Energy poverty in developing countries' urban poor communities: assessments and recommendations

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Front cover photo of High tension power cables strung across the creek in Vashi, Navi Mumbai. Photo courtesy of Deepak Sharma, 2011.

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Executive Summary

South Africa has adopted a universal access approach to energy for households and has developed various programmes to support this objective. These have included the Integrated National Electrification Programme (INEP), subsidies to address affordability including an electricity consumption subsidy (Free Basic Electricity) and a consumption subsidy for those households not connected to the grid (Free Basic Alternative Energy) as well as the removal of VAT on kerosene (known as paraffin in South Africa). Despite the existence of this supportive policy framework there remain a number of on-the-ground barriers to energy access for the urban and peri-urban poor in South Africa. This study explored the demand and supply barriers to improved access to modern cooking services in Imizamo Yethu, a low-income settlement in Cape Town, South Africa. The research focused on electricity, liquid petroleum gas (LPG) and kerosene. It was undertaken by interviews with selected key stakeholders both from the local community as well as those involved in the supply of the three fuels being investigated. A key component of the research process was aimed at actively engaging with stakeholders to identify solutions to overcome barriers.

Households in Imizamo Yethu have a range of different electricity connections ranging from formal grid connections to informal connections through neighbours selling electricity as well as households illegally tapping into the grid. There are key shortcomings in the electrification policy to adequately target all households in an urban low-income settlement, for example backyard dwellers. This barrier creates knock-on impacts affecting supply for the whole settlement. Informal and illegal connections increase demand on the local supply network beyond its original design capacity and negatively affect quality of electricity supply by overloading the system and contributing to blackouts. This in itself requires the ongoing use of alternative fuels as backups when there are electricity blackouts. There are also local level barriers to electricity access for unconnected households that stem from local politics that have delayed the settlement upgrading process. The City of Cape Town is making attempts to overcome barriers for backyard dwellers and has initiated pilot projects in other settlements to address service delivery. There are also key demand barriers relating to the misperception that electricity is a more expensive option than kerosene and there appears to be a perception that people need to use kerosene because they cannot afford to use only electricity. Various research on the comparative costs of cooking with different fuels has not substantiated such findings however and find electricity to be the cheapest option. There is a need therefore to educate people about costs of using different fuels to encourage transitions away from kerosene, which has negative health and safety impacts, towards electricity.

Kerosene is widely used in Imizamo Yethu and there are well-established supply and distribution networks in the settlement. It is perceived as a convenient, affordable and easy to access fuel. The usage of this fuel in the South African context is however associated with many health and safety risks including burns, poisonous ingestions and indoor air pollution. These issues stem from unsafe appliances and the way that kerosene is supplied and packaged for use in the home. Whilst these challenges can be overcome and kerosene used in a safe and modern way, there are inadequate regulations, as well as inadequate enforcement of existing regulations, which inhibit its safe usage. There is a need to engage more with policy makers and the supply chain to address these issues. At a local level it was evident that residents are unaware about safer alternatives, for example appliances, and would benefit from more education and awareness programmes. A local NGO, called the Paraffin Safety Association (PASASA) does on-going work in this regard.
LPG is a safe and clean burning energy source with no impacts on indoor air pollution. This fuel is however unfortunately not widely used in the domestic sector in South Africa. Despite its relative safety over a fuel such as kerosene, demand is suppressed by strongly held perceptions by poor households that it is dangerous and that there are risks of cylinders exploding. Supply networks in low-income settlements are also generally quite limited. The research process aimed to explore solutions to overcome the barriers identified. The researcher facilitated the engagement between Kayagas, a local LPG distributor, and the local community and specifically local township traders (known as ‘spaza shop’ owners) to explore the establishment of local supply networks. This was a challenge that Kayagas had previously been unable to overcome in their engagements in the local area. Kayagas also addresses demand barriers as part of their business model to expand into new areas by running educational and promotional days to inform residents about the safety and benefits of LPG. By increasing awareness and access to this fuel, residents may benefit from increased variety and options when making their energy choices. LPG offers them a viable safe alternative to kerosene, especially where a household may not be able to use electricity instead due to barriers associated with that fuel. LPG is however more expensive than kerosene and requires a large cash outlay to transition, as well as requiring upfront payments when purchasing the fuel, rather than being able to buy in smaller incremental amounts. It may not be a viable alternative for all households. There is an on-going need at a national policy level to overcome supply and pricing barriers and potentially to explore the feasibility of subsidies or other policies to promote the domestic use of this fuel.
1. Introduction

This study, Urban and Peri-Urban Energy Access (UPEA) Phase III, is the third in a series aimed at exploring the issue of energy access for the poor in urban areas, and intends to further develop the work done in earlier phases. The focus of this study is on the demand and supply side barriers and identifying solutions to modern cooking energy services. Access to modern energy services in this report includes consideration of an energy service that is clean, safe, reliable and enhances social and economic development. The study focused on access to electricity, liquid petroleum gas (LPG) and kerosene in Imizamo Yethu, a low-income settlement in Cape Town. The study used a participatory approach to investigating solutions with stakeholders involved in energy supply in Cape Town and representatives from the community. The output of this research includes the recommendation of measures to improve energy access for the urban poor.

Chapter two describes the methods employed to undertake the research. Chapter three introduces the research setting and reviews the legislative context pertaining to poverty, service delivery and energy access in South Africa to get a better appreciation of the national framework within which energy access for the poor falls. Chapter discusses some of the key supply and demand side barriers identified through desktop research, a community survey as well as interviews with the community and other stakeholders. Chapter five then presents the action area of research undertaken in collaboratively initiating solutions to energy access in the community.
2. Methods

This study followed a qualitative approach using stakeholder interviews and a survey. The research agenda was purposely left open and undefined in order to be flexible and to respond to new avenues of enquiry as they arose. This research process sought to explore opportunities for improving access from a barrier perspective and to identify, through the course of the research, where the best opportunities for social change would lie. The intention of the study was to use the research process itself, in conjunction with stakeholders, as a catalyst for developing solutions. A purposive sampling approach was undertaken as there are a limited number of specific stakeholders who had relevant expertise with regard to the issues under discussion. Participants were selected based on their likeliness to contribute relevant and insightful data, which in this case was critically exploring barriers to different energy sources and identifying potential solutions. All interviews were undertaken in an informal manner with pre-determined prompting questions but aimed to allow for more general discussion of issues. The stakeholders included:

- Local government representatives from the Electricity Services Department and the Sustainable Livelihoods division;
- The Paraffin Safety Association of South Africa, an NGO working around kerosene safety;
- Kayagas, an LPG distributor who has a focus on supplying LPG to low-income settlements.
- Community development worker in Imizamo Yethu
- Spaza shop owners in Imizamo Yethu

The local community development worker in Imizamo Yethu was selected as an appropriate point of contact with the local community. He had a thorough knowledge and understanding of the community and, as a development worker in the community for many years, had the ability to reflect upon key developmental characteristics and issues. He also had had previous interactions with other researchers in the realm of energy and development and was keen to contribute input to the issues under discussion. He was well known to the community and able to connect and elicit support from other relevant stakeholders (for example spaza shop owners) in developing and discussing solutions to go forward. Multiple meetings and site visits were undertaken with him, for example visiting spaza shops and households to talk to community members about energy usage to develop contextual understanding of issues. An important focus during the study was on linking stakeholders with the community to explore and develop solutions. To this end interactions were facilitated by the ERC between Kayagas and community representatives and spaza shop owners to collaborate in developing LPG supply networks for the local area.
3. Setting the context

3.1 Imizamo Yethu

Imizamo Yethu is a low-income township situated in Hout Bay, a wealthy suburb in Cape Town in the Western Cape Province. Imizamo Yethu is an informal settlement with mostly black residents and was established as a planned settlement in 1991 to relocate squatters in Hout Bay to 18ha of land with around 500 sites serviced with roads, water, sanitation and waste management (Fieuw, 2011; Roth, 2011). However from its establishment the population of the settlement quickly grew, with economic immigrants largely from the rural Eastern Cape, which has swelled the numbers beyond the carrying capacity of the area. The population is predominantly Xhosa speaking South Africans however there are also a number of immigrants from various southern African countries including Zimbabwe, Malawi and Democratic Republic of Congo as well as many from Nigeria and Somalia (Roth, 2011). Population estimates for the settlement vary; in 2007 the City of Cape Town estimated that the population was around 13,000 people whereas an estimate by civic groups in 2008 put the figure at 30,000 (Roth, 2011). The settlement is densely packed with many backyard dwellers and more recent arrivals forced to settle on the steep upper slopes of the mountain, to where there is no tarred road access. Most townships in South Africa are located on the periphery of urban centres and people must travel significant distances to get to their places of employment. In contrast Imizamo Yethu is well located with its close proximity to Hout Bay, an economic centre and source of employment.

