



Alleviation of Poverty through the Provision of Local Energy Services APPLES

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**Project Deliverable No. 23:
Summary of WP 3 and WP 4**

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Abstract

The present report is deliverable no. 23 of the COOPENER project ‘Alleviation of Poverty through the Provision of local Energy Services(APPLES)’ and covers Work Package 8. The APPLES project commenced on 1 June 2005 and is implemented in South Africa by ECN, The Netherlands, University of Oxford, UK, Risoe National Laboratory, Denmark, Parallax South Africa and the Energy Research Centre of the University of Cape Town.

The main objectives of APPLES are to understand the energy needs and energy priorities within the target communities, to determine and demonstrate the best practices for energy service provision to meet the needs of these communities, and to strengthen the embryonic networks of existing energy centres in South Africa.

The present report presents a summary of work package 3 (energy needs assessment) and work package 4 (identification and demonstration of best energy practices) of the APPLES project.

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PART ONE

1. Introduction to WP 3

Due to the fact that project activities for the work package 3 of the APPLES project (consultation with all stakeholders to establish energy-related needs and priorities in a range of poor communities) have been conducted on two quite separate tracks by two project teams – a rural one and an urban/peri-urban one, it is useful to provide a summary of both tracks of activities, compare their approaches to the needs assessment process and most importantly, compare the results and interpret the differences.

The scope of the project has also been quite distinct in the two areas. The main aim of the rural track has been to establish a co-op run energy centre that would improve access and affordability to both conventional (paraffin, LP gas, etc) and innovative (solar home systems, ultra efficient biomass stoves, etc) commercial energy fuels and appliances for poor rural communities. This is closely aligned with the South African government's strategy of establishing many "Integrated Energy Centres" (IeC's) across the country. The main aim of the needs assessment process in the rural locations was thus to gain an understanding on what kind of products and services the energy centre should provide to maximize its benefit to the local communities.

On the other hand, in urban / peri-urban areas, at least those represented by the two areas in Western Cape selected for this project, local access to commercial fuels is generally less of a problem than in remote rural areas. The most striking energy-related problems affecting poverty in urban / peri-urban settlements, rather include extreme dangers of ravaging township fires, the disparity in welfare, energy expenditures and quality of life between informal township shack areas which do not have access to grid electricity, and those (the majority) which do and finally a very high local air pollution in some areas, which is partly associated with energy use practices. These examples, and several others, require attention to a combination of local community issues as well as local/national government planning, policy and regulatory issues. The aim of the urban wing of the APPLES project was to make a contribution at these combined levels and therefore the needs assessment process has been conducted in a different manner as well, to allow for a wider perspective required by higher levels of planning.

In both cases, the process of selecting the locations for the needs assessment and the implementation of subsequent activities was subject to multiple considerations. For the rural areas, co-ordination with the national programme of Integrated Energy Centres (IeCs), managed by the Department of Minerals and Energy, was a particular priority. For both areas, the foundations laid by previous activities in specific areas, and the benefits of linking with ongoing initiatives related to APPLES objectives were also considered. Previously established relationships with local stakeholders proved to be especially useful given the time constraints of the project.

The main locations selected were:

- for the rural part: Highflats (next to the town of Ixopo) in KwaZulu Natal and Lucingweni in Eastern Cape and

- for the urban part Kayelitscha and Imizamu Yethu in the Greater Cape Town area in the Western Cape.

As already mentioned, there were significant differences in the scope of APPLES activities in the rural and urban/peri-urban areas, which required a very different approach to the needs assessment process as well. A further up-front difference was the amount of information on the local energy situation available, which to a large extent dictates the amount of community involvement necessary for the information collection effort.

Information on the energy situation in the rural areas is very limited, often based on outdated studies and anecdotal evidence. On the other hand, the situation in the selected urban areas has been well-documented by several recent location-specific surveys and complemented with interviews and has allowed for a desk-top analysis of the energy situation and its implication on the still unfulfilled energy needs of the people. Therefore, one of the main differences in the approach to the needs assessment in both locations was the need for involvement of local stakeholders in providing basic insights into the energy circumstances and needs of the local communities (in the rural areas) versus the readily available information on the same issues in the urban areas, that entail less need of community involvement. Both approaches and their results are described in more detail in the following sections.

This summary aims at providing an overview of the two tracks of WP3 activities within APPLES that are presented in more detail in deliverables 9 and 9b. The structure is as follows: In section two, the main characteristics of the needs assessment process and its results for the rural areas will be provided. Section three covers the same for the urban locations. The final section 4 will provide a short discussion on the main differences of the two tracks of this project activity.

2. The needs assessment process in the rural areas

The needs assessment process in the rural areas sought to answer the following questions:

- What energy-related requirements of the community can be provided by the Energy Centres?
- What activities should the Energy Centres be conducting to help address the needs of the local community?
- What services should the local energy businesses offer, to be associated with (and perhaps accommodated by) the Energy Centre?
- What are the highest priority energy capacity development needs of the community?

To answer these questions, two levels of intervention with the community were planned in advance: community meetings to present the APPLES project and the APPLES team, and workshops with community representatives and other stakeholders, including local government, to determine the needs and priorities. A framework for a participatory needs assessment process was therefore agreed in advance.

The participatory needs assessment was about asking people within the community *what they want* in terms of energy services. The APPLES team planned to start the workshops by asking people to describe their past development project experiences, *what* they would most like to change, *how* they will contribute to make this change come about and *why* they would like these developmental changes. Above all the APPLES team wanted to ascertain to which extent energy can contribute towards these positive changes.

The needs assessment process had the additional purpose of encouraging real buy-in to the development of any APPLES intervention, and hence aim to achieve local ownership of project results, which will provide a basis for longer-term sustainability.

2.1 Method

The needs assessment process was conducted in the same fashion in both rural communities. Both times, the planned community interventions were prepared in accordance to the guidelines of the following methods:

People-Centred Development (PCD)

This participatory needs-based approach is informed by the view that development is not simply about “products” but that people are essential to the development process. It acknowledges that development interventions need to be driven by the needs of the people that the project intends to serve.

The PCD principle of fundamental relevance to the APPLES needs assessment is that of *interactive participation*. Effective interactive participation means that women and men are involved in the decisions that affect their livelihoods. The PCD approach also emphasized that communities have their own knowledge systems and resources that are used to sustain and develop their livelihoods in their own way.

The needs assessment was to be conducted interactively with a “facilitator” that attempts to provide “spaces” for people to talk and also “discover” for themselves what these needs are – essentially, to build and strengthen their existing capacities in a facilitatory manner.

Appreciative Inquiry (AI)

One of the main methods used in this APPLES participatory needs assessment was Appreciative Inquiry. It is an interviewing technique that has been used effectively to consult with communities and learn from their experiences, to involve them in change and development interventions and to build a shared vision for the future that everyone helps put into practice.

Needs Assessment Techniques

Some **in-depth interviews** with key stakeholders were planned as part of the needs assessment, and these were complemented by **community interactions, which consisted of meetings** and **focused workshops** with community representatives and related

stakeholders. Next, the needs assessment techniques employed in the rural track of APPLES are discussed one-by-one.

- ***The interviews***

Before the actual workshops with local people were conducted, a series of individual interviews with several community leaders (formal and informal) were conducted. The interviews served different purposes depending on the societal role of the interviewee. Some aimed to developing an understanding of community organization and lobbying for community support of APPLES project. Others investigated household energy sources and energy appliances used and the potential for supporting micro-enterprises. Investigating possible impact of new energy centre on existing local business was the purpose of another one.

- ***The community interactions***

The approach taken for community meetings and workshops was framed by the “Transformational Attitude Interview” (TAI) concept, which is based upon the three areas of discovery, discrepancy and destiny. This investigated the workshop participants’ current experience and ideal situation with regard to energy-related activity, the difference between these extremes, and how this gap could be addressed.

The questions used during the workshops covered issues relating to energy (for example energy uses in households, small enterprises and for community purposes) and development projects. The interactive approach was an essential element of the needs assessment. However, it was important to take account of the limited resources available (time and budget), the context of this needs assessment (some information was already available about the selected locations) and the need for clear feedback that will provide a basis for the energy centre (some context was necessary but not divergence from this project focus).

The process of community interaction was divided into two sections, the first day being devoted to a community meeting at each relevant location where a description was given by the APPLES team of the energy centre’s purpose and the method of operation was described. This was followed the day after by a workshop of selected participants who would liase with the communities they represent and provide input as to the communities needs and capabilities.

- ***Community meeting***

The main aim of the community meetings was to familiarize the local stakeholders with the APPLES project and the team. The APPLES team explained the reasons for setting up an energy centre and what the expected outcome would be. It was emphasized both times that this process was at a very preliminary stage and that nothing could be confirmed regarding the future of the process.

- ***Needs Assessment Workshop***

The workshops were conducted the day after the community meeting. Significant time was spent explaining the objectives of the APPLES project. Since the

funding of the project had still not been confirmed at that point, it was decided to explain the project as having a phased funding approach with the needs assessment being the first phase for which funding had been secured. However, the APPLES team emphasized the potential value to the community and the local municipality of the energy needs assessment report even in the absence of further funding.

The four main goals of the workshop were:

- Defining priority energy needs
- Defining the energy centre services
- Defining business opportunities: existing and new
- Defining the capacity building requirements

However, before addressing these key issues, it was important to spend time defining the concept of energy to the participants. This step, which is often overlooked in such external interventions, was an essential part of the process since drawing meaningful input from the workshop participants was dependent upon them understanding the issues and options available before making any proposals for the focus of the APPLES project.

Hence, different energy sources relevant to the area were considered (defining renewable and non-renewable), looking at current uses and then suggesting alternative options and defining potential opportunities. Due to the perception of renewable sources of energy as being ‘inferior’ to grid electricity, some time was spent explaining e.g. that electricity from solar panels could be used in the same way as grid electricity but that it depends on the size of the system. Of course a major issue is the cost. Another important issue explained was the reason for the fluctuating price of paraffin and gas since people often commented on the rising cost of paraffin and gas at the local spaza and are distrustful of the prices charged.

Energy use was also considered in some detail (explained in conjunction with the above energy sources and energy related appliances). This included:

- energy for cooking and heating
- energy for lighting
- energy for transportation
- energy for ICTs

2.2 Outcomes

To determine the community energy needs, workshop participants were helped to imagine their “energy dreams” as current reality. Each individual shared their ideas with the partners in the group and then in the plenary session. Through dialogue, individual vision became a shared vision.

The most common energy requirement idealised by participants was electricity and a number of its applications as improvement to current situations were identified and based

on those, their preferred use of electricity was categorised into domestic activities, community services and small business interests.

A second step to determining energy priorities was for the individual workshop participants to consider their current energy-related activities. By comparing their current reality with their energy dream, participants were able to determine their energy needs. This process included thinking about “where you get the energy from, how you get it, what you use it for, who uses it”. By defining their energy *use*, the participants were able make a direct link to their energy *needs*. In their groups they wrote down their energy dream and then also their current reality. Next, we summarize the result of the needs assessment process in both rural locations.

2.2.1 Needs assessment outcome for Highflats

The energy needs listed in Higflats (Ixopo) and how they are currently met is described in the following table:

Table 1: Activities requiring energy and the related current use in Highflats

Domestic activities	Current use
• Cooking	Wood, paraffin, gas
• Boiling water	Paraffin, wood
• Water Collection	Walks to river with bucket
• Radio/TV	Batteries, SHS
• Ironing	Coal, wood
• Vacuuming	Broom
Community services	Current use
• Computers – writing minutes of community meetings	By hand
• Schools – feeding scheme (cooking), computers, overhead projector, copies, faxes	Wood, gas (cooking), teacher writes on black board for learners to copy notes
• Skills development centres	Too far and expensive to travel
• Baking – bread, catering	Wood (in iron pot)
• Transportation	Taxi/bus prices too high and infrequent
• ICT services listed– faxing, emailing, printing, internet access, typing, photocopying	Only available in town
• Community meetings – microphones, posters	Posters are written up, loudhailers
Small businesses	Current use
• Welding – gates, burglar bars, car exhausts	Blow lamp
• Carpentry	Hand held saw

• Spaza shops – lighting and refrigeration	Paraffin, gas
• Hair salon – tongs, hair clippers, hairdryers	Scissors for cutting, towels for drying, curlers (more time consuming)
• Sewing	Hand driven sewing machine
• Motor mechanics – welding, spray painting	Blow lamp, hand pump (affects quality)
• Cutting grass (along the roads)	Hand shears

These needs were ranked by the workshop participants in order to determine the priority energy needs around Highflats. The ranking evolved into five levels of priority, with all the levels having more than one need listed.

Table 2: Energy needs per priority level in Highflats

	Priority Energy Need	Priority Energy Need	Priority Energy Need
LEVEL 1	Clean water on tap – the river is too far and the water is often dirty ¹	Cooking – Paraffin, LPG and wood (wood is the cheapest option, electricity too costly)	
LEVEL 2	Local skills development centre with electricity for computer, welding, carpentry	Computer access	Electricity for a stove to cook and bake
LEVEL 3	Boiling water at home – paraffin	Spaza shops – gas for refrigeration, candles for lighting to stay open longer	
LEVEL 4	Radio and TV – batteries	Transportation	Solar system –for ICT services (as listed above)
LEVEL 5	Local school feeding scheme – wood, gas	Boiling water at school - paraffin	

Having established their priority energy needs, the workshop participants were then asked to imagine the energy centre as a change that can take them a step towards the group energy dream by satisfying the needs identified. They were asked to consider what services the energy centre will need to offer to help fulfil their energy dream. These ideas were shared in groups to bring some overall priorities. In Highflats, the products/services required from an energy centre were listed as:

- Energy efficient lights for 220V
- Battery sales (including car batteries)
- Gel fuel stoves and gel
- Paraffin in safety bottles

¹ The possibility of providing water through energy-powered pumps was seen as an energy need rather than simply a water-need.

