercial fuels but these are very expensive and this study has shown that if LPG was subsidized in the same way as electricity, willingness to use it as an everyday fuel would be much higher as its stigma of being dangerous would be removed.

Notes

1. This paper is based on a research report titled: From Electricity to LPG and Back Again: Power cuts, LPG supply and the poor in Khayelitsha 2006/2007. The study was funded by the South African National Energy Research Institute (SANERI), a public entity established in 2004 and entrusted with the coordination and undertaking of public interest energy research, development and demonstration. A slightly different version of this paper was presented as a workshop paper at the 31st IAEE International Conference in Istanbul, Turkey, at the pre-conference workshop on 'clean cooking fuels'.
2. Vouchers were given to households to encourage them to use LPG and to help them pay towards the costs of refilling their cylinders. At the time of research a kilogram of LPG cost around R10 (US$1.60).
3. Very few households in Khayelitsha can be categorized as well-off. These are households that may be earning more than R10 000 or more per month with more than one household member employed. Education levels amongst these households are usually higher than in those earning lower incomes with earnings of less than R1600 (US$257.23) per month (City of Cape Town, 2006).
4. Informal homes without services are usually built in areas not approved by the municipality for people to settle or build dwellings. These structures are usually temporary but due to the backlog in housing delivery and over population in urban areas, they may be occupied for a period of up to ten years. In order to discourage people from building in these areas, municipal authorities do not usually provide services to such households but due to the need, health hazards and recognition of basic human rights, the municipality sometimes provides these households with communal services, such as water and sanitation facilities.
5. One of the households did not respond to the 'type of electricity service' question, hence the overall total is 281 instead of 282.
6. These figures are based on the July 2007 ZAR: US$ exchange rate during the survey period i.e. US$1 = R6.22 cents.
7. The one-burner paraffin wick stoves available in South Africa for households to use are mostly unsafe and do not conform to the safety standards set by the South African Bureau of Standards. In 2007, the DME with the assistance of the Paraffin Safety Association, recalled the unsafe stove and new and safe stoves are being manufactured and tested for the South African market (Truran, 2009)
8. Households in the greater Cape Town areas also receive between 30KwH and 50KwH of electricity per month regardless of their income status and the amount of electricity they use.

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