The settlement is a mixture of formal and informal housing. Many of the formal houses were built by the Neil Mellon Foundation Trust. This is an Irish philanthropist organisation that initiated a building project in the township between 2002 and 2005. These households have formal access to water, electricity and waste management and the owners have title deeds to their properties. There is also government subsidised low-cost housing, so-called RDP (Reconstruction and Development Plan) housing. Figure 1 shows a picture of the settlement divided into different formal and informal areas. The Imizamo Yethu site is estimated to be able to support between 1,300 and 2,000 units, based on South Africa’s standard for low-cost housing of 40 units per hectare. However it is estimated that the demand for formal housing is approximately 6,000 units (Roth, 2011). There are settlement upgrade plans currently underway.
3.1.1 Access to energy in South Africa

South Africa has a wide-scale electrification programme giving access to electricity for poor households. Estimates of the extent of the remaining backlog vary. Although the DoE has recently stated that 84% of households have access to electricity (DoE, 2012a) there are other estimates which suggest a much larger backlog and that 25% of households (3.4 million) are still un-electrified (DoE, 2012a). With dwindling connection rates in the last few years amidst on-going growth in new households, there has been very limited change in the absolute number of un-electrified households since 2000. This is illustrated in Figure 2 below.
The City of Cape Town has a population of approximately 3,154,000 people or about 800,000 households, of which approximately 19% are informal houses or shacks. Whilst almost 95% of formal households are connected to electricity, it is more difficult to ascertain informal electrification rates (Jaglin, 2008). There is a constant influx of migrants, economic and otherwise, into the city, who set up residence in shacks and whose number is constantly changing and difficult to estimate (Jaglin, 2008). Often informal settlements expand onto areas such as conservation land which are not proclaimed for housing and therefore do not qualify for service delivery. These households therefore remain without access to electricity, water or sanitation. It is estimated that 80-85% of informal households on municipal land are electrified, compared to roughly 60% of total shacks in informal areas, both on private and municipal land (City of Cape Town, 2003).

Despite access to electricity, the continued usage of other fuels in poor households is widespread and multiple fuel use is common (Cowan, 2008; Kimemia and Annegarn, 2011; Matinga, 2010). Consumption of electricity tends to often be very low for many years after electrification (Prasad, 2006) which may be due to a lack of affordability (or perceived lack of affordability) of this fuel, the quality of supply, a household’s personal preferences for using other fuels (Cowan, 2008) as well as reticence to use new and unfamiliar fuels which may require changes in household cooking practises for example (Matinga, 2010) etc. Cooking is one of the most energy intensive energy services and also that service most imbued with cultural meaning, and it has been observed that many households do not make a full transition to electricity.

Table 1 below indicates the usage of different fuels used by households in South Africa for cooking. These statistics do not however fully capture the extent of household usage of alternative household fuels. The way that energy consumption data is collected in national surveys in South Africa is by asking interviewees what the primary fuel they use is for different energy services. It therefore does not reflect all those using a fuel as a secondary or supplementary option, so for example these statistics do not reflect the total number of households using kerosene. Table 1 indicates that electricity is the most widely used primary fuel for cooking. LPG is hardly used at all, and South Africa is somewhat of an anomaly in its low consumption of LPG in the domestic sector (Kojima, 2011). Wood and kerosene remain fairly widely

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**Figure 2: Total estimated electrified households in South Africa**

![Figure 2: Total number of households and electrified households in South Africa (millions)](image)

Source: Department of Energy, 2012a
used. Both of these fuels have negative characteristics associated with their use in South Africa which are detrimental to health and safety as well as have gender connotations (Paulsen, 2010).

Table 1: Primary fuel used for cooking by households, 2011

<table>
<thead>
<tr>
<th>Fuel used</th>
<th>Proportion of total households</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td>73.1%</td>
</tr>
<tr>
<td>LPG</td>
<td>2.2%</td>
</tr>
<tr>
<td>Kerosene</td>
<td>7.5%</td>
</tr>
<tr>
<td>Wood</td>
<td>13.3%</td>
</tr>
<tr>
<td>Coal</td>
<td>1.0%</td>
</tr>
<tr>
<td>Other</td>
<td>3.0%</td>
</tr>
<tr>
<td>Total</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

Source: General Household Survey, 2011, Statistics South Africa

3.2 Review of legislation related to service delivery

South Africa inherited a legacy of social problems from its apartheid past. Poverty and unemployment remain widespread after democracy despite the new democratic government’s attempts to address these issues. Poverty and unemployment remain largely concentrated amongst black and rural populations (Mensah and Benedict, 2009). The democratic government introduced a number of redistributive policies aimed at redressing the legacy of injustice and inequality. A central component of this was focussed on addressing the unequal distribution of social services and the provision of basic services to all residents has been one of the key priorities for the post-apartheid government. There have been major programmes in the areas of housing, water, electrification, land reform, healthcare and public works.

South Africa has adopted a rights-based and a ‘universal service’ approach to basic services (Jaglin, 2008). Although the South African Constitution does not specifically frame energy as a basic right in the same way that is does for access to sufficient water, research undertaken by Dugard (2008) explores various statutes in South African law and finds that there is a strongly implied right to electricity contained therein. This is further validated by the inclusion of electricity in the government’s free basic services delivery and ‘arguably, the allocation of the Free Basic Electricity (FBE) subsidy to qualifying households … alongside Free Basic Water, is an implicit acknowledgement of a right to ‘sufficient’ electricity along the same lines as the constitutional right of everyone to ‘access to sufficient food and water’ (Dugard, 2008: 268).

The government has also established a fairly extensive social welfare system in South Africa. The White Paper on Social Welfare defined the policy framework for social welfare in South Africa which aimed to “facilitate the provision of appropriate developmental social welfare services to all South Africans, especially those living in poverty, those who are vulnerable and those who have special needs” (Department of Welfare, 1997). Current cash based welfare grants include the old age pension, disability grant and child support grant for children in poor households. These grants play an important role in reducing extreme poverty amongst the most vulnerable parts of society. The HIV epidemic in South
Africa for example has increased the number of child-headed or pensioner headed households and these grants are often the main source of income for many of such households (Niño-Zarazúa et al, 2011).

All three spheres of government in South Africa, national, provincial and local have a role to play in redistribution and service delivery. The national government is responsible for providing a framework within which service delivery will occur equitably, establishing norms and standards regarding redistribution. Provincial government and local municipalities have the responsibility for actual delivery of many services such as housing, water and sanitation. Electrification rollout is however undertaken by both the national utility, Eskom, and local municipalities. Management and funding of the electrification programme, originally housed in Eskom, has changed over time, and since 2001, overall responsibility for the electrification programme has been with the national Department of Energy. At the same time local municipal distributors were given the responsibility for expanding new connections in their areas. Distribution in South Africa falls under the auspices of a range of different actors including around 185 municipalities and Eskom (Maphumelo and Fowles, 2008). Some of the challenges associated with this fragmented distribution industry include substantial differences in the financial statuses of different distributors, disparities in prices paid by customers, efficiency losses in terms of economies of scale, skills and lowering the average cost of supply and a lack of human capacity in many municipalities (Davidson and Mwakasonda, 2004). Attempts to reform the distribution industry into Regional Electricity Distributors (REDs) have been opposed by local municipalities, for whom electricity sales provide an important (and sometimes the only) significant revenue stream. The result of this fragmented approach to distribution is that even within one city such as Cape Town, distribution and pricing may fall under different distributors – both Eskom and the City of Cape Town. The City of Cape Town municipal distribution covers mainly the previously white residential areas, the city centre and commercial and industrial zones; whilst Eskom supplies many of the previously designated black and coloured1 township areas (Jaglin, 2008). Imizamo Yethu, the area of interest for this study, falls within the remit of the City of Cape Town.

### 3.2.1 National policy framework for domestic energy

The White Paper on Energy (DME, 1998) sets the overall policy approach for the energy sector in South Africa. It includes key objectives relating to energy access for poor households and promotes an integrated approach to household energy that considers all energy sources and supports the achievement of a range of social objectives including economic development, affordability, health and environmental protection. These objectives are given effect in the Energy Act (2008), which outlines the mandate given to the Minister of Energy to increase access to affordable energy services as well as minimizing the negative effects of energy use on health, the environment and personal safety. This section outlines some of the key national programmes and strategies that have been implemented promoting access to energy.

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1 Population groups in South Africa under apartheid were classified on the basis of skin colour. The term ‘coloured’ is now the official term used to denominate a diverse ethnic group in South Africa that includes people of mixed African and European settler heritage as well as those of Khoisan, Malay and Indonesian descent.
3.2.2 South Africa’s electrification programme

Grid electrification

Access to electricity is generally seen as an important step in socio-economic development and South Africa has a universal access target to connect all households to the grid. A wide scale electrification programme targeting poor and previously un-serviced households was commenced in 1994. The programme was originally housed and funded by the national utility, Eskom, and was known as the National Electrification Programme (NEP). Since 2001 it has been under the remit of the Department of Energy as the Integrated National Electrification Programme (INEP).

The programme saw impressive successes in the early years, made possible by surplus electricity generating capacity at the time and good human and institutional capacity within Eskom to undertake the programme (Bekker et al, 2008). High connection rates in the early years were also due to the programmes initial focus on urban areas, which have denser settlement patterns and are easier and cheaper to service (Bekker et al, 2008). In recent years connection rates have slowed as illustrated in Figure 3. This is largely due to a lack of bulk infrastructure, programme funding constraints and the challenges involved with addressing the remaining rural backlog (Bekker et al, 2008; DoE, 2011a). Achieving universal access is a challenging policy target given the funding and capacity constraints the programme is facing. The date for achieving universal access has been revised several times and has most recently been set at 92% of households by 2014 (DoE, 2012a). The viability of achieving this target appears low (Tait and Winkler, 2012) and DoE have acknowledged that it will likely take many more years to achieve universal access (DoE, 2012b).