- Coal
- Computer centre
- Solar cookers
- Energy appliances
- Paraffin and gas heaters
- Skills development, training
- Battery charging (cell and car)
- Cell phone air time
- Candles
- Solar power sales and installation
- LPG
- Tokens for pre paid electricity
- Public telephone facilities
- Sale of wood and charcoal
- Sale of gas
- Communal TV/ radio facilities
- Wood stoves

To consider local business opportunities from greater access to energy, the participants were asked to consider their energy dream and their ideal energy centre, and then to imagine what energy-related local businesses may be explored. The group discussed how energy may improve existing businesses, how new businesses can be created with different energy sources, and especially how the services offered by the businesses can improve the lives of people in their area. The following new energy-related companies could be supported by the energy centre:

- Ice-making
- Petrol sale (idea from Jolivet wards despite a petrol station in Jolivet)
- Public phone facilities (phones, airtime and pre-paid cards)
- Solar systems
- Paraffin sales
- Cell phone airtime
- The sale of petrol
- Solar water pumps (to pump water from the river to a vegetable garden)
- Sale of vegetables
- Local hairdresser
- Gas shop to buy and refill gas, including delivery
- Pre-paid electricity tokens.
- Cell phones and car battery charging facility
- Sale of pre-paid electricity cards
- Supermarket (rather than spaza shops that overcharge)
- Sale of energy efficient lights
- Internet centre
- Skills centre: brick laying, bookkeeping, computer literacy, computer technician, sewing

The energy centre could help to develop a range of existing businesses including:

- the Hair salon – services improved with electric tongs, hair clippers, hairdryers
- Spaza shops - could have gas fridges (to sell meat, cold drinks) and solar lighting (to remain open later)
- Bricklayers
- Welders
- Bookkeeping – electronic record keeping with computers

Capacity building requirements were identified by asking participants to imagine the skills that they and their community required to make their energy dream become a reality. This time, participants were asked to consider all the components of their energy dream (energy priorities addressed, energy centre providing relevant services and energy-related local businesses operating successfully). Then they were asked to consider what capacity or related skills exist in the community that APPLES could build upon. And then to consider the skills that are required. In the group feedback session in Highflats, these were listed as:

Table 3: Existing and required skills in Highflats

Existing skills	Skills/services gap identified
Bookkeeping	Energy literacy
Community health worker	Transport services
Driver	Business negotiation skills
Meeting organizer and minute taker	Computer literacy
Solar installation	Micro-financing
Electrical repairs	Education/training facilities
Teachers	ICT services
Hairdresser	

At the conclusion of the workshop, the APPLES team explained how the information collected will be used. The phased funding approach was again emphasized and the team stressed that APPLES did not want to raise expectations regarding the energy centre. All participants were thanked for their involvement and hard work in representing their community in the workshop.

The workshop had the additional value of exposing a number of issues with strategic importance for the APPLES project, which were duly considered in the following project activities.

2.2.2 Needs assessment outcome for Lucingweni

In Lucingweni, these were the listed energy needs:

Table 4: Activities requiring energy and the related current use in Lucingweni

Domestic activities	Currently uses
• Cooking	Wood, paraffin, gas
• Boiling water	Paraffin, wood, gas
• Water Collection	Fetches water from the river needs water pumping project
• Radio/TV	Batteries, mini-grid system
• Ironing	Coal, wood
• Cell phone charging	Mini-grid, solar panels
• Charging car batteries	Mini-grid, solar panels
• Lighting	Paraffin, candles
Community services	Currently uses
• Schools – feeding scheme (baking/cooking)	Wood, gas, solar for TV
• Petrol station	Taxis often get stuck without petrol
Small businesses	Currently uses
• Catering	Wood, paraffin, gas
• Plumbing	Generators, gas
• Spaza shops – lighting and refrigeration	Paraffin, gas
• Sewing	Hand driven sewing machine
• Mechanic	Gas

When asked to set priorities on their needs, it became obvious that a lot more energy information needs to be provided; the lack of knowledge clearly influenced much of the two hours that it took to set the priorities. The eventual list of the energy priorities was:

Table 5: Energy needs per priority level in Lucingweni

	Priority Energy Need	Priority Energy Need
LEVEL 1	Cooking – wood, paraffin and gas	Electricity for lighting and water pumping
LEVEL 2	Water project – water from the river is often dirty, some areas there is no easy access	
LEVEL 3	Building clinic – clinics are too far and there is no transport at night (people have died)	
LEVEL 4	Fixing roads project – very little development projects because of access	
LEVEL 5	Electricity for ICTs – computers, faxing, typing	

This completed the first major goal for the workshop. The other goals (identifying the services required of the energy centre, deciding on small business opportunities and determining the capacity building needs) were all addressed in sequence in a similar fashion to the procedure in Highflats.

In Lucingweni, the products required from an energy centre were listed as:

- Paraffin
- Petrol
- LPG
- Solar panels
- Diesel
- Batteries
- Oil for cars
- Globes (lighting)
- Cellphones and cellphone airtime
- Brake fluid
- Two plate stoves
- Paraffin and gas heaters
- Low-energy lights
- Candles
- Matches
- Cooldrinks
- Gas fridges

Services that could be provided by an energy centre in Lucingweni, or by small local businesses associated to the centre, included:

- Public telephones
- Computers for faxing
- Catering (using gas, paraffin, wood)
- Baking (using gas, paraffin, wood)
- Extended spaza shop services including public phone, gas, fridge for cold meat, yogi, ice cream, beer and cool drinks
- Battery charging – Cells phone (currently costs R5) and car batteries
- Area for homework (providing lights using candles, paraffin)
- School feeding (using gas, paraffin, wood)
- Boiling water (using gas, paraffin, wood)
- Clean water for the sick - the clinic was too far away and no transport available (there is a great need for a clinic)
- Mechanic services (using oxi acetylene gas)
- Plumbing services (using diesel generators and gas)
- Lighting, TVs and street lights

The possible new businesses allowed by the presence of the energy centre and its services identified were:

- Computer centre

- Public phone facilities
- Computer and cell phone repairs
- Cell phones and Battery charging using solar panels
- Petrol station
- Sewing centre
- Cold storage facilities– selling fish, meat, cold drinks etc.
- Vegetable gardening project – water pumping
- Wood sales
- Gas sales
- Sales of paraffin heaters
- Local hair salon

Existing businesses that could be developed were:

- Spaza shops –tills, airtime, cell phone and battery charging, public telephones
- Wood and gas sales
- Expand domestic gardening – irrigation for vegetables
- Catering – gas, electricity, baking also for catering for schools
- Expand mechanic services
- Battery charging

The above may already be in operation but all could use the energy services discussed above. In some cases the reason for similar existing and new businesses being listed is because the community would like to see more of these.

And finally, the capacity building requirements were identified:

Table 6: Existing and required skills in Lucingweni

Existing skills	Skills/services gap identified
Plumbing	Hair salons
Carpentry	Baking
Painting	Computer maintenance
Bricklaying	Shoe maker
Computer skills	Solar system technician
Fencing skills	Life saver
Cooking	Police forum
Drivers	Security
Sewing	Electrician
Artist	Business plan writer
First aid	Driving skills
Fishing	Management skills.

Baking	
Catering	

2.3 Conclusions

The workshops held in Ixopo and Lucingweni provided very useful feedback which was considered for further APPLES activities. The two meetings with community representatives were very interactive and provided most of the information needed, not withstanding the lack of energy literacy.

Some of the products and services required by the energy centre from the community clearly exceeded the potential impact of the APPLES project (e.g. petrol station in Lucingweni), however, the majority of suggestions have been taken into account in subsequent steps of the project. Most importantly, when deciding which products to stock at the newly opened energy centre in Highflats, the outcome of the needs assessment was the main selection criteria. Unfortunately, the insights from the needs assessment process in Lucingweni were never used in a similar fashion, since due to budget and time constraints, APPLES had no further activities in that area.

The community interactions carried out during the needs assessment process had the additional value of giving important strategic insights into community developments that might affect further APPLES activities. In Lucingweni, internal disputes between the traditional and formal authorities hindered full community representation at the community meetings. Very low awareness levels on general energy issues ranging from pricing to usefulness of alternative energy sources also became apparent and the related need for a significant education effort. And finally, keen supporters for APPLES activities among local stakeholders were also identified.

3. The urban needs assessment

The initially selected localities for the urban / peri-urban APPLES activities are all within the greater Cape Town area. Within the Western Cape (greater Cape Town area) the selected localities were in Khayelitsha, the largest peri-urban township area in the Cape, and in Imizamo Yethu, which is a smaller community in the suburb of Hout Bay. Since Khayelitsha is so large, and quite diverse, two sub-areas were selected in Khayelitsha, namely Monwabisi Park and Kuyasa. Both of these are predominantly low-income settlement areas.

Partly because of the local effects of the present political climate, and also because of the short remaining time period for APPLES, the urban team was advised that it may not be practical to achieve much in the targeted areas of Khayelitsha in terms of on-the-ground engagement. Hence, it has been decided to focus most of the APPLES urban/peri-urban

activities in Imizamo Yethu, although an assessment of energy needs in Khayelitsha has been conducted nevertheless.

Following the different scope of the urban wing of APPLES compared to the rural one, the result of the urban needs assessment is not a list of energy needs identified by local stakeholders and the related expectations from an energy centre, but rather a set of recommendations for focused activities around a number of themes that are most relevant for the improvement of the energy situation of the population in urban / peri-urban areas.

Because of the good amount of information readily available on the energy situation in the selected urban areas, rather than summarizing the process that led to relevant information on local energy needs (as in the rural part), this section distils the most important information on the urban/peri-urban energy circumstances and possible improvements based on information sources consulted.

3.1 Imizamo Yethu

3.1.1 Area profile

Imizamo Yethu is an informal settlement located in the Cape Town suburb of Hout Bay. According to South Africa's latest analysed census data, from 2001, Imizamo Yethu is the home of around 9 900 people belonging to the African population group. Attesting to very high immigration into the area, the Hout Bay 2005 Migration Survey, assessed that over four-fifths of the population in Imizamo Yethu had not been born there.

The unemployment rate among residents is rather high at 32 percent. Among the employed, around 25 percent were domestic workers and in total 40 percent were employed by private households. Other occupational categories of distinct size include fishing-related occupations, construction and hotels or restaurants employees. Presumably the often small household sizes and low prevalence of non-working age individuals result in relatively small support burdens for income earners. Hence, despite the high unemployment rate, average household per-member incomes are found at R958 per month (with the corresponding median at R700).

In terms of electricity access, approximately 58% of the households had some form of connection to grid electricity supplies (which could be a regular metered supply, or an informal shared supply) while 42% did not. The majority of the *electricity-connected households* use mainly electricity for all three energy services considered here, cooking, space-heating and lighting. Among households *without an electricity connection*, there is very large dependence on paraffin for cooking, space-heating and lighting. Candles are also very widely used for lighting, but to a greater extent among electrified households (as an occasional lighting back-up, in event of power failures) while the households obliged to use non-electric fuels for all purposes tend to select the more economical practice of using paraffin lamps for their main lighting needs.

Compared with communities in remoter rural areas of the country, residents of Imizamo Yethu experience relatively good access to a range of common commercial energy sources. By far the commonest commercial household energy sources used in Imizamo Yethu are electricity, paraffin and candles. LPGas is used by only a small minority. Dry-cell batteries are quite widely used in Imizamo Yethu households – obviously a minor energy source in terms of kWh, but with important functions, and sometimes constituting an important cost-component in a household’s energy budget.

3.1.2 Approach

Information availability

The urban wing of APPLES had the advantage of having at their disposal considerable amount of data collected by previous studies in the area. The following surveys yielded results useful for the APPLES project and have been heavily relied upon for understanding the energy uses and needs of the local population:

- **Imizamo Yethu energy survey 2006**

The first energy-specific survey was carried out by ERC in June 2006. The main purpose of this survey was to establish a baseline picture of energy use in Imizamo Yethu. Three associated aims were (i) to monitor changes in energy choices among Imizamo Yethu households – by carrying out later follow-up surveys, (ii) to use this information as a contribution towards understanding fuel-switching trajectories and reasons, among lower-income households, (iii) to follow a specific intervention, which was the planned introduction of ethanol gel stoves, as a replacement for dangerous paraffin stoves, in Imizamo Yethu.

- **Imizamo Yethu survey 2007**

Another survey of 100 Imizamo Yethu households was carried out in 2007, focusing on the thematic issue of “energy access” among the poor in developing countries. There were combined agendas in this 2007 survey, including (i) to compare energy access conditions internationally among poor communities, (ii) to prepare for a South African roll-out of safer paraffin stoves. The context for the 2007 Imizamo Yethu survey therefore included the motives of the SA government (via its Central Energy Fund) to reduce the destruction and damages of township fires.

Together with the SALDRU² survey of 2005, these two surveys and community visits and interviews (described further on) allowed for a rather detailed and reliable assessment of the energy situation in Imizamo Yethu. Deliverable 9b includes descriptions on the following aspects of household energy use in IY:

- Access to commercial and non-commercial fuels and appliances
- Formal and informal electrification status of households
- Energy costs
- Energy consumption patterns (for electricity, paraffin, LG gas, candles, batteries, wood, etc)

² Southern Africa Labour and Development Research Unit

- Quantities of useful (end-use) energy consumed

Community interaction

During the “Needs Assessment” phase of this project, discussions were held with local leaders and community representatives in Imizamo Yethu. Leaders and activists consulted included representatives of the ANC Youth League, the local ANC councillor, some block leaders (Imizamo Yethu is divided into nine “blocks”), and women’s group leaders.