Figure 3: Total annual new electrical connections

The non-grid electrification programme

In recognition of the challenges in extending the grid to remote areas with dispersed settlement patterns, the government also launched an off-grid electrification programme. This programme originally granted private companies concession rights to supply different geographically defined areas with solar home systems using solar photovoltaic systems. This programme was meant to aim primarily at areas where grid electricity is not economically or technically feasible. However more recently the application of the
programme has been expanded in recognition that grid electrification continues to become more uneconomical given rising costs of materials, and dispersed nature of rural settlements and that it is “unlikely that grid will reach most areas in the medium term” (DoE, 2012a/b: 3). The programme has now been extended beyond the original concession areas and municipalities can now make applications to electrify areas for the non-grid programme. There are certain criteria to identify suitable areas which include that there should be no grid electrification plans for the next 3 years and the nearest grid lines should be more than 2km away. This policy would not therefore cover most urban and peri-urban settlements in Cape Town for those households without access to their own connection.

Under the concessionaire agreement, the DoE will subsidise 80% of the capital cost of the solar home system (SHS). It is a fee-for-service model and the customer pays a minimal connection fee and a small monthly service fee. The system provides enough electricity for four lights, a radio, a black and white TV and the facility to charge a cell phone. The overall uptake of this programme in terms of numbers of households serviced to date remains relatively low in comparison to the grid electricity programme, with approximately 47,000 installations to date compared to the target of 300,000 (Barnard, 2012). There has in the past been an apparent lack of commitment to the programme on behalf of the government with irregular subsidy payments and delays in issuing new contracts with concessionaire companies (Wlokas, 2011). As a result of these and other challenges in servicing renewable energy systems in remote rural areas, many of the private concession companies have been struggling to stay in business (Wlokas, 2011).

3.2.3 National policies to address the affordability of energy for poor households

Pricing and cost of electricity for households is a topical issue in South Africa and will continue to be so in short term. Electricity prices in South Africa, historically very low, have been sharply rising over the last few years and will continue to do so in the future. These price rises are necessary to fund South Africa’s large capital expansion in new generating capacity. In 2010 the National Energy Regulator of South Africa (NERSA) approved overall tariff increases of 25% per year for three years. Residential tariffs were protected somewhat with increases of approximately 15% (DoE, 2012a). The poorest consumers are further protected through the introduction of Inclining Block Tariffs by NERSA in 2010. Redistributive pricing policies are permitted by the Electricity Regulation Act which allows for “the cross-subsidy of tariffs to certain classes of customers” (Department of Energy, 2006). There are different tariffs associated with different consumption levels, aimed at benefitting low-income consumers and penalising wasteful consumption (DoE, 2012a). For example the City of Cape Town’s tariff structure is shown in Table 2 below. Tariffs are divided into a ‘lifeline tariff’ and a ‘domestic tariff’. Households that use less than 450 kWh per month on average over a 12 month period qualify for the lifeline tariffs, those that use more than 450kWh fall under domestic tariffs. For households falling into the Block 1 usage category are applicable for the FBE subsidy of 50kWh free per month, thereafter tariffs are based on consumption as follows:
Table 2: City of Cape Town electricity tariffs for 2012/13

<table>
<thead>
<tr>
<th>Tariff</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lifeline tariff</strong></td>
<td></td>
</tr>
<tr>
<td>(for customers using 450kWh per month or less. These customers entitled to 50kWh free)</td>
<td></td>
</tr>
<tr>
<td>Block 1 (0 – 150kWh)</td>
<td>64.93 c/kWh</td>
</tr>
<tr>
<td>Block 2 (150.1 kWh – 350kWh)</td>
<td>89.95 c/kWh</td>
</tr>
<tr>
<td>Block 3 (350.1 kWh – 600kWh)</td>
<td>118.06 c/kWh</td>
</tr>
<tr>
<td>Block 4 (600.1 kWh +)</td>
<td>137.98 c/kWh</td>
</tr>
<tr>
<td><strong>Domestic tariff</strong></td>
<td></td>
</tr>
<tr>
<td>Block 1 (0 – 600 kWh)</td>
<td>118.06 /kWh</td>
</tr>
<tr>
<td>Block 2 (600.1+ kWh)</td>
<td>137.98 c/kWh</td>
</tr>
</tbody>
</table>

Source: City of Cape Town, 2012

In addition to the tariff structure described above, the government has had, for several years, consumption subsidies in place in an attempt to alleviate affordability constraints for poor households. There is both an electricity consumption subsidy as well as a subsidy for other energy sources for households in unelectrified areas. These are described below.

**Free Basic Electricity Policy**

In 2003 the government introduced the Free Basic Electricity (FBE) policy funded by the national government. This policy, in line with the government’s broader poverty alleviation objectives and a culture of rights based access to services, aims to provide poor households with a limited amount of free electricity every month. The tariff aims to assist poor households with a record of using less than 450kWh monthly per eligible household and the subsidy is funded by the national government. Although EBSST partially addresses the issue of affordability, there are problems of targeting households and different electricity distributors have different means of doing so. Additionally the subsidy is unable to reach backyard dwellers\(^3\) and houses on unproclaimed land that is not eligible for services, the so-called ‘invisible’ urban poor (Parnell, 2007).

The subsidy policy has been criticised by several NGOs and civil society groups (e.g. Earthlife Africa, 2010) for being insufficient to meet a households daily electricity requirements. Research to estimate the typical daily consumption requirements of households for essential energy services (defined in the study as space heating, lighting, hot water for cooking, cooking, warm water for washing, and refrigeration) estimated that monthly consumption to meet these essential services would range from between 261kWh

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\(^3\) Backyard dwellers are informal shacks constructed in the backyards of formal households. These backyard dwellers are often not eligible for services such as electrification (DoE, 2012b)
to 357kWh (depending on winter or summer). The consumption estimates included consideration of the, number of devices and appliance efficiencies as well as number of hours of operation for winter and summer days. The FBE subsidy provides 50kWh of free electricity per month, suggesting a contribution of between 14% and 19% to daily electricity consumption (Earthlife Africa, 2010).

Lobbying efforts to increase this subsidy amount have not been successful to date and there has been little indication from government to date that this subsidy amount will change in the future. Given the scale of poor households in South Africa increasing the subsidy would have significant fiscal implications. It is questionable from a national perspective whether further increasing a direct consumption subsidy would be the most cost-effective means of achieving overall social and economic objectives relating to energy access in South Africa.

Free Basic Alternative Energy Policy

In order to also subsidise energy consumption of households not connected to grid electricity, the government developed the Free Basic Alternative Energy Policy (FBAE) in 2007. This policy provides a subsidy to poor households for use of alternative fuels or technologies to support a household’s energy need such as kerosene, LPG, renewable energy etc. Implementation of the policy has, however, been poor as delivery is complex to deliver and many municipalities are faced with human and resource capacity constraints which limit their ability to effectively implement such policy directives with (Wolpe and Reddy, 2010). The subsidy is also paid to municipalities as an unconditional grant. This means that unless the municipality is committed to alternative energy access the funding may instead go towards the delivery of other services, such as water or sanitation (Wolpe and Reddy, 2010). The funding by National Treasury is also often insufficient and local municipalities are expected to supplement this amount from their own revenue streams. Since many rural municipalities face funding shortfalls and are unable to augment the subsidy pay-out, they may only irregularly pay the FBAE subsidy (Matinga, 2010).

Whilst the policy itself merely refers to unelectrified households – and therefore could in theory be addressed at urban households in or near to electrified areas but without their own electricity connection, in practise this does not appear to happen. Conversation with the City of Cape Town revealed that as a largely electrified municipality they are not eligible for this subsidy which in practise is supposed to be reserved for more rural municipalities without access to electricity.

Paraffin (kerosene) tax exemption and price regulation

Despite the fact that most of the urban poor have access to grid electricity, kerosene remains a widely used fuel for a large number of urban households. In 2001 the government exempted the sale of kerosene from value added tax (VAT) to make it more affordable to the poor. This serves as an indirect consumption subsidy as it lowers the price of this fuel for consumers. However there is a lack of research evaluating the impact and effectiveness of this indirect subsidy. Surveys undertaken before and after the VAT removal indicated that the price decrease was not passed onto consumers (PDC, no date). The price of kerosene is also regulated by the DoE to protect consumers against gross markups in the supply chain and overcharging to the end consumer. Again there is no national evaluation of adherence to this. It is questionable as to whether it is appropriate to be subsidising consumption of a fuel with significant health impacts and which negatively impacts other parts of the national budget, for example health and emergency service. This funding might for example be better spent on other aspects of this energy supply – for example safer appliances. However, due to the environment in which it is used and the manner it is distributed, kerosene use in South Africa has many safety issues. Despite official regulations, kerosene is
often sold in pre-used drinks, unlabelled bottles. Ingestion by small children is common and can lead to death. Because the urban poor live in high-density areas, they are at extreme risk of shack fires caused by unsafe kerosene appliances.

3.2.4 Implications of energy policy for poor households

South Africa’s approach to energy access is set against a backdrop of unequal service provision under apartheid on the basis of race. Following democracy in 1994 there has been a dedicated policy focus on equalising the levels of service between formerly advantaged and disadvantaged population groups. From this paradigm it is understandable how electricity has come to dominate the attention of access to energy in South Africa. Despite provision in higher level policy documents for a wider and more integrated policy approach perspective to household energy, to date most strategies and programmes for implementation have focussed predominantly on access to electricity. The enactment and efficacy of other programmes, such as kerosene price regulation and the implementation of FBAE are very poor and have not achieved meaningful results. Implementation of stated policies is a big challenge in a developing country like South Africa, which experiences significant skills and resource constraints.

South Africa is not alone in over-emphasising electrification in their approach to energy access, Lambe and Atteridge (2012) note similar observations in India, and Matinga (2011) discusses that many governments as well as other international organisations working in the realm of energy access fall prone to this approach. After almost 20 years of the electrification programme in South Africa it is evident that this policy is, on its own, unable to fully displace the use of other fuels, and therefore does not address health issues such as exposure to indoor air pollution (Matinga, 2010). Such a policy approach is based on a linear deterministic assumption that access to an electricity connection will be sufficient to transition households away from other fuels. This creates an overly simplistic view of the socio-cultural context in which energy is used in poor households. Choices around domestic energy use are far more complex and dependent on a much wider range of inter-related factors (Paulsen, 2010; Matinga, 2010). The current suite of energy policies and programmes for the domestic sector may be inadequate to address the social and economic objectives underlying energy access, such as maternal and child health, education, gender equality and providing opportunities for economic development.
4. Investigating demand and supply side barriers to modern cooking fuels in Imizamo Yethu

This section investigates the main demand and supply side barriers facing households in Imizamo Yethu in meeting their need for cooking services. It considers barriers related to electricity, LPG and kerosene and takes into consideration issues related to both the fuel and the appliance. It is necessary to consider both of these elements when investigating whether demand for an energy service can be met in a manner that is safe, affordable and convenient for a poor household. These barriers were explored through site visits to Imizamo Yethu which included interviews with the local community development worker and visits to households as well as a survey of spaza shop owners. It also involved consulting other key stakeholders involved in the supply of various energy sources including local government officials from the City of Cape Town, an LPG distributor focusing on supplying low-income settlements and a local NGO working in the arena of kerosene safety. The aim was to explore some of the key barriers in more detail and identify where potential areas of intervention might exist that could be followed up on either in this phase of research or that might require further work in the future.

The predominant fuels used for cooking in Imizamo Yethu are electricity and kerosene and to a lesser extent LPG. Wood is also used but this is used as a ‘last resort’ when they cannot afford alternatives, or for special occasions or barbequing (Tokwe, personal communication). The issues surrounding each of the different fuels and technologies and the stakeholders involved with each were quite varied and distinct, for this reason it was decided that it would be less productive to bring all stakeholders together in one strategy session and that it would be more beneficial to conduct stakeholder meetings individually, allowing issues to be discussed in greater detail and then facilitating interventions with stakeholders and the community where appropriate.

4.1 Survey of ‘spaza’ shops in Imizamo Yethu

A survey of traders in Imizamo Yethu was undertaken to get a better picture of the supply of different fuels. Typical of informal settlements in South Africa, Imizamo Yethu has a number of informal shops, known locally as ‘spaza’ shops selling a variety of goods. An emerging trend over the last several years has been for spaza shops to increasingly be owned by so-called ‘foreign nationals’ who are often Somali or Chinese. They have out-competed South African traders and come to dominate the local trader market. Their growing economic dominance has been accompanied by increased social tensions, with a number of documented cases of Somali shopkeepers being the victims of threats, intimidation and xenophobic violence by South Africans. In Imizamo Yethu more than 90% of the shops are Somali owned. Although there have not been outbreaks of violence in Imizamo Yethu against foreigners there is however an underlying resentment of the competition (HSRC, 2008). South Africans do in fact benefit from their presence by being able to buy goods more cheaply and income from renting out their premises to Somalis.

Table 3 shows the results of a survey undertaken for this study of formal and informal businesses located in Imizamo Yethu and the types of fuels available. It shows that the most widely available fuels are candles and kerosene, followed by electricity. Imizamo Yethu is located close to the CBD of Hout Bay and as such residents may also travel into Hout Bay CBD to make energy purchases. The nearest formal shop is Penzance, located at the petrol station outside of the settlement in a neighbouring suburb, where one can purchase pre-paid electricity and gas in 9kg cylinders.
Table 3: Supply of fuels by informal traders in Imizamo Yethu

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<th>No</th>
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4.2 Electricity

4.2.1 Supply side barriers to electricity use

Households in Imizamo Yethu gain access to electricity through a variety of means. Firstly there are formally connected households with their own electricity connection point, electrified through the INEP programme. In addition informal connections are used by those households without their own grid access point where extension cords are run between neighbours’ houses and electricity is purchased through individual household agreements. Electricity can also be illegally tapped from network supply distribution points. During UPEA II (Energy Research Centre, 2008) a survey of 100 low-income households in Imizamo Yethu was undertaken to investigate the state of access to electricity. Within Imizamo Yethu, the three communities of Dontseyake (unelectrified), Zola (meter-electrified) and Hadges (mixture of electrified and extension cords) were surveyed. It was found that 74% of the interviewed households had access to electricity through either formal or self-made connections. The results also showed that the number of years someone lived in the locality had a positive correlation with whether that person had metered electricity. This may suggest that the longer people have lived in a locality the better they are able to overcome some of the barriers associated with access to metered electricity. It may also suggest that newer households were not in existence or occupied at the time of the electrification process. Electrical appliance ownership was also positively correlated with electricity use, and metered electricity customers used more appliances than those with extension cords. (Energy Research Centre, 2008). It was established during conversations with households that many of those that buy electricity from neighbours cannot use it for cooking as the connection, designed for a single household’s energy use, cannot handle the load from more than one household cooking at a time.

The electrification of poor households in South Africa is integrated into the overall housing and service delivery process. Formalised municipal rollout plans for housing and service delivery are developed to plan and identify new projects, which are tabled in a municipality’s Integrated Development Plan (IDP). In the Western Cape Province there is an estimated backlog of 180,000 households (formal and informal) awaiting electrification (DoE, 2011a). Electrification connections in the 2010/11 year were 8,960 in the municipal programme and 2,496 in the Eskom programme in the Western Cape. In line with the electrification roll-out policy not all informal settlements are eligible for electrification, for example those located on private land or on municipal land that has not been proclaimed for housing such as conservation land, road reserves, pylons or banks of rivers and wetlands. The upper part of the settlement in Imizamo Yethu is on unproclaimed land and therefore not eligible for housing or services. Relocating such households is often very problematic and ends in violent clashes between the community and authorities such as the police, as happened in February 2012 in the nearby coloured settlement of Hout Bay called Hangberg.

The City of Cape Town’s Integrated Housing Plan includes provision for a housing project in Imizamo Yethu on the Forestry Site for 870 units (City of Cape Town, 2011b). Development of the Forestry Site is the best prospect for those awaiting service delivery in the settlement to get access to their own legal electricity connection. Upgrading of the settlement has been an extremely sensitive and politically charged topic however. Discussions have been on-going for over ten years and the proposed development site has been the subject of various court orders and interdicts (Roth, 2011; Fieuw, 2011). Central to the
disputes has been the Forest Station site. This land was originally established as a ‘buffer zone’ between the African and the white communities (Fieuw, 2011). The local community had been campaigning for release of this land for housing and development, however this has been stalled by internal community struggles and has been blocked by court interdicts lodged by the Hout Bay Rate Payers Association and Residence Association. A final plan for upgrading the settlement was reportedly agreed upon at the beginning of 2012 but how the development process will unfold remain to be seen. Consultations with representatives from the City of Cape Town agree that electrification follows a much formalised approach and there is little that an individual community can do to intervene or alter the roll-out plan

The policy approach to electrification does not target all households in a typical urban settlement such as Imizamo Yethu, for example those households on unproclaimed land, households not in existence when settlement was electrified and backyard dwellers. Backyard dwellers are informal structures erected in the backyards of formal households. The primary household will rent out areas of their backyards to families from which they can earn an income. This practise exacerbates problems of overcrowding and puts pressure on existing services. However the incidence of backyard dwellers will not go away in Imizamo Yethu or indeed in other settlements in South Africa. These households (backyard dwellers and houses on unproclaimed land) find their own ways to obtain access to electricity outside of formal policy through illegal and informal connections. However this practise impacts the overall quality of supply for the whole settlement. Conversations with the community development worker confirmed that electricity supply is very unreliable in Imizamo Yethu and households in the settlement experience frequent blackouts. This is an issue experienced by many low-income settlement dwellers in South Africa (Paulsen, 2010; DoE, 2012a) and is in large part due to increase in demand from these informal connections on the supply network beyond the original network load capacity design. This means that a household cannot make a full transition to electricity but must also use ‘backup fuels’, commonly kerosene and candles, to meet their energy needs when electricity is unavailable.