A community focus-group discussion was organised to obtain a range of opinions and information about current problems and priorities related to energy and other services in Imizamo Yethu. About twenty people contributed to this discussion, conducted mainly in isiXhosa³. In addition, some other survey activities conducted in the area during other projects included a number of more in-depth informal discussions with some of the survey participants.

Furthermore, a number of information-gathering interviews were arranged with service-providers, supply-side agencies and planners/consultants relevant to energy service provision in Imizamo Yethu and similar Cape Town areas. These included members of the following organisations/departments:

- In Cape Town Municipality, the Housing Department, members of the “Urban Renewal” section, the Electricity Department, and the Environmental Planning Department.
- The Western Cape representative for the Department of Minerals and Energy, who deals with funding allocations for electrification projects and works together with the City of Cape Town, municipalities within the province and Eskom in approving their electrification plans.
- Members of Cape-based consultancies/NGOs which have been highly involved in contributions to energy planning and specific energy projects in the area, including Sustainable Energy Africa, Palmer Development Group, SouthSouthNorth, Restio Energy and Agama Energy.
- The Paraffin Safety Association.
- Representatives of energy supply companies, including an oil company major (interested in Imizamo Yethu needs and opportunities), minor alternative energy supply companies (e.g. around ethanol gelfuels) and ongoing contacts with various staff in Eskom.

Specific interviews were generally treated as a “first phase”, gathering information but also serving to introduce the aims of APPLES and help open the way for further collaboration.

³ The first language of most Imizamo Yethu residents.

3.1.3 Electricity use profiles of IY households

Based on detailed descriptions of the above aspects of household energy use, a build-up of basic energy requirements for lower-income households was developed. The results are presented in table 1:

Table 7: Households using electricity: estimates of basic energy requirements (Imizamo Yethu)

Electricity consumption required (at different service levels) in kWh per month												
Service Level reference:	E1	E2	E3	E4	E5	E6	E7	E8	E9	E10	E11	E12
Cooking & heating, Level 1 (4 litres boiled, 1 hour simmering per day)	23 kWh/month											
Cooking & heating, Level 2 (10 litres boiled, 2 hours simmering per day)							52 kWh/month					
Basic electric lighting (2 * 60 W lamps)	11						11					
Preferred electric lighting (Average 3 indoor and 1 outdoor lamps, 60 to 100 W)				35						35		
TV	7		7		7		7		7		7	
Fridge	36			36			36			36		
TOTALS FOR THESE ENERGY SERVICES												
kWh consumed per month	34	41	77	58	65	101	63	70	106	87	94	130
<i>MJ consumed per month</i>	<i>122</i>	<i>148</i>	<i>277</i>	<i>209</i>	<i>234</i>	<i>364</i>	<i>227</i>	<i>252</i>	<i>382</i>	<i>313</i>	<i>338</i>	<i>468</i>
Approx. cost in Rands/month (at 50 cents/kWh, excl. Free Basic Electricity allowance)	R17	R21	R39	R29	R33	R51	R32	R35	R53	R44	R47	R65
Approx. cost in Rands/month (at 50 cents/kWh, incl. Free Basic Electricity allowance)	R0	R0	R14	R4	R8	R26	R7	R10	R28	R19	R22	R40
Approx. cost in Rands/month (if no FBE, and electricity price rises by 20%)	R20	R25	R47	R35	R40	R61	R38	R42	R64	R53	R56	R78

Key to basic electricity Service Levels in the Table:

- E1: Boil 4 litres/day, simmer 1 hour/day, light with two 60W lamps.
- E2: Boil 4 litres/day, simmer 1 hour/day, light with two 60W lamps, + TV.
- E3: Boil 4 litres/day, simmer 1 hour/day, light with two 60W lamps, + TV + fridge.
- E4: Boil 4 litres/day, simmer 1 hour/day, light with four indoor/outdoor lamps.
- E5: Boil 4 litres/day, simmer 1 hour/day, light with four indoor/outdoor lamps, + TV.
- E6: Boil 4 litres/day, simmer 1 hour/day, light with four indoor/outdoor, + TV + fridge.
- E7: Boil 10 litres/day, simmer 2 hours/day, light with two 60W lamps.

E8: Boil 10 litres/day, simmer 2 hours/day, light with two 60W lamps, + TV.
 E9: Boil 10 litres/day, simmer 2 hours/day, light with two 60W lamps, + TV + fridge.
 E10: Boil 10 litres/day, simmer 2 hours/day, light with four indoor/outdoor lamps.
 E11: Boil 10 litres/day, simmer 2 hours/day, light with four indoor/outdoor lamps, + TV.
 E12: Boil 10 litres/day, simmer 2 hours/day, light with four indoor/outdoor lamps, + TV + fridge.

These results are contrasted to appliance ownership and reported energy expenditure by Imizamu Yethu households (table 8)

Table 8: Approximate breakdown of fuel expenditures, for typical households in each sub-group (based on IY2006 survey data)

Electrification status	Typical monthly spend (R/month per household) per energy type					Total energy spend
	Electricity	Paraffin	Candles	Batteries		
Formally-connected (own meter)	200	25	5	-		228
Informally-connected	100	25	6	-		135
No electricity	-	125	6	-		131

Finally, based on the SALDRU (2005) survey of household income and average energy expenditure figures indicated in Table 8 above the average energy burden was estimated. The typical energy burden for Imizamo Yethu households would be in the range of 6 – 10 % of household income.

By comparison, similar estimates for four different areas of Khayelitsha gave a range of 4 – 7 %, again based on median values per area. The lower values here came in a modern high-density planned and serviced housing area (Kuyasa), and the higher values came from an informal shack area without regular electricity services (Monwabisi Park), which is more similar in character to the unserviced areas of Imizamo Yethu.

3.2 Khayelitsha

Due to the shortened timeframe of the project and quite tense politics at the time of APPLES among various community leaders and groups, who at times would want to control the results (and project activities) for particular reasons, the space for on-ground APPLES contributions and activities in Khayelitsha had become too limited. It had become quite evident that it was advisable to reduce any APPLES on-the-ground activities in this locality, given the situation there and the shortened project timeframe, and to focus these project activities more in Imizamo Yethu. This proposal (to focus mainly on Imizamo Yethu) has been discussed with the SA Department of Minerals and Energy, without any stated objections.

Nonetheless, there are many commonalities between energy conditions (and associated problems, and possible solutions) between an area like Imizamo Yethu and comparable areas in Khayelitsha. This is why the urban part of WP3 includes a comparative assessment of energy conditions in Khayelitsha.

3.2.1 Area profile

Khayelitsha was first established as a “black” residential area outside Cape Town by the apartheid phase of South African government during the 1980s. It remains a growing settlement area, both through natural increase from family growth of existing Khayelitsha households as well as rural-urban in-migration. The present population size is uncertain and may be approaching 1 million people. Despite this large-city size of population, Khayelitsha still does not function as a well-integrated urban complex for residence and livelihoods, commerce, industry and services, and is famously built on sandy ground. The air in this area is highly polluted and unemployment soars at 48%. Among the employed, roughly one-quarter was found in the “Other services (private sector)” sector. Roughly one-fifth was in “Catering and Accommodation” and just below 15 percent in “Construction”, with a somewhat smaller share in “Manufacturing”. Occupation-wise, almost half the employees were found in the class of “Elementary occupations”, half of which were “Domestic workers” and a similar share were “Labourers” in either construction or manufacturing. Given the high unemployment rates and concentration of employed in low-paid occupations, it is hardly surprising that households’ monthly per-member incomes were on average R240 with the median at R370. For comparison with the Imizamo Yethu population, these figures were inflated to 2005/06 Rands, yielding about R305 and R470 respectively.

In addition to its natural population growth, the settlement absorbs both new in-migrants and some of the natural growth from communities in other township areas in the greater Cape Town area. The arrival of new people moving in causes settlement pressures in the township, with new shacks being built on marginal areas of land that are not approved for settlement by the municipality. In such areas, the provision of services such as running water, sanitation and electricity is very limited.

Within it, the area known as **Kuyasa** is sometimes described as a typical “RDP” housing area. RDP refers to the “Reconstruction and Development Plan” approach adopted by the SA government, after democratic elections, in the 1990s. A key element in the RDP approach was rapid service provision for the poor, including housing and electricity, and achievements included the establishment of urban residential areas with state-subsidised housing and Eskom/state-subsidised electricity services. Kuyasa is a good example of this. The houses tend to be rather small and densely spaced, but built of solid materials, and probably preferable, in many respects, to informal housing options such as self-built shacks. Kuyasa is regarded as a fully-electrified area – electricity services were planned into the development of this area. Overall, the data from Cowan and Mohlakoana (2005) showed more than 70% of sampled Kuyasa households used electricity as their main cooking fuel.

By contrast, **Monwabisi Park** is a rather informal “expansion area”, and people living here generally do not have access to regular standards of service provision. Some Monwabisi households have electricity (mainly *via* extension cords) and some do not. Monwabisi Park households tend to be built from less permanent materials (e.g. wood, corrugated iron and plastics). Levels of electricity access are not known accurately. The data from Cowan and Mohlakoana (2005) indicated that about 51% of the sampled households in this area had no electricity connection, and 49% had an informal electricity connection (via extension cords); but the sample size was not really large enough to generalise from these figures.

There were two main reasons why these two areas within Khayelitsha were earlier chosen as focus action areas for urban / peri-urban APPLES activities, along with Imizamo Yethu.

- Together, they represented the main clusters of issues around (i) *planned organised service delivery for low-income households* and (ii) *the additional problems for marginal households* (e.g. on unapproved land) who don't qualify for such state-subsidised services.
- ERC has been tracking these issues, along with other government / non-government stakeholders, and has useful relevant research information from Kuyasa and Monwabisi Park (among other areas in Khayelitsha).

3.2.2 Approach

Information availability

A number of energy surveys have been conducted within Khayelitsha. One of the most comprehensive (Cowan and Mohlakoana, 2005) was carried out in four areas of Khayelitsha in 2004, based on some 200 households, and data from that survey has been used as the main source of statistical information for the present comparison of energy conditions in Khayelitsha (specifically Monwabisi Park and Kuyasa) and Imizamo Yethu. The most recent energy survey in Khayelitsha was carried out in 2007 as part of the Khayelitsha Air Pollution Strategy (KAPS) project. This survey was managed by one of the APPLES team members, Nthabiseng Mohlakoana, (but financed by the Department of Environmental Affairs and Tourism) and covered 1105 Khayelitsha households. The analysis was completed towards the end of 2007, and the results have been used to check for changes since the data collected for the Cowan and Mohlakoana (2005) survey.

Interviews and focus groups

An APPLES focus group discussion took place in Kuyasa, 8 March 2007. It took place at Kuyasa Primary School and was attended by 17 community members from Kuyasa. The discussion, in isiXhosa, included the following issues:

- experiences of switching to LPGas, associated problems (mainly the expense of using LPGas) and partial reversion to using electricity,
- experiences of the CFL exchange campaign,

- more general views about the electricity services provided in Kuyasa, and the benefits experienced from the Free Basic Electricity allowance,
- the high cost of using paraffin (R6 – R7 / litre at the time),
- the relatively low fire risks in the area, as the houses are mainly built of solid materials,
- perceptions of solar water heaters, and disappointment that a pilot subsidised SWH project in the area had not taken off on a larger scale, as promised,
- complaint about many households only having one electrical plug point,
- the ease of access to electricity: in Kuyasa there was only one vendor and because of the rather long travelling distance for many households this makes it difficult and unsafe to send children to purchase electricity. The most urgent need was for another vendor in an area of Kuyasa called Phase 1, as this was the area where children were most frequently robbed of money on their way to purchase electricity,
- ease of access to electricity: the minimum purchase amount makes it sometimes difficult for people to buy electricity when short of cash, and they may instead turn to fuels like paraffin which can usually be bought in smaller quantities if necessary.

A similar focus group discussion took place in Monwabisi Park, 13 March 2007 and was attended by thirteen community members. The discussion covered similar topics to those in the Kuyasa focus group discussion, but in addition had greater emphasis on the experiences associated with energy use in an informal settlement where only some of the houses have access to electricity. Such additional topics which came up during the discussions included:

- the comparative costs and convenience/safety of using different fuels,
- the disadvantages of gaining access to electricity via extension cords, versus regular metered supplies,
- the difficulties in benefiting from Free Basic Electricity allowances, for informally-connected households or those without an electricity supply,
- the comparative dangers of different kinds of paraffin stoves,
- people's initial concerns about the safety of LPGas use; these seemed to be largely resolved through demonstration and education campaigns (as part of the LPGas exchange programme) plus appreciation for the enhanced safety features of LPGas appliances distributed in that programme,
- the fire dangers from the use of candles,
- the extent of occasional use of firewood, by some households, for cooking,
- an awareness that the agency responsible for electricity supply in the area, PN Energy, does not have decision-making power about which households can be electrified, in settlement areas which have not been approved by the municipality,
- satisfaction with the accessibility of vendors.

The collective discussions showed high awareness and understanding of the energy circumstances and choices experienced by various households in Monwabisi Park.

Prior to these organised focus-group discussions, introductory and information-gathering interviews were conducted with relevant gate-keeper/leadership individuals and groups, covering both energy concerns and related planning and political/administrative issues. Discussions with the local councillor responsible for Kuyasa and adjacent areas were less informative, but included a possibly valid query from her: “Is energy really a problem in Kuyasa?”