Figure 4: Shacks with formal electricity connections in Imizamo Yethu
The official approach from the Department of Energy acknowledges the issues and challenges that backyard dwellers represent, but consider that the practise of buying electricity from neighbours is the best way to address supplying these households (DoE, 2011b). This is because of the DoE’s stated policy approach that they will not ‘double-fund’ any electrification project – therefore if formal households in an area have been electrified they would have to return to electrify additional backyard dwellers there would be a repeat of the investment required (in terms of supply infrastructure for that area). This restriction absolves the DoE from having to supply these households and yet creates conditions for negatively impacting quality of supply for entire settlement by not upgrading network infrastructure to be able to handle additional demand from these households.

At a local government level, backyard dwellers were previously declared illegal and therefore not eligible for formal services. As such these households are often particularly vulnerable and susceptible to exploitation, for example the overpricing of services sold by neighbours such as electricity. In 2011 The City of Cape Town announced a revision to their policy stance regarding informal backyard dwellers (CoCT, personal communications) and announced the adoption of a Backyard Essential Services Improvement Programme. This programme seeks to provide backyard dwellers with toilets and running water as well as electricity. The plan has commenced with several pilot projects to address the practical and logistical issues associated with servicing backyard dwellers. However it is relevant to note that there is a significant backlog in the City area and any servicing plan could take many years to implement and/or to reach those backyard dwellers in Imizamo Yethu.

The availability and supply of electricity units for consumption does not appear to be a significant issue and it is widely available in the local area. Virtually all connected households in Imizamo Yethu rely on pre-paid electricity. Electricity units can be purchased from supermarkets and petrol stations but also through independent Flash agents. Flashcow is an innovative system developed by a local cell phone operator whereby electricity can be bought via cell phones. Local Flash vendors purchase a Flash machine and then can run a business selling electricity and airtime. Start-up costs for a phone, SIM card and voucher machine are approximately R1,500 (US$ 215). Flash vendors also have access to a trading loan from the cooperative to grow their business. These electricity agents in Imizamo Yethu are small businesses and the selling of electricity is usually just one aspect of their business operations. For example, one of these agents is the owner of an Internet Café who offers the Flash services in addition to his computer-based services. Another agent is selling the Flash services in addition to running a franchise business with a local cell phone company. Due to the independent nature of these agents, the price charged for electricity varies and most vendors add a small premium above what one would pay in supermarkets and other formal agents. As a result customers appear to use these agents mainly as a last resort. Residents can also purchase electricity using their cell-phone banking if they have a bank account with First National Bank (FNB) with which they are also guaranteed to receive their FBE subsidy.
Electricity is highly desired by households as a domestic energy source to meet all their energy services but for many reasons households do not use this fuel to meet all their energy needs but practise multiple fuel use. Lack of affordability is a frequently cited reason for poor households not consuming more electricity. Consultations with the community development worker and visits to different households revealed that there was agreement of electricity being the most expensive fuel to cook with. Kerosene is seen as being more affordable and is described as an income saving strategy. However research undertaken into the relative costs to cook with electricity, LPG and kerosene in South Africa find that electricity is the cheapest by a significant margin followed by kerosene and then LPG (Cowan, 2008; Lloyd, 2010) and that the price of electricity could increase quite substantially before the picture would change, assuming prices of the other fuels stayed the same. This suggests that rather than actual expense being a demand barrier, it is the perceived expense that acts as a barrier to consuming this fuel. Cowan (2008) discusses that misperceptions about the relative costs of using different fuels for an energy service is understandable given that these costs are typically difficult to isolate and measure. Costs are influenced by multiple factors including appliance efficiencies and varying fuel prices that change over time. Different fuels are also consumed in different units including kilograms, litres and kilowatt-hours, which make a comparative understanding difficult.

Electricity is however often significantly more expensive for those households that have informal connections, buying electricity from their neighbours. A survey of households in Imizamo Yethu undertaken for UPEA II (Energy Research Centre, 2008) found that the cost of electricity supplied through an extension cord connection could be up to 10 times that of a metered connection. Furthermore
these households also do not benefit from the FBE subsidy, further disadvantaging them. Addressing the issue of neighbours overcharging the electricity they sell is challenging. Firstly since it occurs outside of any formal regulation, it is difficult to impose any restrictions or changes to practises, secondly there is what is regarded as a culture of violence in South Africa (Burnett, 1998) with tendencies for violent responses to interventions around service delivery. Any intervention would probably be met with resistance from the electricity sellers for whom this is a lucrative source of income. Another way to address this issue going forward could be to instead promote the usage of alternative sources of energy for backyard dwellers, for example solar lighting or LPG for cooking. Education and awareness raising campaign among low-income households could therefore play an important role in addressing demand barriers relating to misperceptions about the relative expense of electricity. Overcoming such misperceptions is not without its challenges however as the belief that kerosene is the ‘poor man’s fuel’ and electricity an expensive fuel for rich people is deeply entrenched in the mindsets of many poor South Africans. Other demand barriers identified during discussions revealed that some households consider different energy sources better suited to cook different food types. Kerosene is for example seen as being a better option than electricity for cooking meals with long preparation times.

Consultations with CoCT electricity department confirm that affordability is addressed from a policy perspective by subsidising both connection costs and provision of the FBE consumption subsidy. The City of Cape Town reports that the money received from National Treasury for FBE is insufficient to provide all the eligible poor households in Cape Town with the subsidy. The municipality thus finances the shortfall by cross subsidising through rates payments from middle and upper income households (CoCT, personal communication). In response to the issue of increasing the FBE subsidy amount, CoCT discusses the challenge of limited local government’s resources competing with the delivery of other basic services as well, such as water and sanitation. The CoCT comments that the subsidy nevertheless does play a role in reducing the unit cost of electricity for households rather than providing the entire service they need. Essentially lack of affordability is a function of the pervasive poverty and unemployment in Imizamo Yethu and whilst these persist it is difficult to completely address issues of affordability.

4.3 Kerosene

4.3.1 Supply side barriers to kerosene

Kerosene is widely used among low-income households in South Africa and there are well established supply networks. It is sold through a variety of retailers including petrol stations, supermarkets, spaza shops and general dealers. In Imizamo Yethu the spaza shop survey showed that kerosene is available from a variety of vendors. Barriers to being able to use kerosene in a safe and healthy manner are discussed here as a supply side barrier. The health impacts associated with using kerosene in South Africa include the risk of burns and fires, respiratory ailments and other symptoms from indoor air pollution, as well as poisonings and chemical pneumonia (Paulsen, 2010).

Kerosene is typically supplied to local spaza shops in bulk 200 litre barrels. In such cases customers must provide their own containers in which to buy their kerosene. Figure 6 shows a spaza shop in Imizamo Yethu with a large blue barrel of kerosene in the doorway. These containers display no warning labels and there is no promotion of safety awareness or hazards associated with storing kerosene, for example of
contamination with petrol or diesel. Barrels are often left open leaving flammable substance exposed in enclosed shop areas, which reach extremely high temperatures on summer days and may have people smoking nearby. Fuel specification standards are very important. If kerosene is contaminated with dirt and water it can cause appliances to smoke and emit partially combusted and potentially carcinogenic compounds (Truran, 2004). However more dangerously, if containers used to store kerosene have been contaminated with petrol (even as little as 1% contamination), this may alter the flashpoint of kerosene (normally 43 degrees Celsius) to that of petrol (less than 0 degrees) greatly increasing the risk of fires as any spilt kerosene that is ignited could erupt into flames (Truran, 2004).

As stated households typically bring their own containers in which to buy kerosene, this will usually be some old or recycled container often a cool drink container such as a plastic 2 litre coca-cola bottle. Accidental ingestion of kerosene by small children is a serious issue in South Africa. Data on ingestions recorded over a 2 year period shows that the majority of these ingestions are among children under the age of 2 years old (Truran et al, 2008). The major health risk associated with swallowing kerosene is if it is inhaled into the lungs, which can then cause chemical pneumonia which can be fatal (Truran, 2004). This can easily happen due to kerosene’s low viscosity or if the child vomits after swallowing it (ibid, 2004).

Pasasa discusses that there is generally insufficient regulation throughout the supply chain to ensure that kerosene is supplied to consumers in a safe manner. Although standards for labelling of bottles do exist, these are currently voluntary and there is little compliance from the private sector. The national voluntary standards regarding packaging of kerosene include requirements that appropriate container impervious to kerosene should be used, that has a child resistant closure (safety cap) and a label with specific safety messaging and clearly indicating that it is kerosene inside (Truran, personal communication). Introducing safe packaging would however increase the end price of kerosene to consumers, which would be unpopular and may dampen demand for the product. It is therefore unlikely that the private sector would introduce safe packaging for this product without some mandatory requirements from government (Truran, personal communication).

**Figure 6: Spaza shop with bulk barrel of kerosene for decanting**
Figure 7: Kerosene decanting substation

The second issue affecting the safe supply and use of this energy source is appliances. The use of illegal and unsafe kerosene stoves is a major challenge in South Africa and they are responsible for many burn accidents and fires in townships every year (Paulsen, 2010). The risk of fire in townships in South Africa is exacerbated by factors such as the density of settlements, the flammable materials used to construct most shacks and the strong Cape Town winds (PASASA, 2010). Imizamo Yethu has during its history been the unfortunate victim of many fires. Since 2002 there have been 14 reported fires, which have varied in their impact from destroying just a few houses to many hundreds, including one in 2004 that destroyed 1,200 houses (Roth, 2011). Not all of these are necessarily kerosene related; however unsafe stoves carry a high associated risk. Research undertaken among residents of Imizamo Yethu into the causes of the fires indicated that residents perceive illegal electricity connections, unattended flames (for cooking and heating) and drunkenness as the main triggers (DiMP, 2002).

Unsafe stoves are unfortunately widely available. Informal conversations with residents in Imizamo Yethu and the site visits in resident's homes revealed many illegal stoves were in use. Furthermore the spaza shop survey indicated that several of the local spaza shops that sold kerosene appliances had the illegal stoves for sale. The unsafe stoves are often based on a so-called ‘Panda’ wick based stove design. Although illegal, the Paraffin Safety Association (PASASA) reports that they are smuggled into the country. These appliances are poorly constructed and have certain design flaws, for example the kerosene in the reservoir gets heated above the flashpoint of kerosene (43 degrees Celsius) (Truran, 2004). Consequently the risk of explosion is very high and stoves that are accidentally bumped or knocked over frequently erupt into flames (Cowan, 2008). Standards for safe stoves do exist: a wick or non-pressure appliance should comply with the SANS 1906:2006 safety standard and a pressure appliance should comply with the SANS 1243:2007 standard (PASASA, 2011). Market penetration of these safer variants of non-pressure stoves however appears to be low. Furthermore the quality and usability of these
compliant safe stoves has been criticised (Cowan, 2008) which could partly explain their low market penetration to date.

These stoves are also associated with indoor air pollution. A study undertaken an informal settlement near Durban in 2003 exploring the indoor air pollutants associated with kerosene usage by low-income households (Muller et al, 2003) concluded that households were exposed to significant health risks associated with kerosene usage from the investigated pollutants of nitrogen dioxide and benzene. The study noted that behaviour can greatly increase exposure and thereby risks. For example in South African households exposure levels are typically quite high due to factors such as many occupants of a household sleeping in the same room as the cooking is done. The study also noted that poor residents of informal settlements are also more likely to have poor nutrition and depressed immune systems which would make them more vulnerable to environmental pollutants.

Key initiatives to improve supply barriers related to safe usage of kerosene lie with improving the regulatory sphere. There is a need for both new regulation around safe packaging and distribution but also more effective monitoring and enforcing of existing regulations, for example around appliances. Pasasa are engaged in ongoing lobbying activities with government and the supply chain. Pasasa however discussed the challenges they encounter and general reticence from the key stakeholders such as the Department of Energy and private sector players in the supply chain. (Paulsen, 2010) notes that stakeholders appear unwilling to take ownership of this social issue.

Another option to try and engage the supply chain in the responsibility for safety is to use South Africa’s Consumer Protection Act 68 of 2008 (Department of Trade and Industry, 2008) places responsibility for safety of the consumer on the entire supply chain. This implies that if a child fell ill or died from ingesting kerosene, the supplier could be culpable under the Consumer Protection Act. However this Act has not yet been tested in this manner, and would require a test case being taken forward. Furthermore consumers themselves are not aware of their rights under this Act nor do they necessarily have the resources to take such a case forward themselves and it would probably require the active participation of another party, such as an NGO like Pasasa to do take this forward.

4.3.2 Demand side barriers to kerosene

In the South African context, kerosene is an important cooking fuel for many low-income households. Despite kerosene’s prevalence in the residential sector consumption does appear to be declining at a national level, as recorded in nationally collected sales and consumption data. Data from the South African Petroleum Industry Association (SAPIA) on kerosene sales volumes show a steady decline in total sales of kerosene of almost 50% from 1999 to 2009 (SAPIA, 2011). The Department of Energy’s energy balance statistics also show a decline in kerosene being consumed by the residential sector from 1999 to 2009 of almost 40% (DoE, 2009). It is estimated that in 2011 7,5% of households used kerosene as their primary cooking fuel – a decline from an estimated 16,1% in 2002 (Statistics South Africa, 2011). The decline in kerosene consumption is likely driven by a number of factors including rising incomes, increased access to electricity and the rising costs of kerosene (PASASA, 2010). It is likely, although difficult to definitively say from the available data, that although the amount of kerosene being used per household is reducing (as the use for more electricity for example), there is a smaller reduction in the absolute number of households using it. That is to say, that kerosene is still widely used by many
households, although in reduced quantities. The problem with this picture from a policy perspective is that despite observed declines in consumption of kerosene, which can be attributed to electrification, electrification has had less impact in reducing the number of households exposed to the risks of this fuel.

In Imizamo Yethu kerosene is widely used. Demand is driven by factors such as its perceived relative affordability, as a backup fuel when there is no electricity and as the preferred fuel for cooking certain meal types. It is also easily and widely available and can be bought in relatively small amounts which suit small and irregular incomes. There are however also demand barriers which prevent its safe usage. There is a general lack of awareness amongst households about safe appliances. Visits and conversations with households during site visits with the community development worker indicated that unsafe stoves were common and many people are unaware that these are in fact illegal and that safer variants exist. Pasasa comment that consumers lack knowledge about what safety features or labels to look for when purchasing appliances, for example an approval number by the National Consumer for Compulsory Specifications (NRCS). This lack of awareness dampens demand for safe appliances. The community development worker discussed that there had been programmes around energy and kerosene safety in the past by PASASA; however the on-going usage of unsafe appliances suggests that repeated efforts by Pasasa are required. Pasasa agreed that safety awareness is an on-going undertaking and were receptive to doing more initiatives in Imizamo Yethu.
4.4 Liquid Petroleum Gas

4.4.1 Supply side barriers to LPG

LPG can be considered equivalent to electricity in terms of the service it offers, a quick source of heat with no indoor air pollution. Considering the health implications of kerosene usage in South Africa this is an important alternative to consider. This section explores some of the barriers associated with increasing the uptake of this fuel in the low-income market. Although its use in the residential sector and low-income households is fairly widespread in many other developing countries, its consumption in South Africa remains comparatively fairly low. Kojima (2011) shows that out of a sample of 20 developing countries, South Africa had the third lowest per capita consumption. National statistics indicate that LPG is in general not a widely used fuel among poor South African households. According to a household survey undertaken by Statistics South Africa only 2% of households report using gas as their primary cooking fuel and usage is greater in higher income brackets than lower ones (Statistics South Africa, 2011).

From a national energy security perspective it may arguably be more beneficial to promote LPG over electricity as a cooking fuel considering South Africa’s constrained electricity generation capacity. Household cooking places additional stress on the daily load just when it is most stretched and the marginal cost of supply is highest (Howells et al, 2006). Tatham from Kayagas discussed however that there are significant barriers to increasing the uptake of this fuel in the residential sector. These include issues around pricing policy as well as insufficient storage capacity, import and transport infrastructure. The country has experienced supply shortages over the last several years. The government has however given indication that it intends to promote and support the growth and development of the LPG industry in South Africa and is developing an LPG strategy to address the current issues the sector is facing (DoE, 2012c). Of particular relevance for this study is that the Department of Energy have expressed support to grow this fuel in the residential sector as a cooking and space heating fuel. The Minister of Energy announced in 2011 intentions to convert 1.5 million households to LPG by 2016 (Peters, 2011), and there has been discussion around the potential for subsidies on appliances and cylinders to address affordability constraints (DoE, 2012c). Any government programme to stimulate the uptake of consumption of LPG by households would however be contingent on measures to address the current supply constraints facing the industry.

There have been initiatives in the past to promote the use of LPG among low-income households. In 2006 the electricity utility, Eskom launched a programme to incentivise households to switch from electricity to LPG for cooking. This programme was developed in response to the electricity supply shortages that the country was experiencing at that time. One hundred thousand low-income households were targeted through a stove-switching programme whereby households could bring in their (working) electric stoves and would receive a 2-plate gas stove, a 5kg gas cylinder and 4 refill coupons. The programme overall was successful in the short-term in terms of transitioning households to using this fuel, a survey of the stove-switching programme a year after its roll-out found that 89% of the households surveyed reported still using LPG (Mohlakoana and Annecke, 2009). Longer term sustained outcomes were compromised however by ensuing national shortages in the supply of LPG which discredited this fuel in the eyes of
many consumers. However, in the absence of any longer term evaluation studies it is unclear to what extent supply shortages impacted household decisions and caused them to revert back to using electricity.

Supply and distribution networks of LPG to low-income settlements are generally quite limited and the same is true for Imizamo Yethu. The survey of spaza shops illustrates that LPG is not stocked by any shops in the settlement. LPG can be bought at the petrol station at the bottom of the settlement in 9kg cylinders and at a supermarket in Hout Bay. Appliances are also not readily available in the local area and residents would have to travel by minibus taxi into Cape Town or Wynberg. There is only one supplier in Cape Town that this research identified that has a dedicated focus on supplying gas to the low-income market through spaza shops. They have distribution chains in several low-income settlements using spaza shops as well as independent gas retailers, however they are not established in Imizamo Yethu.