Other interviews, relevant to energy supply and energy use options in Khayelitsha, were conducted with a wide range of supply-side agency personnel, municipal planners and energy researchers / consultants.

3.3 Assessment of energy problems and opportunities

Based on the above information gathered for Work Package 3, in both Imizamo Yethu and Khayelitsha, this chapter tries to identify and categorise a number of key energy-related problems, towards which the APPLES project may be able to make a useful contribution. Before arriving to the key-energy problems, it is useful to present some policy context.

3.3.1 Aspects of the present policy context

Basic service provision

The main implementation tool of the South African government’s goal of providing free basic service for the poor in the energy domain is the program of Free Basic Electricity (FBE). The FBE implementation, which in our view has been largely successful and beneficial, does not benefit those poor households which do not have any electricity connection. Recognising this, the DME have tried to introduce a complementary “Free Basic Energy” (or “Free Basic Alternative Energy”, FBAE) programme. In principle, this could lead to a more equitable coverage of government subsidy money, benefiting both electrified and non-electrified poor households. The mechanisms might be a subsidisation scheme (e.g. through vouchers) for purchases of non-electric fuels such as paraffin and LPGas. However, there are many challenges in the face of implementing such schemes, and so far we do not have any robust indications that DME or most Municipalities are so far in a position to promote, support or implement this approach on a wide scale.

In terms of electrification (i.e. providing *access* to electricity) the SA government has a target of almost **universal access** to “basic electricity supplies” by 2012. Most analysts do not believe that this target can be achieved, even through combinations of grid and non-grid electricity supplies, but the target nonetheless provides the policy context for a continuing electrification drive, reaching larger numbers of households each year.

Energy conservation and environmental protection strategies also play a role in shaping government policies on energy use in poor households.

Furthermore, there are the issues of land, housing and services. The most striking and emotive issue is probably the incidence of fires in some informal settlements, causing repeated losses of property and injuries and fatalities. There is no doubt that some of the fire risk is caused by the use of potentially dangerous fuels and appliances, such as cheap paraffin stoves and candles, but alongside other surrounding fire-spreading factors such as cramped and dense houses built of flammable materials. To try to reverse this trend of increasing fires, it is understandable that policy-makers and planners would want to eradicate the fire-spreading characteristics of such informal settlements (e.g. through de-densification and the replacement of home-built shacks by less-flammable “solid” houses). More permanent houses, on approved land, would also provide a more attractive and stable social-investment opportunity for improved subsidised energy services, such as electrification, which could reduce more dangerous fuel uses.

The current electrification policy of the Department of Minerals and Energy is that they will not provide funding for electrification in temporary settlements, or those on unproclaimed land, because of the likelihood that the residents will move to other locations, and the application of the electrification subsidy would then have to be repeated. In contrast, approved informal settlements with a more permanent nature are eligible for the government electrification subsidy. In the Cape Town area, this subsidy is provided to the Municipality, or to Eskom, depending on which supply authority is responsible for a particular settlement area. The DME would consider providing a subsidy for temporary, newer or unproclaimed settlements if the Cape Town Municipality accepted responsibility to cover the costs of relocating the electricity infrastructure in the event that the community moved to a new area. However it is understood that the Municipality’s policy has been to assign such costs of new connections to the electricity user (following the principle of a once-off electrification subsidy per household). It is possible that these policies towards electrification for marginal / dynamic informal settlements may be reviewed, in large part out of concern for the present high dangers and economic disadvantages in these areas of *not* using electricity.

3.3.2 Broad approach to energy-poverty links

There are various ways that local energy conditions can contribute to poverty, at a household (domestic) level. These include the following.

Absolute energy poverty

Where households are not able to obtain sufficient energy to meet their basic survival needs. So far, the sample survey results from Imizamo Yethu have not indicated much evidence of “absolute energy poverty” but it is quite possible that the survey samples missed out a minority of Imizamo Yethu households which do experience these conditions, especially in marginal areas of Imizamo Yethu, on the edges of more serviced areas.

Forced use of “bad” energy options

Here, households may be able to obtain sufficient *quantities* of energy for their basic needs, but only in forms which carry negative indirect costs. In a local perspective, the

highlighted issues revolve mainly around local energy-related hazards, the affordability of energy use, the efficiency of use (especially where this impacts on affordability), and the quality and range of energy services that can be satisfied.

In Imizamo Yethu The main energy-related hazards are the following:

- *Fires.* In earlier years, hundreds of homes have been destroyed by fires in Imizamo Yethu.
- *Paraffin poisoning.* Ingestion of paraffin by young children, mistaking it for water or cool-drink, is a serious hazard, sometimes leading to pneumonia and deaths. Although local survey data did not indicate incidents of such paraffin poisoning in Imizamo Yethu, a paraffin safety campaign would include advice and measures to counteract this potential hazard.
- *Indoor and local-area air pollution.* The use of coal and wood for domestic purposes in Imizamo Yethu is low, and unlikely to present a major hazard in this regard. People however commonly complain about the fumes from paraffin use.
- *Electricity hazards.* Although the survey data indicated that residents regard electricity as comparatively safe to use, it is possible that the informal wiring used to extend electricity supply to households without standard connections adds to dangers of shocks and fires.

The affordability of energy use is dominated, in present circumstances, by the higher prices and lower levels of energy services imposed on residents without any electricity supply; or (to a lesser extent) on those with an informal, generally more expensive electricity supply. While electricity remains a cheaper energy option for electrified Imizamo Yethu households, there is a likelihood of significant increases in electricity prices, and a possibility that the “Free Basic Electricity” subsidy may be modified, which would add to the expenses of electricity consumption. In such circumstances, it would be useful for residents to be well-informed about the comparative costs of using different energy options, and about ways of conserving electricity consumption through energy-saving practices.

Potential straightforward cost-saving efficiency gains in energy use are:

- exchange incandescent lights for CFLs,
- increase efficiency of paraffin stoves,
- improved cooking practices,
- reduce the energy costs of refrigeration through improved efficiencies (however, more information is needed for this)

The quality and range of energy services is partly dependent on whether a household has an electricity supply – and then it overlaps with the affordability issues.

The relative “energy burden”

Households may be able to meet their basic / chosen energy needs, but at a rather high cost relative to their income, thus having a negative effect on other elements of their livelihoods. While this refers mainly to domestic uses of energy, there are of course further links with **productive and income-generating activities**. Inadequate energy

provision can certainly be a *constraint* on productive and income-generating activities. However, it is usually wrong to suppose that improved energy provision (e.g. affordable electricity) will lead to a significant growth in productive income-earning *per se*.

While the average “energy burden levels” (% of household income spent on household energy) do not appear particularly high in Imizamo Yethu, at an estimated 6 to 10%, higher levels can be expected among the poorest non-electrified households.

3.4 Recommended opportunities for (urban) APPLES activities

This concluding section outlines a number of action streams recommended for the urban / peri-urban part of the APPLES project, which emerged from the needs assessment process. The agreed activities include a portfolio of options based on expected benefits and replicability and relevance to the broad objectives of the APPLES project (helping to alleviate poverty through improved energy practices) and relevance to community members in Imizamo Yethu.

The options selected were grouped in 4 themes:

3.4.1 Theme 1: Rational use of energy for low-income households

A focus on “basic” energy needs

The APPLES project targets poverty alleviation, so it is natural to focus mainly on energy provision and practices which most strongly affect the welfare of low-income households. The most staple energy needs for *domestic* purposes, in areas like Imizamo Yethu, are for cooking (including water heating) and lighting. Additional attention may be given to energy uses and practices for space heating, refrigeration and media/communications. All of these should cover both electrified and unelectrified households – with the possible exception of refrigeration (since non-electric options here are generally costly and difficult). These energy uses should be a starting point for focusing on basic energy needs, and ways of exploring best practices.

▪ The cooking focus

It is expected that energy consumption for cooking (including water heating) makes up a significant proportion of a low-income household’s total domestic energy consumption. Cooking is also, of course, a highly important domestic, social and cultural activity. Cooking practices can have quite direct links with health and nutrition. Therefore, if ways can be found to show options for “improved energy for cooking”, the benefits could be substantial.

The improvements could take various forms, such as reduced energy costs, higher efficiencies, greater control over cooking processes, improved versatility in preparing food, higher safety levels, etc.

It always needs to be recognised that cooking is a complex multi-dimensional activity. People’s cooking preferences can vary from place to place, and such preferences are not only related to the way energy is used for cooking, but to many other factors. In fact the

energy aspect may be quite a small component of people's cooking choices – almost a “background” issue compared with foreground questions like what foods should be cooked, by whom, for whom, when, and in what ways.

Based on this, the following steps had been planned:

1. *Gain a better understanding of people's cooking preferences and practices in Imizamo Yethu* by collecting recipes and examining the methods of cooking.
2. *On this basis, identify and compare different energy and cooking options* which could meet people's cooking preferences.
3. Arrange *community demonstrations* and *information materials* about such cooking options. The main community demonstrations would be in the form of sign-up cooking events, limited to about 20-40 people per demonstration event. This would help to establish a better awareness of options amongst maybe 100-200 householders.

The better understanding of people's cooking preferences and practices (together with assessments of best practices) will also feed into the other themes below – reduction of energy-related hazards, improved ways to address the energy needs of marginal households left out from mainline service provision, and pro-poor approaches to electricity and energy conservation.

▪ **Lighting**

Lighting is taken as the second “basic” energy service, affecting household energy budgets and quality of life. From a national or municipal perspective, it is also desirable that households switch to CFLs to reduce electricity demand. Hence, it made sense for APPLES to further investigate CFL penetration in Imizamo Yethu. It may be useful, depending on an assessment of this situation, to include a promotion and demonstration campaign, and to try to arrange for subsidy support for CFL exchanges/replacements, e.g. from the City of Cape Town, or Eskom.

The low levels of lighting employed by the households without electricity, and the dangers of using paraffin and candles, indicate (i) the value of safety campaigns which include these potentially dangerous energy uses, and (ii) the possibilities of a market demand among some of the unelectrified households for low-cost solar lamps (e.g. small low-wattage solar units operating LED lights).

Regarding the safety issues, Imizamo Yethu residents in workshops have pointed out that both paraffin lamps and candles can be dangerous, and have suggested that particular attention should be given to the way candles are used. Candles are widely used by both non-electrified and electrified homes, the latter during periods of electricity power cuts, on an occasional basis. The infrequent use in this case may *increase* safety hazards. People may not have suitable candle holders, or be habitually accustomed to avoid such dangers as falling asleep while a candle is still burning in a potentially dangerous position.

All these lighting issues are highly relevant in many other low-income communities in South Africa, so community-tested guidelines on improved lighting practices should have wider relevance.

3.4.2 Theme 2: Reductions in energy-related hazards

In Imizamo Yethu the most striking danger is that of fires. Other dangers include paraffin ingestion by children, respiratory dangers from smoke, fumes and oxygen depletion, burns (not necessarily all from fires), and electric shocks.

The main recommended approach for APPLES in Imizamo Yethu was as follows:

1. Gain a better understanding of these dangers, their consequences, what people in the community think are the main causes, and useful ways of reducing these dangers. One way of going about this is to work with a group of Imizamo Yethu volunteers (e.g. from care groups in the community) to collect stories, experiences and opinions about such dangers from a range of Imizamo Yethu households. This approach also helps to build community participation and local expertise.
2. Based on this, develop content and methods for an energy-related safety campaign. This will be assisted by the Paraffin Safety Association (PSA), which has offered to provide support for training of about 30 community members on safety practices and hazards, in preparation for a door-to-door safety campaign; plus parallel awareness initiatives through schools and radio, and at busy public places such as taxi ranks.
3. Include safety issues in community demonstrations of improved cooking and lighting options (see Theme 1).
4. Engage with and involve relevant leaders, suppliers, planners and service-providers, including: local councillors and other leaders, Cape Town Municipality representatives (planning, housing, electricity, disaster management, fire services, etc.), Department of Minerals and Energy, the South African Bureau of Standards, and energy-related suppliers (of fuels and appliances), in this process.
5. Collect more detailed and graphic stories about experiences of energy-related hazards, for purposes of spreading awareness of these dangers, consequences and causes, (i) within and across communities, and (ii) as a contributory lobbying tool towards policy-makers.

The overall campaign was expected to be organised mainly by APPLES staff and a core group of Imizamo Yethu community co-workers, strongly assisted by PSA (on the paraffin-related issues), and Imizamo Yethu leadership, with valuable inputs hoped for from supply-side, policy and planning stakeholders. The issue is of extremely high local and national importance.

More specifically, safe use (and appliance safety standards as such) of paraffin stoves and candles are of highest importance due to their widespread usage.

Electricity-related safety hazards have not yet been adequately assessed, in Imizamo Yethu surveys and workshops. The main observation (by workshop participants) has been

that electricity cabling, especially extension cords, can aggravate the spread of fires between households, due to cables catching fire.

The *sustainable benefits* of awareness campaigns over time (or more generally, improved awareness of energy-related hazards and how to avoid them) depend on many factors, including

- building up local expertise and communication methods/structures
- reaching children and youth
- repeating messages and information campaigns
- reaching “new members” of a community (e.g. recent settlers) and “individualistic” members in a community among others.

The last point seems fairly important. For example, the worst incidences of energy-related fires seem to occur in informal settlements where “new members” have moved in, without the same experiences of fire dangers and prevention as longer-established residents. “Individualistic” community members could refer to people who are less aware or concerned about community-wide hazards, like fires, resulting from individual actions like carelessness and falling asleep while cooking after drinking alcohol.

3.4.3 Theme 3: Improved ways to address the energy needs of marginal households left out from mainline service provision

The two themes above (“rational use of energy for low-income households”, and “reduction in energy-related hazards”) are both intended to contribute towards improved energy conditions for non-electrified households, as well as electrified households. However, there are further important issues focused around the situation of informal settlement communities in areas which have not yet been approved for the provision of normal basic services. Theme 3 is intended to add on to Themes 1 and 2 in this respect, and would pay particular attention to the policy and planning environment with regard to such marginal informal settlements around towns and cities.

One of the key questions faced by policy-makers and planners in South Africa (as in many developing countries) is whether dynamic informal settlements on possibly unapproved land should be treated (a) as a temporary phenomenon, which should be addressed by measures such as relocating people to planned and serviced areas, or (b) as a probably “permanent” feature of the urban landscape over coming decades. In reality, (a) and (b) are most likely to occur in parallel. It is likely the government and local authorities will try to control unapproved land occupation to some extent, and to persuade people who have occupied such areas to move to other locations, where possible. However, it is unlikely that government and municipal efforts to provide sufficient housing and normal services will be able to overtake the growing and continuing demand for such services. If these points are valid, they suggest that marginal, unapproved and possibly unserviced urban/peri-urban settlements are likely to be a long-lasting feature of the urban landscape.

Policies (and associated regulations) towards the provision of services for marginal households in such settlements probably need to be reviewed accordingly. This is a wide

issue, in which many stakeholders are involved, including national, provincial and local government, trade unions, NGOs, CBOs, service suppliers and others. It is hoped that the APPLES project can make a useful contribution, by engaging with locally relevant authorities, suppliers and interest groups, particularly around the following matters:

- i) The broad question about best levels of service provision for presently marginal informal settlements (our focus here being energy services).
- ii) Electrification approaches (eligibility, subsidy conditions, possibly “temporary” or “self-help” options for electricity supplies to such households).
- iii) Possible ways of implementing the government’s “Free Basic Alternative Energy” policy, for households not able to access electricity or benefit from the “Free Basic Electricity” subsidy.
- iv) Possible ways of improving access to “informal electrification”, including issues of safety, billing, equitable access to subsidies, and perhaps more organised ways of achieving safe informal connections.

Policy-makers and planners preferably need evidence on which to base their judgements. It is recommended that the APPLES team, together with Imizamo Yethu co-workers (and in liaison with government and other agencies) try to provide community-based evidence about the options, needs, and likely benefits and costs associated with the options considered.

The issues referred to are important worldwide in developing countries. European partners in the APPLES project may be able to draw on extensive experience across a variety of developing countries to make helpful recommendations.

3.4.4 Theme 4: Pro-poor approaches to electricity conservation

As the South African electricity supply crisis deepens, it is fully expectable that campaigns and measures to reduce national electricity consumption will intensify. There is considerable scope for electricity savings in the country, probably especially in the industrial and commercial sectors, although the domestic sector must also be targeted if electricity demand reduction targets are going to be met. Periods of peak demand generally coincide with periods of high domestic consumption, in the morning and evening.

Many electricity-saving measures can also have cost-saving benefits. Examples are the use of energy-efficient lamps, and the adoption of more efficient cooking and heating practices. However, some measures may have adverse economic and safety consequences for householders, especially in lower income communities. These could include programmes to encourage people to switch away from electricity for cooking and other household thermal energy needs. At present oil prices, switching to non-electric petroleum-based fuels like paraffin or LPGas would be more costly for low-income households, unless the fuels are adequately subsidised. The expected rises in the electricity price during 2008 may provide an incentive for such fuel switching, but our

tests and calculations indicate that electricity would still be a cheaper option for consumers.

While recognising that there are competing objectives at play here – protecting the well-being of the poor, and protecting the integrity of national electricity supply – it is recommended that APPLES should contribute in an information role towards both community members, and to policy-makers and electricity suppliers.

Towards community members, the main lines of information (backed by demonstrations) would include:

- accurate information about current or proposed electricity conservation programmes and incentives,
- explanation and local promotion of measures which can save people money and increase their welfare,
- information about measures which would reduce electricity consumption or electricity demand, but which could entail higher costs for consumers.

There may be opportunities for APPLES to assist access to and adoption of beneficial measures in Imizamo Yethu, through liaison with authorities and suppliers.

Towards policy-makers and suppliers,

- information about the likely effectiveness of different measures, among low-income households (magnitudes of expectable savings, the time of day, etc.),
- information about relative energy costs, as experienced by poor households,
- assessment of the relative magnitudes of electricity savings which can be achieved in lower- and higher-income residential communities,
- suggesting possible combination or mitigation strategies, e.g. providing adequate subsidies for LPGas fuel purchases, for low-income cooking, only in mid-winter months when electricity evening peak demand is highest.

In the rather sensationalised climate of rolling power cuts, there has been quite a lot of inaccurate and sometimes seriously misleading journalistic coverage, both in the press and on television and radio. With the technical, economic and community-based resources available to APPLES, it is recommended that a further role for the project is to provide balanced information for the media, especially concerning electricity conservation measures relevant to the poor, and hopefully assisting rational achievement of the country's much-needed electricity reduction targets in an equitable way.

4. Comparison of rural and urban needs assessment

This summary provides the main differences between the rural and urban tracks of the APPLES project. It is evident, that the two tracks operated under quite different circumstances, which called for different approaches to the needs assessment process,

which yielded very different recommendations for further APPLES activities in the two areas.

In the rural locations, the information available on the local energy situation was very limited, hence the needs assessment process had to serve the double purpose of a general data gathering exercise and identification of specific energy needs based on which further APPLES actions were defined. Because of the APPLES mission to contribute to the embryonic network of the SA government’s Integrated Energy Centres, the further activities in the rural setting focused on how such an energy centre could best serve the needs of the community as defined during the needs assessment.

On the other hand, the urban track of APPLES had the advantage of having a significant amount of data on the local energy situation readily available from previous studies conducted in the same urban/peri-urban location, which allowed for a mainly desk-top analysis of the local energy needs, still complementing it with community meetings where the “official” information could be tested against “popular perception” of some relevant energy issues. Based on this combined information, a set of proposed contributions was drafted, which included both community interaction (e.g. demonstrations on efficient cooking practices and safe use of appliances) but also involvement with policy makers (mainly on a municipal and provincial level) and suppliers to present them with a detailed assessment of the energy situation of the poor households and suggestions for improvement of policies that aim at improving their energy situation.

A short overview of the main differences and similarities between the two tracks is provided in the below table:

Table 9: Main characteristics of the rural and urban wings of the APPLES project

Issue	Rural	Urban
Contextual		
Information availability	<i>Very limited information available on local energy uses</i>	<i>Fairly good information available on local energy uses</i>
Perception of alternative energy sources	<i>Generally low awareness of alternatives to traditional energy sources (electricity and paraffin), renewable energy perceived as inferior to grid electricity</i> <i>Lack of understanding of the cost of electricity</i> <i>Limited awareness of energy related hazards</i>	<i>Generally better understanding and acceptance of solar power (solar water heaters in particular)</i> <i>Better understanding of electricity costs</i> <i>Limited awareness of energy related hazards</i>
Energy use		
Electrification rates	<i>Low electrification rates (less than 50%)</i>	<i>High electrification rates in formal settlement (close to 100%) and low in informal (around 50%)</i>
Main cooking fuel	<i>High reliance on wood for energy (more than 50% of households regularly cook on wood)</i>	<i>Very low usage of wood for energy (almost no household regularly cooks on wood)</i>
Main energy hazards	<i>Respiratory diseases due to indoor air pollution and paraffin ingestion by</i>	<i>Fires from paraffin stoves and lamps, candles and extension cords</i>

	<i>children</i>	
Needs assessment outcomes		
Main energy needs	<i>Need for improved energy products and service provisions, need for skills and raising awareness on alternative energy options</i>	<i>Need for information on safe energy use and improved energy access for unserved areas</i>
Implementation	<i>Semi-centralized, through the energy centre</i>	<i>Diffused, through demonstrations and information campaigns, Advice to suppliers and policy makers</i>

PART TWO

5. Introduction to WP4

The second part of this report summarizes the activities undertaken in Work Package 4, entitled *Identification, communication and demonstration of targeted best energy practices for the poor*. This WP was only carried out in the urban wing of APPLES.

The stated objectives of APPLES WP4 included the following:

- Identify and implement a number of best practices which address prioritised energy-related problems in the local areas, and which contribute to poverty reduction and sustainable development.
- Produce guidelines for the implementation and wider dissemination of such practices.
- Strengthen local capacity for implementing pro-poor energy plans and practices.
- Inform and involve national energy planners and policy-makers, and energy service suppliers.

It was recognised that the nature of “best practices” (regarding energy for the poor) can take many forms, for example

- improved energy service delivery, maintenance and payment methods
- energy use practices – promotion of more efficient, effective, safer, cleaner, healthier and productive energy-use choices, within the constraints experienced in poor communities
- ways of enhancing access to improved and affordable energy-use options
- local, district and national planning approaches which benefit the poor and promote sustainable development

During the needs assessment process, the identified and prioritised energy-related problem areas in Imizamo Yethu were grouped, under the following themes:

Table 10: Thematic grouping of urban energy needs

	Theme	Headline issues
1	<u>Enabling Rational Use of Energy for low-income households</u>	<p>With a focus on staple energy uses: for cooking and lighting (maybe also space heating). Main aims: reduce costs, improve services, reduce hazards. Save energy. Choose best options.</p> <p>* <i>Pay less, get more benefit.</i> * <i>Avoid dangers.</i> * <i>Policy advice.</i></p>
2	<u>Reducing energy-related hazards</u>	<p>A focus on the devastation of fires in communities like Imizamo Yethu. Ways to reduce fire risks, and other energy-related dangers to life, property and livelihoods.</p> <p>* <i>How to reduce these dangers?</i> * <i>The links with housing and planning policies</i> * <i>What are their best energy options?</i> * <i>Can their energy services be improved and formalised?</i></p>
3	<u>Addressing the energy needs of marginal communities presently “left out” from mainline urban</u>	<p>The marginal households here are primarily without electricity or other organised / assisted energy services, or obtain “informal” electricity supplies from neighbours.</p>

- services provision
- 4 **A comparative analysis of electricity conservation opportunities, costs and benefits, as between low and higher-income households**
- In the context of South Africa's electricity supply shortages, and national programmes to reduce electricity consumption.
- * Who can make greatest savings?*
** Which households experience the greatest disadvantages if their electricity is curtailed?*

In practice, it was decided not to attempt to cover Theme 4 above, during the course of the present project. While it is considered a highly valuable topic to investigate, in current South African circumstances, it would have required further empirical studies outside the Imizamo Yethu community. The effective APPLES project timeframe had been severely curtailed, as a result of delays in obtaining South African co-funding from the Department of Science and Technology, so it was decided to focus on Themes 1 to 3.

6. Follow-up community engagement

Following on from the surveys, workshops and focus-group discussions which were part of the Needs Assessment phase (up to Feb/March 2008), further meetings were held in the community. The aims here were to discuss further the identified energy problems with a range of Imizamo Yethu community members and activists, and to attract a small team of local volunteers who would like to take part as active participants in the APPLES project. A smaller group of five women, who were able to commit time and energy to the project on a steady basis, were chosen as the APPLES volunteers. All these women happened also to be engaged in other aspects of community development work in Imizamo Yethu.

Numerous meetings were held among these Imizamo Yethu women volunteers and the Cape Town APPLES project staff (Bill Cowan and Jocelyn Muller, from ERC, and Nthabi Mohlakoana, HSRC) to unravel the list of identified energy problems brought up in the Needs Assessment, and to discuss possible strategies to try and address these. These discussions were assisted from time to time by other Imizamo Yethu community workers as well, plus invited local householders, and guest contributors such as members of the Paraffin Safety Association.

In total, approximately 40 such meetings and small-group workshops in Imizamo Yethu took place over the course of WP4 of the APPLES project, in addition to a number of one-on-one meetings around particular tasks.

This may seem a large number of meetings and workshops, but similar energy action and capacity-building projects elsewhere have shown the value and necessity for such regular continuing engagements with community participants.

6.1 Capacity-building and training

One of the declared aims of a project like APPLES is to help build local community capacity around energy issues. But equally, local project participants help to build the knowledge and capacity of the professional project staff (both South African and international “energy experts”). For example, APPLES staff provided training sessions around energy issues, research and communication methods, etc. while Imizamo Yethu women participants provided information and insights to APPLES staff about energy-related issues experienced in Imizamo Yethu.

This type of ongoing informal information exchange (called “Type 1” here, for convenience) is often difficult to describe and quantify but nevertheless a very valuable form of interaction. “Type 2” outcomes can be linked to particular training activities and other distinct, organised capacity-building and were a concrete focus of the APPLES work in WP4. The main activities here included:

- *Enquiry and documentation skills* (training the volunteers in interviewing and data collecting techniques)
- *Cooking practices* (through workshops exploring costs of different cooking practices, public cooking competitions for awareness raising)
- *Lighting practices and preferences* (through an exchange programme for replacing incandescent electric lights with efficient cost-saving CFLs and a door-to-door energy safety campaign where IY volunteers demonstrated safer ways of using candles).
- *Public presentation skills and preparations* (for the IY volunteers)
- *Capacity-building for energy suppliers, planners, policy-makers, etc.*

6.2 Research, demonstration and communication methods

These will be described in more detail under the different activity themes covered in later sections of this report. The Table below provides a brief summary.