Kayagas discuss that there are many difficulties for distributors in operating in low-income settlements. This includes the requirement to deal with many small distributors and to operate in cash based transactions. Other difficulties include difficulty in engaging with non-English speaking spaza shop owners. They mentioned that this was one of the key constraints to why they had not yet expanded into Imizamo Yethu as they had had not been able to establish a relationship with Somali shop-owners in the settlement. They also discussed that the few spaza shops they had visited in Imizamo Yethu had had space constraints and were not suitable for storing gas cylinders. In addition the ones they had visited were informal structures made of corrugated iron, cardboard and other materials. Fire safety regulations require that a formal brick building is required for storing cylinders.

Complying with municipal fire safety regulations is a major barrier for Kayagas in Cape Town. In order to store and sell gas, fire safety regulations require that spaza shop owners need to get a flammable substances certificate (SANS 087), however the requirements for this certificate do not sufficiently address the particular considerations of informal township businesses and are in practise almost impossible to obtain for most spaza shops in townships. For example the requirements include getting permission of the landowner who is often unknown and the correct commercial zoning, neither of which is commonly done in informal settlements in South Africa. Kayagas is currently engaged in legal proceedings to try and accommodate the particular circumstances of informal spaza shops.

### 4.4.2 Demand side barriers to LPG use

LPG is a modern, clean burning cooking fuel that could have significant benefits for many low-income households who remain reliant on kerosene, which has significant health and safety issues. It is also a viable alternative for those households without their own electricity connection that may not be able to use electricity for cooking. However one of the biggest barriers to increasing the consumption of LPG are safety fears among poor households, particularly around the perceived risk of gas cylinders exploding. Interviews with community members undertaken during site visits revealed that there are deeply entrenched fears related to LPG. Tatham from Kayagas agreed that this was probably the biggest barrier dampening demand for their product. However he discussed that they had found relatively easy to address by incorporating education and awareness-raising activities into their product marketing. Kayagas runs promotional days in townships with cooking competitions and information to inform people about the merits and safety of gas.
Affordability may also be a barrier to increased uptake of this fuel both in terms of the relative cost of the fuel itself compared to kerosene and electricity (Cowan, 2008; Lloyd, 2011) as well as the upfront cash outlay required for purchasing the cylinder. Both kerosene and electricity may be purchased in amounts that can vary according to variable household incomes. LPG on the other hand requires an initial output at the beginning of the month to purchase an entire month’s (or more) supply in one go. Budgeting in this manner and making large outlays of money in one go may be difficult, especially for poorer households. In contrast kerosene can be bought a litre at a time for approximately R13 (US$ 2) whereas households must pay approximately R100 (US$ 14) at one time to pay for a month’s supply of LPG.

LPG has historically been a more expensive option either kerosene or electricity for cooking. The margin of difference between LPG and kerosene is however often fairly small (Cowan, 2008; Lloyd, 2011) and depends on relative price changes in the two fuels. As electricity prices in South Africa are set to rise quite significantly over the next several years, LPG may also become more competitive comparatively with electricity. Although this also depends on concomitant movements in LPG prices and world markets. Unlike electricity and kerosene, LPG does not receive any direct or indirect subsidies in South Africa. Since these fuels are all substitutes for thermal applications for low-income households, there may be negative consequences of policies that may inadvertently promote the use of kerosene, which has associated negative health and safety impacts, over LPG, which is a more desirable clean burning and safe modern fuel.
5. Overcoming barriers to energy access in Imizamo Yethu

This section presents the findings from the intervention undertaken to overcome barriers to energy access in Imizamo Yethu. The choice of action was based on the intervention that could be undertaken during the course of this study with the greatest potential to initiate change and have an impact on the lives of residents. It is recognised that the method employed to choose intervention, although developed with the stakeholders involved, was based on a limited number of interviews and not in a wider participatory process with the community themselves. It may not therefore necessarily reflect the priority areas of intervention that the community themselves might choose. It is highly likely that community members themselves would prioritise electricity access given the aspirations of many poor people to use this form of energy. The proposed intervention chosen, around improving LPG access, was however developed with the community development worker and garnered much interest and support from those community members that were involved in the proceedings.

Many of the most significant supply side barriers to energy access stem from the policy environment. For example there is considerable need and scope for lobbying activities to continue to draw attention to specific objectives such as the need to create the right markets for cooking fuels through pricing and subsidies, or specific issues such as drawing attention to backyard dwellers and quality of electricity supply for local residents. There is also an opportunity to generate discussion around the introduction of new policies to regulate particular important issues such as safety, or better monitoring and enforcement of existing policies. This study however aimed to direct efforts at initiatives on the ground that could have a more readily realisable impact in people’s lives.

The key opportunity to improve electricity access in the settlement is interlinked with the settlement upgrade plans (as described in section 4.1) This is however an on-going and very sensitive process that has required the involvement of independent mediators, such as the Institute for Justice and Reconciliation. It was not considered appropriate to intervene in this process as part of this research. Kerosene is an important issue, particularly around education and raising awareness about costs and safety. There is however a dedicated NGO, PASASA, who have on-going programme of work directed at the local community level. They were supportive of undertaking education programmes in Imizamo Yethu in the future and it was considered that efforts of this research process would not necessarily be additional to activities that Pasasa would undertake anyway. The best opportunity appeared to be in working with Kayagas and the community to establish an LPG distribution network in the settlement. This intervention is further described in the section below.

5.1 Addressing barriers to LPG access in Imizamo Yethu

There are a number of demand and supply side barriers which constrain greater uptake of LPG use in low-income households in Imizamo Yethu. On the demand side these include perceptions about it being a dangerous fuel to use and relatively expensive compared to kerosene, and a lack of supply networks established in the settlement. Kayagas have established LPG distribution activities to supply local spaza shops and entrepreneurs in many townships in Cape Town, supplying 5kg cylinders and a variety of LPG appliances. Imizamo Yethu is however one of the few settlements they have not yet managed to expand
into. This study sought to engage with Kayagas and the community about the opportunities to improve gas supply in the settlement.

Kayagas run a full-for-empty exchange model, collecting empties for refilling and delivering full containers to their network of spaza shop suppliers. Spaza shops use cell phone text messages to place their orders in the morning and deliveries are typically made in the afternoon. Kayagas focuses on selling a 5kg supply cylinder to the low-income market, the choice of this size was based on research that the company undertook which suggested that a typical low-income household’s monthly supply needs for cooking and water heating was between 4.5 – 5.5 (Tatham, personal communication). Five kilogram cylinders are sold wholesale to their stockists for R79 (US$ 11) and are sold retail for approximately R97 (US$ 14), depending on the stockist. Households pay R100 (US$ 14) deposit on their first cylinder. They also provide a range of gas appliances to stockists including a stove, heater, gas oven, hot water heater, space heater and a lamp. A two-plate gas stove is sold wholesale to stockists for R225 (US$ 32) and its retail price is in the region of R275 (US$ 40).

Kayagas indicated that they had not had success in the past when they had tried to find spaza shop owners to act as suppliers and stockists of LPG cylinders. As indicated in the previous section they had battled to communicate with Somali shop owners and those shops they had visited had not had suitable premises. It was decided that as part of this study the ERC could facilitate stakeholder meetings with Kayagas through the community development worker. A stakeholder meeting was arranged by the ERC to introduce Kayagas to the community through meeting with two community representatives— a development worker and a woman who runs an after school programme for children in Imizamo Yethu. During this meeting Kayagas discussed with the community representatives the issues around using gas and the benefits thereof in terms of safety and cost. The idea and feasibility of setting up a gas distribution system with spaza shop owners was discussed. The community representatives agreed about the benefits of gas in terms of safety over kerosene and were positive about the prospect. Kayagas then took the community representatives to visit various of their suppliers in other settlements around Cape Town to get a better understanding of their various business models (using containers vs. supplying existing shops), and the types of space and safety requirements (e.g. a ventilated area outdoors with sufficient space to store protective cages). The community representatives were able to discuss with other gas sellers issues relating to demand, the viability of the business opportunity and their experiences with using and selling gas. Figures 8, 9 and 10 shows supply set-ups in other settlements that were visited.
Figure 8: Typical container supplied by Kayagas and storage of cylinders inside

Figure 9: Example of size and area required for safety cage used to store gas outside
Following this site visit the community development worker agreed to go and discuss the prospect with local spaza shop-owners in Imizamo Yethu and arrange for representatives of spaza shop owners to meet with researchers and Kayagas to explore the matter further. There was much discussion as to the appropriate choice of who to engage with regarding new business opportunities for supplying gas. Despite most of the spaza shops now being run by Somali traders it was felt necessary to offer new business opportunities to both South African and Somali in order to make sure that the process was deemed to be fair by the community. It was felt that in this way there would be no chance of stoking any latent resentments in the community towards Somalis who are sometimes victimised and threatened for ‘stealing business’ away from South Africans.

A further meeting was held in Imizamo Yethu with one South African and one English speaking Somali representative of spaza shop owners and Kayagas again described issues around usage of gas, their business model and the safety requirements. They described that not all shops would comply with the safety and space requirements and this would be the primary determining factor in selecting suppliers. Kayagas are keen to supply as many local shops and entrepreneurs as are interested and it was agreed that the spaza representatives would discuss the issue with other shop owners. After the meeting, participants walked through the settlement visiting various spaza shops to screen their potential regarding sufficient outdoor space in ventilated areas to house safety cages. It was agreed that once several shops had been stocked, Kayagas would organise a promotional cooking demonstration day to advertise and promote usage and safety of gas to township dwellers.
During the stakeholder meetings relationships were established between Kayagas, the community development worker and spaza shop owners and all parties appeared keen to take the relationship further and establish distribution networks. For the residents of Imizamo Yethu this would mean that both LPG and appliances would now be readily and easily available in the township. Additionally Kayagas’ marketing efforts and promotional day will widen people’s understanding and awareness of the relative safety of LPG and the benefits in terms of cost. Kayagas’ distribution model is likely to also have positive multiplier effects in the settlement by offering new income generating opportunities for existing entrepreneurs as well as establishing new business opportunities for new entrepreneurs. Many of Kayagas’ stockists in other townships are gas suppliers only.