Table 11: Summary of main methods and activities

Primary Themes and sub-themes	Main Methods / Activities
1. Enabling Rational Use of Energy for cooking and lighting	
Understanding and documenting local cooking practices	Collection of local recipes from households. Observation and documentation of cooking practices. Recording of associated “stories” and subjective associations. Workshop discussions of these. Testing of some recipes. Analysis of survey information about household fuel and appliance uses. Nutritional examination.
Testing and	Laboratory tests under controlled conditions. Comparisons

demonstrating cooking fuels, appliances and cooking methods	with national and international literature. Stove/fuel tests and demonstrations in small-group community workshop settings. Community demonstrations in large-scale public cooking competitions, with measurement.
Analysing and communicating results	Analysed results communicated to audiences at public cooking competitions. Presentations in parliament, and in energy-supplier / planner stakeholder workshop. Analytic method developed for calculating costs of different cooking procedures, different meals. Energy analysis, recommendations and tips included alongside local recipes and stories in preparation of an "Imizamo Energy Cookbook".
Understanding local lighting preferences and practices More efficient, affordable and safe lighting	Survey analysis on household use of lights. Discussions in small-group workshops. Literature studies on CFL uptake and reversion factors studied in other local communities. Evaluation of costs, local availability, and variety, of efficient electric lamps. Literature reviews of lighting efficiencies and quality. Subsidised CFL exchange campaign in the community. Evaluation and testing of non-electric lighting options. Demonstrations of safer ways of using candles (door to door visits and at public community events).

2. Reducing Energy-Related Hazards

Understanding and documenting local dangers	Collecting stories about experiences, causes and consequences of fires and other energy-related hazards, from community residents. Photographic documentation. Discussions, analysis and video recording in small-group workshops.
Energy safety training	Training workshops by Paraffin Safety Association for APPLES community volunteers and researchers.
Energy safety awareness campaigns	Door-to-door household visits by community volunteers. Public "energy safety" event held, for community-wide audience (addresses by community leaders, safety presentations, demonstrations, edu-drama, and entertainment by local performing groups) – jointly organised by APPLES and PSA.
Communications around energy safety	As above, door-to-door and at public safety awareness event. Presentations in parliament, and energy stakeholder workshop. Collection of signatories to a petition of concern towards national government.

3. Addressing the Energy Needs of Marginal Communities Presently "Left Out" from Mainline Urban Services Provision

Understanding present services provision and conditions	Survey analysis, community leader interviews, local workshop discussions, interviews with energy supply and planning agencies, national government representatives and NGOs.
Analysis and recommendations	Evaluation of present policies and regulations. Analysis of basic energy needs requirements, and electric / non-electric options. Certain recommendations discussed with energy supply and planning agencies, national government representatives and NGOs. Further recommendations summarised in APPLES "Implementation Guidelines" document.

7. Theme 1: Enabling Rational Use of Energy for low-income urban households

The focuses under this theme were affordable, efficient and safe uses of energy for cooking and lighting. These are primary energy applications for lower-income households, and as such make up a large portion of “basic needs” energy consumption among poor households, in an urban South African context.

The term “Rational Use of Energy” (RUoE) is broad in range. Key issues here, for enabling RUoE among lower-income households include:

- The ability to afford, obtain and use suitable energy appliances – which are efficient, cost-effective, safe and “fit for purpose”.
- The ability to obtain, afford and choose optimum available fuels for household energy needs.
- The ability to adopt affordable, efficient and safe energy-use practices, and to balance the best available energy options against householders’ preferences (e.g. ways of preparing meals, economical choices of foods, lighting preferences, etc.).
- The knowledge, means and ability to avoid particular energy-related hazards, such as fires, burns, air pollution and electric shocks.

From a poverty-alleviation perspective, the emphasis here is on ways of saving money, obtaining better energy services from available options, and reducing energy-related health and safety risks.

7.1 *A focus on cooking energy*

Cooking is culturally important, a major use of energy in most lower-income households, and a major element in nutrition, well-being and social/family relationships. However, energy planners and researchers are often not able to explore cooking practices and preferences in enough depth, partly because they are so complex and vary across households, communities, culture areas and time.

Some of the important contextual factors, applicable to cooking energy use in Imizamo Yethu (and applicable in many other similar lower-income communities) that needed to be taken into consideration when planning the activities for WP4 were:

- the availability of fuels (most commercial fuels are easily accessible to residents of the area),
- prices of fuels (volatile during the period of this study),
- availability and prices of cooking appliances,
- local economic conditions in general (average income levels at about R700/month per household member and an unemployment rate of about 32%),
- household conditions (most formal households are under pressure for space and many informal houses are built from flammable material),
- common styles of meals and finally energy-related hazards.

7.1.1 Practical approaches taken

First, there was discussion and agreement that the investigation of cooking practices, cooking methods, the way energy is used for cooking, and possible ways of reducing such energy costs (and hazards) would be a useful focus for APPLES activities in Imizamo Yethu.

In order to gain a better understanding of local cooking practices and preferences, it was decided to collect a set of typical local recipes from a range of Imizamo Yethu householders. The IY APPLES team collected these recipes, discussed them with cooks, documented them (with notes and photographs) and also recorded the associated cooking-energy techniques. This information was then discussed and analysed in small-group review workshops.

From the recipes collected, approximately thirty were selected for inclusion in an “Imizamo Yethu Energy Cookbook⁴”, designed to spread information both about the recipes and the experiences and feelings of people cooking these meals, as well as the ways that energy was used when they cooked these meals; and how there might be cheaper, safer cooking-energy options.

At the University of Cape Town, controlled laboratory tests were conducted across a range of fuels and cooking appliances, to assess their efficiencies and other characteristics. Based on these tests, methods were developed to estimate likely fuel consumption and costs, when using different fuels/appliances for cooking a variety of types of meals.

In small-group workshops in Imizamo Yethu, the APPLES teams cooked a variety of typical meals, using different stoves and pots, measured and discussed the resulting energy costs and consumption, and related issues. This was a part of increasing awareness and understanding about cooking-related energy issues, among the APPLES participants, and also a way of preparing for community-wide information campaigns and public awareness events.

To spread community awareness, public cooking competitions were organised, again using different fuels and appliances. Local cooks won prizes, based on which of their dishes were judged to taste the best. At the same time, energy consumption and energy costs were measured, providing useful information to the community audiences about the relative costs of different cooking options.

Energy-related information from these cooking competitions has been shared with members of parliament, Eskom, local government and NGOs.

⁴ In preparation, expected to be printed in 500 copies (of 80 pages each).

7.1.2 Energy-efficient cooking practices

The main point that became evident from both laboratory tests on fuels and appliances as well as during community cooking demonstrations was that at present, there is a **clear overall advantage in using electricity**, where available. It is cheaper to use, safer and more controllable – from a householder’s perspective, at current energy prices (more energy costs of different fuel types are presented in section 7.4.2).

Some households do not have a normal metered electricity supply, but instead obtain electricity from neighbours, using extension cords. In this case, they may pay more for the electricity they consume, but even so, electricity use is still usually their most economical energy option.

Those households in Imizamo Yethu that do not have access to electricity, clearly have to resort to other fuels and appliances. Those households face the highest costs of cooking, both in monetary and safety terms. Their alternatives, mainly paraffin and LPG are both problematic for several reasons. Very cheap paraffin wick stoves have officially been banned from sale in South Africa, because they fail to meet national safety standards. In addition, they have low efficiencies. LPGas stoves on the other hand seem costly and are difficult to control at low power settings, suitable for simmering. Very high costs of LPGas for Imizamo Yethu residents (as elsewhere in SA) make gas cooking an expensive option, compared with electricity.

Many basic cooking methods involve boiling and simmering, so it is useful to look into ways of making these basic cooking processes efficient and cost-effective. Therefore, the question of efficient boiling-and-simmering processes has special relevance to lower-income South African households (as in many other developing countries). Tips for increasing efficiency of other cooking techniques (roasting, baking, preserving food etc) can be found in deliverable 17.

The information and recommendations which follow are based on a variety of investigations, tests and demonstrations, including

- reviews of local and international literature on the subject
- laboratory tests at UCT on different stoves/fuels, across various cooking modes
- analysis and discussion of cooking methods employed by IY householders, as collected in the series of local recipes
- small-group demonstrations and analysis of different cooking methods in IY
- community demonstration events (cooking competitions) in IY and nearby suburbs

The advices below are applicable regardless of the energy type used for cooking.

7.1.2.1 Efficient ways of heating water (for non-cooking purposes)

Before going on to *cooking-specific energy use*, it is helpful to consider the most efficient ways of *heating water*, e.g. for non-cooking purposes such as washing dishes, clothes and bathing.

Only a minority of the households in Imizamo Yethu have electric geysers for water heating. Others more commonly use stoves and kettles. In this situation electric kettles are more efficient than heating pots of water on a stove. However, if water is heated in pots on a stove, the efficiencies here can be increased, and the energy costs reduced, by following items of advice below.

Ways of reducing energy costs when heating water on a stove (for non-cooking purposes):

- Choose the best fuels and appliances for your circumstances.
- Use fairly big pots.
- Do not heat the water to a higher temperature than you need.
- Do not heat more water than you need.
- Heat the water as fast possible (within limits).
- Use lids and insulation.
- Heat the water when needed – don't let it stand around.

The points above are related to heating water for non-cooking purposes. However, they are also relevant to many cooking processes, which require heating water to a cooking temperature, often followed by a simmering phase at reduced stove power.

7.1.2.2 Efficient cooking: boiling and simmering

(a) Advice for efficient boiling

- Bring water to the boil at a rapid rate (at high power, but within limits).
- However, avoid using such a high stove power that the heat is going to waste around the sides of the pot.
- It can be faster and more efficient to heat water to boiling-point first in a kettle, rather than in a pot on the stove.
- When boiling water in a pot, use a tight-fitting lid to reduce the heat losses that occur when the water starts to steam.
- It can help to cover the lid of a pot with a folded dish-towel, or some other/better type of insulation.
- Do not boil more water than needed for the satisfactory cooking of the dish in question.
- If it is possible to warm up the water to be boiled to some extent beforehand, this can reduce the energy needed to bring it to boiling point (for example in a small solar water heater or a black water container left in the sun).
- The size and shape of the pot can make a difference:-
- Once a pot of water with food has reached boiling point, the stove should be turned down.

(b) Advice for efficient simmering

- Avoid unnecessary heat and steam losses, by using a pot with a tight-fitting lid.
- Use the minimum stove power required to maintain a simmering temperature.
- Use a stove which can maintain this steady low-power setting, preferably with a minimum of adjustment and supervision by the cook during prolonged simmering periods.
- Use the best fuel/stove combination available for economical and efficient simmering. At current fuel prices, an electric stove with a good turn-down ratio (a good low power setting) is the preferred choice.
- Use a pot which is large enough to cover the heat source of the stove, but not unnecessarily large for the amount of food being cooked.
- Use a minimum amount of liquid, compatible with the preferred cooking method.
- Avoid unnecessary stirring and opening of the pot's lid⁵.
- The use of insulation can reduce the amounts of fuel needed for simmering.

7.1.2.3 Other possibilities for increasing cooking efficiencies

Potential economies of scale in cooking

When talking about energy efficient cooking, the potential economies of scale of batch cooking larger quantities are also an interesting option for energy saving. However, there is no clear answer to whether, in general, there are economies of scale in cooking larger quantities of food at the same time. It can depend on the cooking method, the appliances and fuels used, and the foodstuff. A related aspect, relevant to the costs and availability of energy for cooking among poorest households, is the scope for more efficient energy use through *pre-cooking* or *partly pre-cooking* foods which would otherwise need extended cooking times and household energy inputs.

Cooking less often, as a way of reducing energy costs

According to surveys in Imizamo Yethu and Khayelitsha, people who are conscious of the need to cut down on their expenditures for cooking energy often mentioned this as a tactic. For example, a household might change from cooking one main meal per day to cooking once every two days. This could have adverse health effects, if it reduces the nutritional content of food eaten on non-cooking days, perhaps through greater use of pre-cooked food, less fresh food, and possibly shortage of food.

Benefits of refrigeration

The ownership of fridges can play an important role here. The economies in cooking energy, and improved health and nutrition opportunities, through fridge ownership are probably important, to the extent where refrigeration should perhaps be viewed as a “basic energy service” for low-income South African electrified households. However, electric fridges are quite expensive to purchase, and also to operate. The high rate of

⁵ The required stirring of the food can cause significant energy losses and some types of food require more (e.g. the popular mealie meal, the most common staple food in South Africa), while others require less (rice, fresh pasta, cous-cous, potatoes).

fridge ownership among surveyed households in IY and Khayelitsha endorses the high value which many households place on having refrigeration, in such lower-income areas.

Energy planners, policy-makers, suppliers, appliance manufacturers and standards organisations should give attention to the supply and availability of low cost and energy-efficient fridges, suitable for the needs of lower-income households; and take refrigeration into account when assessing the “basic energy needs” of low-income households in South Africa.

7.1.2.4 Important non-energy considerations on cooking practices

Nutritional links

Energy constraints can affect nutrition, along with other factors, e.g. by affecting which foods can be cooked and how often. The rate of severe malnutrition in Imizamo Yethu can be regarded as quite low, probably only affecting a minority of very disadvantaged residents. However, more generally, Sizakele Mthembu-Xaba (one of the APPLES community volunteers in Imizamo Yethu, particularly concerned with community nutrition) explained to members of the SA parliament:⁶ “*We are now not eating to be healthy. We are eating to survive.*”

She explained this general comment as resulting from several factors, including the rising costs of energy, the high transport costs entailed in obtaining access to cooking fuels or making electricity payments, and rising food prices, especially for lower-income households in Imizamo Yethu.

Possible myths and habits hindering RUoE for cooking

Possible myths and habits linked to cooking practices can be a major hindrance to introducing practices to increase the rational use of energy for cooking. Nevertheless, this section is introduced cautiously. What one person considers a “myth” might be another person’s cherished tradition or cooking method. The comments which follow are based on interaction between energy researchers and observed cooking practices in Imizamo Yethu and other communities. They include the following (misconceptions):

- The need to “Preparing a stove for cooking”
- “Cooking on full power is best”
- “Non-electric stoves are cheaper to use”
- “Low-power stoves are cheaper to use for slow cooking meals”
- “Some foods require hard boiling techniques”
- “A well-cooked meal needs to be stirred well”
- “A well-cooked meal needs a lot of preparation and cooking time”

⁶ Parliamentary Portfolio Committee briefing, 18 September 2008, Cape Town.

7.1.3 The choice of cooking ingredients, and associated cooking-energy costs using different fuel options

The choice of cooking ingredients can have a large impact on the amounts of energy needed to cook these foods. Conversely, the choices about what foods are cooked affect the energy bill. However, lower-income households generally have limited choices about their basic, affordable food options.

Deliverable 17 presents the approximate costs of the most common food ingredients (mealie meal, rice, pasta and meat) and the energy costs for cooking these ingredients. Here, we illustrate the calculations on the example of mealie meal (quantities for 4 people).

Comparative costs of cooking staple starch foods (Mealie meal)

- ♦ The cooking method (in this typical example): *Water is brought to the boil, mealie meal added, and simmered and stirred in an open pot until ready. When ready it is kept on a low heat until served.*
- ♦ Quantities cooked for four people are taken as: *0.5 kg mealie meal, with 1.8 kg water.*
- ♦ Additional ingredients considered: *100 to 200 mg oil or margarine.*

Table 12: Comparative costs of cooking a staple starch meal with different cooking fuels

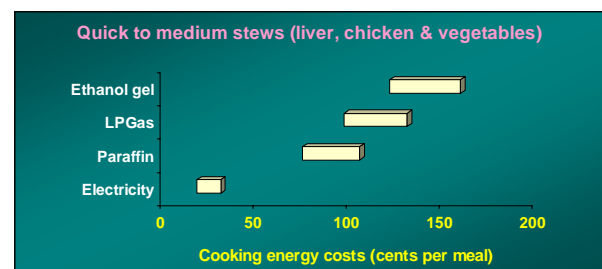
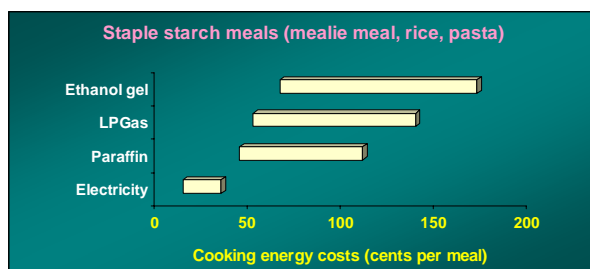
Fuel type	Total cooking time (est.) In min	Energy consumed cooking meal kWh	R spent for this	Typical costs of the food ingredients (R)		Cooking energy costs as a % of food costs	
				Main ingredients	All ingredients	% of main ingredients	% of all ingredients
<i>Electricity</i>	41	0.45	R0.27	3	5	9%	5%
<i>Paraffin</i>	44	0.84	R0.93	3	5	31%	19%
<i>LPGas</i>	34	0.79	R1.26	3	5	42%	25%
<i>Ethanol gel</i>	44	0.57	R1.44	3	5	48%	29%

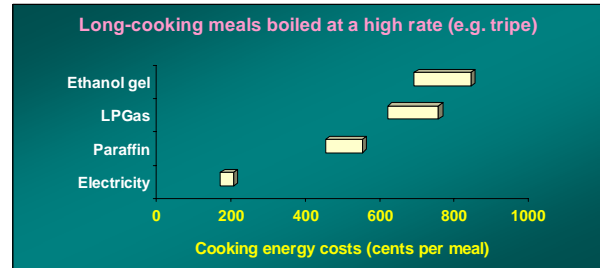
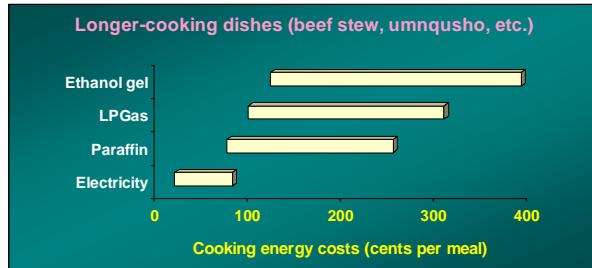
Imizamo Yethu / S.Africa, 2008 circumstances & prices. The energy estimations are approximate, e.g. to within about ± 15%.

These estimates indicate why it so important to provide cost-effective cooking energy options for lower-income urban households. Using electricity, the energy cost of cooking this staple meal is only about 5% of the cost of the food ingredients, at current prices. Using paraffin, this percentage rises to about 20%; using LPGas 25%; and using ethanol gelfuel nearly 30% of the food costs.

Comparative costs of cooking other foods

Similar calculations for other starch foods and different meat dishes were performed and the results are summarized in the graphs below:





For all these types of meals, it is clear that electricity is a much cheaper cooking-fuel option for IY households (at 2008 prices). Paraffin was generally the next best choice, in terms of simple cooking-energy-costs, but is probably more dangerous to use than any other of the cooking fuels shown above. Ethanol gelfuel appears to be the most expensive fuel option considered. The main reason here is that the energy-content of ethanol gelfuels (as tested in local laboratories) is very low in relation to their selling price. In the case of LPGas, the graphs above are based on a mid-2008 retail price of R20/kg. However, typical prices rose above R25/kg during this period, in local outlets, so actual cost ranges could have been even higher than shown. In contrast, any household receiving a Free Basic Electricity allowance would have paid *less* per kWh than the rates assumed in the graphs above.⁷

7.1.4 Cost, reliability, performance and safety of common stoves

Based on experience in this project, there are serious concerns about the quality of low-cost cooking appliances commonly used in South Africa, including electric hotplates, paraffin stoves and some LPGas stoves. During the course of the APPLES project, different appliances were bought for demonstration purposes and were also analyzed in terms of their operating characteristics, safety aspects, and durability when used for a more extended period of time under normal home conditions. The appliances researched included:

- *Electric kettles*
- *Electric hotplates*
- *Electric bar heaters*
- *LPGas stoves*
- *Paraffin stoves*

It is recognised that the numbers of appliances evaluated in such ways were too small to make a statistical assessment. It was outside the scope of the APPLES project to do so. However, the high incidence of defects, dangers and poor performance characteristics even in this small sample of lower-cost appliances can be instructive.

The main result of this analysis was that both electric and non-electric cooking appliances, commonly bought by households in communities like Imizamo Yethu, have

⁷ The length of the bars, in the above graphs, indicates the expected range in costs for each fuel use. This range covers different types of meals in each category, and also includes a 10% uncertainty margin in each case (subtracted from the minimum values, added to the maximum values) which approximates a 95% confidence interval, in terms of the calculation methods and associated test results.

showed major shortcomings, in aspects such as: efficiency, controllability, ease of use, instructions, reliability and durability. It is also interesting to note that no correlation appeared, in this small sample, between the price of these appliances and their observed performance and reliability characteristics. In addition, many of the specific appliances used in cooking tests, demonstrations and competitions showed potential or *immediately* serious safety dangers.

These points emphasise the financial advantages, for low-income electrified households, of using electricity for cooking, as well as the main shortfalls of the current appliances available to perform this basic household task. These conclusions now needed to be communicated to a wider audience – the poor communities of IY – through a series of demonstration and awareness campaigns around cooking energy use, the culmination of which was a cooking contest organized in the community itself.

7.1.5 Demonstrations and awareness campaigns around cooking energy use

7.1.5.1 Small-group demonstrations and tests

Small-group cooking demonstrations were held jointly by the IY and Cape Town APPLES team members, together with a number of other interested observers, in Imizamo Yethu. The main purpose was to investigate the comparative costs of using different stoves, fuels and cooking techniques, in a hands-on way, so that the team members would have a firmer understanding of the issues, in preparation for the public cooking competitions. This understanding also helped the IY team to assess observed household cooking practices, in the process of collecting recipes and monitoring cooking methods in local households.

Accurate measurement facilities were provided by the University of Cape Town, to record amounts of fuels and electricity used during the cooking demonstrations.

The results were discussed, together with related issues such as the types and sizes of pots and lids, safety and convenience aspects. Although this workshop focused on directly-watched cooking tests (which are of course more difficult to standardise than laboratory-type tests) it was possible to compare the findings with more scientifically-controlled stove tests which had been performed in laboratory conditions in the University.

The local participants were quite surprised by the results, especially the lower cost of using electricity compared with other fuels. Presented next, is the main activity employed by the APPLES team to demonstrate the costs and benefits of the different cooking technologies.

7.1.5.2 Public cooking competitions

As a way of publicising different cooking options, and in particular the comparative costs of cooking common dishes using different fuels, a public cooking competition was organised in Imizamo Yethu in August 2008. The event was publicised in advance and

community members were invited to enter their names for possible selection as competitors.

Two sets of meals were planned, for the competing cooks: (i) a combination of beef stew and mealie-meal (*umnqusho*), cooked in succession, on one stove, (ii) a slower-cooking meal of samp and beans. In each case, these were to be cooked in equal quantities on three types of stoves, using LPGas, paraffin and electricity respectively, leading to six cooking opportunities. Six of the community entrants were selected accordingly (by drawing names out of boxes) to be the competing cooks on the day.

The APPLES IY team members helped to select and purchase ingredients for the prizes. On the day, each cook was provided with the food ingredients they required for their recipes. They were asked to cook typical family-sized meals (e.g. for approximately four to six people), with the aim to demonstrate typical family cooking situations, so that the audience members attending the event could relate the results more easily to their own household cooking experiences.

About 70 invited community members came to attend the event as the audience, plus another 20 to 30 other participants (APPLES, community leaders, engineering student assistants, PSA members, community workers from other areas, etc.).

ERC provided the LPGas, paraffin and electric stoves, together with back-ups (these were needed, as several of the stoves showed malfunctions during the competition), measurement equipment⁸, and recording/display equipment to help communicate and record information. The stoves and measuring equipment were set up at the front edges of the hall, so that people could easily watch.

The start of the cooking began later than expected due to the electricity supply in the hall repeatedly tripping out. Other appliances also failed to perform in a satisfactory way. Two of the paraffin stoves failed to provide sufficient heat for the task, while the LPGas cooker proved difficult to control due to continuous problems with its knobs. One of the electric cookers repeatedly tripped the electricity supply, and had to be abandoned.

Interestingly, none of the cooking contestants, or audience, seemed surprised by the high failure rate of the stoves used.

The prizes to participating cooks were awarded on the basis of which cooked meals were judged to have the best *taste*. The judges carefully tasted each dish, and explained their opinions. However, another objective of this competition was to demonstrate the different *cooking-energy costs*, when these dishes were cooked on different stoves and fuels. ERC provided measurements and fuel-cost calculations for the three different ways of cooking the first dish on the gas, paraffin and electric stoves, and these were announced to the audience.

⁸ An accurate electronic balance, to measure quantities of LPGas and paraffin consumed, and an accurate integrating power meter, to measure electricity consumed by the stoves.

Based on measurements taken in this competition event, the comparative energy costs for cooking the pots of *umnqusho* (the first dish) were about

Table 13: Comparative energy costs of cooking a typical dish with different fuel types

		<i>Stove type</i>	<i>Current fuel costs used</i>
Paraffin	R4.13	Panda wick stoves	R11/litre
LPGas	R4.72	Single cylinder-top burner	R20/kg
Electricity	R0.71	2-ring hotplate	R0.57/kWh

It seems that this information came as a great surprise to many members of the community audience, particularly the dramatic difference between electric and non-electric cooking costs. The audience were also told about results from earlier APPLES tests of the costs of cooking mealie-meal using different stoves/fuels. Even though these measurements and calculations are not exact, they are representative and they indicate that households using paraffin or gas for cooking were likely to spend 3 to 5 times more for cooking, compared with households using electricity, at the current 2008 prices.

Following the success of the cooking competition in Imizamo Yethu, the Paraffin Safety Association decided to organise a similar event in the low-income community of Masiphumelele in November 2008, following the APPLES approach and asked the APPLES staff members to help with this event.

The energy costs for cooking that resulted from the competition in Msiphumelele were somewhat different from comparable results from the cooking competition in Imizamo Yethu, mainly because of respective differences between the cooking techniques of the different contestants. Even so, the trend in the comparative energy costs, using the different fuels, showed the non-electric options were still three times as expensive as electricity, at the prevailing fuel prices, re-confirming the general findings at IY.

7.2 A focus on household lighting

Across a range of “basic energy needs” scenarios (see tables 7 and 8 in section 3.2.2), it was estimated that a typical two-light household would consume about 10 – 17% of their basic energy budget (kWh/month) on lighting, and a typical 4-light household about 27 – 40%. This illustrates how **energy for lighting can be an important component of the energy budgets of lower income households**. It needs to be stressed that these estimates are based on the use of incandescent electric light bulbs, which, although much more efficient than non-electric lights such as paraffin lamps and candles, are much less efficient than compact fluorescent lamps (CFLs).

Given the significance of energy consumption for lighting, in low-income households, **ways of improving the efficiency and reducing the costs of household lighting can have important benefits**. There are simple ways of doing this, mainly through switching to more efficient lights and lighting practices; but for such changes in behaviour to take place on a wide scale, promotion campaigns and incentives may be required.

Another factor to consider, in this context, is that low-income households may be restricting their use of lights below the levels they would prefer, if they could afford better lighting. By providing options for cheaper, more efficient lighting, they can more easily meet some of this “suppressed demand” for more light (indoors and outdoors).