This intervention, when supply networks in the settlement are established, will increase both residents’ energy options through improved availability, as well as their awareness of different energy options, through Kayagas’s marketing activities. Many households had indicated that they used kerosene for example because they felt there was no viable cooking alternative, especially if they could not use electricity for cooking if they were buying electricity from a neighbour. Fears about the safety of LPG act as a strong deterrent to using this fuel and Kayagas indicate that their promotional and marketing activities, aimed at dispelling these fears, have been remarkable effective in other low-income settlements. It is acknowledged that LPG may not be a viable alternative for all households, especially poorer households who may not be able to afford to transition to this more expensive fuel.
6. Conclusion

This study has explored the barriers to energy access for the urban poor living in Imizamo Yethu in Cape Town. For each of the three fuels investigated, electricity, kerosene and LPG, key demand and supply barriers were identified in consultation with key stakeholders and supported by desktop research into the issues identified. This research was undertaken with the intention of exploring potential solutions and identifying ways in which the research process could support, contribute to, or initiate, such solutions together with stakeholders. Many barriers identified for the different fuels related to the policy and regulatory environment and were outside the scope of this research to effectively intervene in. It was found that many segments of the urban poor fall between the gaps of household energy access programmes and policies and do not benefit from such programmes. Such policy barriers require ongoing engagement and lobbying around such issues. Examples of such barriers include the inability of the electrification policy to reach all households, for example electrify backyard dwellers, and so these households have little potential to obtain their own electricity connection. At a local municipal level the policy approach is responding to this challenge with pilot service delivery projects being run in other settlements in Cape Town. It appears the best option for un-electrified households in Imizamo Yethu is through a low-cost housing delivery project on the Forest Station Site. Although this decade long process has finally received confirmation of its final plan, it is unknown how it may proceed and in what timescales. There are also policy barriers associated with kerosene as well which relate to inadequate regulation as well as inadequate enforcement of existing regulations, of the safety aspects of using this fuel. As a result many households are exposed to unacceptably high health and safety risks. Work needs to be done both in developing new mandatory standards as well as in enforcing existing standards and regulation in the supply chain. A real challenge is to involve stakeholders and engage with the supply chain and government to develop better regulation for distribution systems. PASASA are actively involved in on-going work in this regard.

The research also highlighted demand barriers related to a lack of information and misperceptions that dampen demand for certain fuels and prevent people from making optimal energy choices. There is for example a lack of awareness of the true costs associated with using different fuels which influences which fuels people choose to cook with. Despite electricity being the cheapest fuel to cook with, demand for this energy source is reduced as households perceive it to be too expensive. There are also misperceptions relating to safety of different fuels, for example many households are afraid of using LPG because they believe it to be dangerous. Kerosene is a commonly used fuel mainly due to its cost and convenience, and although people are aware of the safety hazards related to stoves and accidental ingestion, there seems to be low consumer awareness of alternatives available, for example safe appliances.

The outcomes of the stakeholder discussions revealed that a potential area of intervention lay in overcoming supply barriers to LPG. LPG has a strong potential to benefit households with a modern and clean energy source that could provide a safe alternative where households cannot use electricity for cooking. However both supply and demand barriers dampen use of this fuel and it is not widely used. The stakeholder dialogues revealed that supply at a local level could be enhanced and this research process initiated engagements between a local LPG distributor, Kayagas and with local community representatives and spaza shop owners. The outcomes of the engagements was positive and all
stakeholders felt this to be an important intervention for energy supply in the settlement and expressed enthusiasm in taking the process forward further.
7. References


PDC. No date. Review of the effectiveness of energy subsidies and related taxation policies in South Africa. Available at [http://www.pdc1.co.za/energy.html# Toc144022368](http://www.pdc1.co.za/energy.html# Toc144022368)


Annex A: Overview of stakeholder dialogues

The stakeholders interviewed as part of this research included the following individuals and organisations. An overview of the meetings and dialogues is presented below.

### Table 4: Stakeholders interviewed

<table>
<thead>
<tr>
<th>Name of organisation</th>
<th>Individuals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paraffin Safety Association of Southern Africa (PSASA)</td>
<td>Glenn Truran</td>
</tr>
<tr>
<td>Kayagas</td>
<td>George Tatham, Enzo D'Alessio, Themba Mkoko</td>
</tr>
<tr>
<td>City of Cape Town – Sustainable Livelihoods division</td>
<td>Jacque du Toit</td>
</tr>
<tr>
<td>City of Cape Town electricity department</td>
<td>Neil Ballantyne</td>
</tr>
<tr>
<td>Community development worker for Imizamo Yethu</td>
<td>Kenny Tokwe</td>
</tr>
</tbody>
</table>

### Pasasa

A meeting was undertaken with the Paraffin Safety Association of South Africa to discuss the challenges and opportunities around the supply of kerosene in South Africa and to discuss their activities in this regard. PASASA undertake ongoing work at both a local level in informing communities about safe usage of kerosene and at a higher level in producing evidence based research and lobbying around the development of appropriate standards and regulations for the safety of this fuel. PASASA provided key insight into the issues at a higher national level as well as providing supporting context for specific insights that had emerged at a local level in Imizamo Yethu. They explained that they do education work at a local level, often going door-to-door to engage with households about kerosene safety. They expressed interest and support for undertaking future education and awareness programmes in Imizamo Yethu.

### Kayagas

Several meetings were held with various Kayagas representatives. An initial meeting was held with George Tatham from Kayagas to discuss the barriers to increased LPG uptake both in South Africa in
general, and in Imizamo Yethu in particular. A key objective of this meeting was also to better understand Kayagas’s business model and their activities in supplying low-income settlements. Tatham discussed the opportunities and difficulties with working in low-income settlements and how they had developed their product and business model over time to address these. Imizamo Yethu was discussed in particular and Tatham expressed interest in continuing discussions about overcoming barriers in this settlement. He suggested that ERC next meet with his two supply reps, Enzo D’Alessio and Themba Mkoko, within whose area Imizamo Yethu fell. A Meeting with D’Alessio and Mkoko were held to explore their previous experience with Imizamo Yethu. They discussed that they had tried previously to expand into this settlement but with limited success. The barriers were discussed and they expressed their interest and support in engaging with the ERC further to overcome these. Various suggestions were discussed as to how this could be achieved.

A meeting was organised with Mkoko and Tokwe and another community member to introduce to Kayagas to the community representatives and explore the potential need and desirability of this intervention in Imizamo Yethu. Mkoko took the other members to visit Kayagas’ operations in other low-income settlements to explore the types of local businesses supplying LPG, talk to shop owners about the business model and identify the types of site requirements (e.g. space and storage requirements) that Kayagas need from their suppliers. An initial follow-up meeting was held between spaza shop owners and Kayagas which was followed by another site visit where Kayagas walked around the settlement talking to various spaza shop owners, to explore suitable shops that complied with the safety requirements for storing LPG.

**City of Cape Town representatives**

Two representatives from local government were interviewed as part of this study. Sustainable livelihoods division engaged in promoting development of sustainable livelihoods for the urban poor living in Cape Town. Part of this relates to living conditions and deals with housing and services. He discussed the policy change relating to backyard dwellers and how the City was attempting to address solutions to this previously unattended segment of the population. He discussed that energy access is seen primarily as electricity access, and whilst there are limited other initiatives, such as solar water heater and CFL rollouts, these are often not driven by the municipality themselves and do not form the core part of energy access policy initiatives. Whilst du Toit indicated that they could provide strategic support to other organisations working around energy access initiatives, their unit did not drive or run any programmes initiatives in this regard. He explained that at a local level energy access is dealt with by the electricity services department. They expressed willingness however to continue to engage and provide support in appropriate manner around improving energy access in Imizamo Yethu. A representative, Mr Ballantyne, from the electricity services department was interviewed to better understand the electrification process and discuss various supportive policy levels both at a national and local municipal level. Discussions included the process as well as how FBE and FBAE were implemented at a local level. All electrification service delivery projects are identified as part of the municipality’s Integrated Development Planning process. Ballantyne indicated that electricity roll-out and subsidy provision is a highly formalised process and there is little opportunity for a local community to intervene and lobby around specific provision.
Kenny Tokwe – community development worker

Multiple meetings with Tokwe were undertaken as the research process unfolded and he was a key stakeholder in developing solutions and bringing together necessary parties from the community to engage in dialogues with Kayagas. During initial meetings, site visits would be undertaken visiting households to engage informally about their energy use. Tokwe was instrumental in building up contextual knowledge and discussing particular developmental issues related to energy use in households. For example he provided the context for the settlement upgrading process and the delicacy of the process over the last several years.