When households run out of money, or for other reasons are unable to carry on using electricity, they need to turn to other lighting options, such as candles. These are more expensive light sources and can be more dangerous. During electricity power cuts, the same applies. In discussions with Imizamo Yethu residents, probably the foremost concern when losing the use of electricity, whether from running out of money or from area-wide power cuts, is the loss of electric lighting.

For households in Imizamo Yethu which do not have any electricity supply, candles and paraffin lamps are mainly used. Paraffin lamps appear most common (with 95% ownership) in this group. They are generally cheaper to operate, and safer, than candles. Among electrified households, the use of candles is most common as a back-up during power cuts or other periods of electricity interruption.

The foremost poverty concerns, among households using non-electric lighting, are probably *health and safety*. Secondly, such non-electric lights are relatively *inefficient and expensive*, compared with electric lighting. The lighting efficiencies (e.g. in lumens/Watt) are very much lower than those for electric lights (about 50 to 100 times less). The result, in practice, is that when people are using non-electric lights, they are paying more, and getting much less light.

The main conclusions would be:

- wherever possible, provide for electric lighting, and where this is achieved, promote energy-efficient lamps
- try to reduce the health and safety risks arising from the use of non-electric lights, where these are the only alternatives, and consider ways of improving their useful light outputs
- advise people how to get better illumination from their lighting appliances

Although more household energy is usually spent on cooking rather than lighting, these points underline the rationale for also focusing on lighting, among the energy uses of lower-income urban households.

7.2.1 Context factors

7.2.1.1 CFL promotion campaigns

When the Western Cape experienced serious electricity power shortages, from the end of 2005 onwards, an “Accelerated Demand-Side Management Programme” for the Western Cape was introduced, in order to reduce electricity demand. One of the main measures under this programme was to promote switching to energy-efficient lights. As a relatively small community, Imizamo Yethu was not included among the lower-income residential

areas targeted for the W Cape CFL exchange programme in 2006. The IY 2006 household energy survey accordingly found only a very small proportion of households making use of CFLs in this community at that time.

However, a later CFL exchange scheme was carried out in Imizamo Yethu in 2007. We do not have accurate information about what proportion of IY households took part in this, or how many CFLs were exchanged, but community leaders have commented that “almost every house now makes use of CFLs”. This expresses a trend, but is doubtful.

As in other countries which have carried out CFL exchange/promotion campaigns, a concern in South Africa is the “reversion rate”. This refers to the proportion of households which, after trying CFLs, go back to using other types of lights. Some broad observations from a W Cape survey have been that higher-income households tend to revert from CFLs mainly because of dissatisfaction with lighting quality, while in some lower-income areas the main factors appear to be the higher purchase costs of replacement CFLs compared with ordinary bulbs, coupled with failure rates (in some cases). Workshop discussions about lighting preferences in Imizamo Yethu also raised the issues of quality of the light.

7.2.1.2 Price and availability of CFLs

The prices and availability of CFLs are important factors. They affect the decisions both of first-time buyers, and people (including those who have adopted CFLs as a result of a promotional campaign) who need to replace their lights when they wear out. The price and availability of CFLs can therefore affect “reversion rates” – especially when a household’s initial adoption of CFLs resulted from a subsidised promotion campaign.

For Imizamo Yethu residents, the *commercial* prices for buying CFLs from supermarkets, are spread across quite a wide range, depending on the make, wattage and design of the lamps, and have been varying over time.

Table 14: Indicative prices (mid to late 2008) for basic low-wattage CFLs

CFL	Supermarket price range ⁹	Approx. incandescent equivalent
11 Watt	R 14 – 24	50 Watt
15 Watt	R 24 – 30 (or R15 subsidised)	75 Watt
18 Watt	R 30 – 38	100 Watt

Many Imizamo Yethu households have adopted CFLs through *subsidised* CFL exchange opportunities, such as those organised by Eskom in 2007, and Eskom/APPLES in 2008. Such exchange opportunities tend to be intermittent and of short duration. It would seem more desirable to have facilities in Imizamo Yethu for making CFLs readily available and affordable within the community, on a long-term basis.

⁹ Standard incandescent bulbs can be bought for less than R5.

The long-term affordability of switching to CFLs, compared with the use of less energy-efficient lights, is clear cut. As a rule, the lamps use around 20 – 25% of the energy consumed by equivalent-light incandescent bulbs, and should last five times longer.

For various reasons, however, this clear-cut financial advantage may not be evident to householders. It is difficult for electrified households (low or high income) to disaggregate how much money/energy they are spending on lighting, versus other energy uses such as cooking. Secondly, it is difficult for a householder to weigh up the advantages of buying a more expensive appliance, versus a less expensive appliance which will use more energy and last a shorter time – especially when there is uncertainty about their expected lifetimes.

The CFL promotion campaigns, up to now, have tried to overcome such uncertainties by offering free or subsidised CFL replacements. From a national economic perspective, this approach is probably justified. From a sustainability perspective, there needs to be an information feedback loop, informing people about what they are saving through adoption of CFLs. This should take account of householders' qualitative lighting preferences, and recount people's actual experiences (plus energy analysis), for wider communication.

7.2.1.3 Prices and availability of non-electric lights

Candles and paraffin lamps provide for most of the non-electric lighting in a suburb like Imizamo Yethu. Gas lamps are owned by only a small number of households.

Candles are readily available, locally and from supermarkets. The purchase price, up to 2006, was about R1 per candle but, as with other fuels linked to oil prices and along with inflation, typical purchase costs have risen steeply since then and were about R2.50 per candle in the second half of 2008. The main advantage of using candles is that they are very easy to use (just lit up and let burn), but this same feature can also be the main source of danger (if the unattended flame spreads).

A **paraffin** lamp can be bought for about R25 or less. The lamps are typically manufactured using thin materials, which contributes to their low cost. The fuel costs for operating such a paraffin lamp depend, of course, on the current price of paraffin. The lifetimes of such lamps have not been studied in South African conditions, as far as known, but are probably in the order of a few years, on average.

Typical burning rates¹⁰ for open candles (no wind, standard size candle) are about 7 to 8g per hour. If a single candle costs R2.50 and weighs 70g, this means that the approximate cost of operating such a candle is about 25 cents per hour.

A typical consumption rate for a small paraffin lamp¹¹, as described above, is around 12g paraffin per hour, on a medium wick-setting. If paraffin costs R11/litre, this indicates a

¹⁰ These indicative figures are from ERC/APPLES tests.

fuel cost of about 17 cents per hour – about two-thirds of the candle cost, at prevailing prices.

Over the course of a year, supposing 3 hours of single-source lighting per night, it might cost a household about R250 using candles, or R170 using a paraffin lamp.

This is a large enough difference to recommend that non-electrified households should use paraffin lamps, rather than candles, for lighting [and in practice they do so]. In addition, paraffin lamps are generally more secure/stable, controllable, positionable and steady-burning, compared with candles.

However, there is a more dramatic comparison, between such non-electric lighting costs and electric lighting costs. A grid-electrified household can obtain basic electric lighting, at about 0.7 cents/hour (for a single CFL, providing much more light than a paraffin lamp or candle.)

7.2.2 Practical approaches taken

Based on household energy surveys in Imizamo Yethu, discussions with community leaders, activists and volunteers and specific questions related to CFL uptake, it was sufficiently established that IY households in 2008 had a demand for subsidised CFLs. Hence, an exchange scheme (to replace incandescent bulbs by CFLs) was organised together with an Eskom-sponsored CFL roll-out company, and implemented with the help of the IY APPLES team.

Safer ways of using candles were also demonstrated, in households and during community energy events.

7.2.2.1 Understanding lighting preferences and practices in Imizamo Yethu

While the Imizamo Yethu energy surveys provided some quantitative information about the types and quantities of lights used, more qualitative information about people's lighting preferences was sought through workshop and small-group discussions. However, this was not sufficiently thorough to arrive at definite conclusions which could be generalised across the entire community, and should rather be regarded as a collection of shared opinions.

Points which emerged most strongly were

- an appreciation for the energy-saving by using CFLs – but uncertainty about the extent (and monetary value) of this
- the quality of light from standard CFLs was often not enjoyed (colour, brightness) as much as normal incandescent electric lights
- higher-powered CFLs (above 11 or 13 W) were preferable

¹¹ From ERC/APPLES tests.

- the aesthetics were less pleasing, if bare CFLs were used; and many CFLs, being larger than incandescent globes, did not fit well into peoples lamps and lampshades
- the higher cost and less easy availability of CFLs would discourage people from buying new ones when an existing (subsidised or free) CFL wears out

Regarding non-electric lights,

- candles were regarded as *commonly* dangerous
- non-electric lights were considered inferior (mainly in terms of brightness) for reading, studying and similar activities at night

From energy surveys in Imizamo Yethu and elsewhere, the issue of the costs of using non-electric lights does not seem to be clearly expressed. People often respond, for example, that “candles are cheap”. This may be a fault of the questionnaire process,¹² leading to confusion between the idea that one candle can be bought for a small amount, or instead weighing up the longer-term costs of using candles, paraffin, electricity, etc. for lighting.

7.2.3 Energy-efficient and safer lighting options

For households with electricity, the main recommended practices for less expensive and more efficient lighting seem fairly clear:

- Use energy-efficient lamps, typically CFLs in a small-household setting.
- Do not leave lights on when they are not needed.

Additional recommendations could include the following:

- Avoid heavy lamp shades which obscure much of the light.
- The illumination levels are increased if the surrounding surfaces are light in colour.
- For tasks which require relatively high illumination levels, it is more efficient to use lower-power task lights which can be positioned close to the task, rather than higher-power general room lights.

For households without electricity, which require the use of non-electric fuels for lighting, the recommendations (based on the Imizamo Yethu context) would be:

- Use paraffin lamps in preference to candles.
- Keep the glass of a paraffin lamp clean.
- Where possible, hang such lamps in a secure and safe position.
- When using candles, always make use of a secure candle-holder.
- Do not place candles (or lamps) on easily inflammable surfaces or near inflammable materials such as curtains.
- Take care not to place candles in a position where they could be easily knocked over.
- Do not leave lamps or candles burning unattended.

¹² Nonetheless, this issue of **perceived expense** is highly important, affecting householders’ decisions and budgets.

- Do not fall asleep with a lamp or particularly a candle still burning.

These recommendations are largely “common sense” – but are none the less highly important practices, given the high rate of fire accidents, especially associated with the use of candles in areas such as Imizamo Yethu.

For houses with electricity supplies, but temporarily without power, for example as a result of power cuts or running out of electricity units, the same practices would be recommended as for un-electrified households. It is recognised that electrified households are more likely to use candles for occasional temporary lighting, rather than paraffin lamps, but this may not be the better choice.

8. Theme 2: Reducing energy-related hazards

Energy-related hazards are often more severe for people living in poverty-affected communities. They include such risks as health-threatening air pollution (indoor and outdoor), poisoning, burns and fires. In turn, such hazards contribute to their experience of poverty, by reducing quality of life, endangering health, shortening life, and by destroying homes, possessions and livelihoods.

However, the gravest risks in South African low-income urban settlements, for example township fires, are not just caused by dangerous energy use, but are *multi-faceted*. They are often related to people’s energy use, but are also caused or exacerbated by a wide range of other factors. This makes it even more difficult to address and reduce these risks. The APPLES project work in Imizamo Yethu focused on *energy*-related hazards, and ways of reducing these hazards, e.g. through energy safety campaigns. The main hazards that were addressed through APPLES activities were:

- **Burns.** The most serious cases of burns are usually associated with serious fires, from which individuals were unable to escape (mostly young children).
- **Paraffin ingestion.** Younger children might drink paraffin, mistaking it for water or cool-drink, especially if it is in similar bottles and within easy reach. Drinking paraffin can have serious effects, including lung damage and possible fatalities.
- **Electric shocks.** The potential dangers are greater when low-quality or damaged electrical appliances are used, where informal wiring techniques are used, and in wet household conditions (all common in some parts of Imizamo Yethu).
- **Indoor pollution.** The main dangers in Imizamo Yethu are from carbon monoxide poisoning (where flame stoves such as paraffin and gas stoves or imbhawulas¹³ are used in confined spaces without adequate ventilation), and from the smoky pollutants arising from badly-burning fuels such as paraffin (in low-quality stoves) or wood.
- **Outdoor pollution.** Not so relevant for Imizamo Yethu which sits on a mountain slope, in an area where there are usually fresh winds blowing. The situation can be

¹³ These are braziers: usually fires made in a metal drum (e.g. a discard 20 l can), often ignited first outdoors because of the smoke, then brought indoors for heating purposes.

quiet different in other geographic areas in the Western Cape (and elsewhere in the country), where outdoor air pollution is *not* taken further away by air flows. For example, many residential areas in the Western Cape and Gauteng are affected by climatic “inversion layers” at some times of year which can entrap air pollutants, aggravating respiratory disease.

8.1 Contextual factors

IY’s location on the fynbos mountain slopes makes it vulnerable to natural fires although, as far as known, virtually all the serious fires destroying Imizamo Yethu households so far have originated from causes of fire *within* the community, rather than surrounding mountain fires. The main reasons for the destructive fires seem to be the very high density of housing in Imizamo Yethu, and the fact that many of the informal shacks are partly constructed from flammable materials (mainly wood), increases the risk of fires spreading from house to house.

As mentioned several times already, while energy use is not the only cause of fires, dangerous energy use can be a strong contributing factor, both in causes of fires and their subsequent spread.

Cheap paraffin stoves are well known for their bad safety record and candles, used in both non-electrified homes and households with electricity (e.g. during power cuts), also have a bad reputation for dangerous potential to start fires. Furthermore, when households store quantities of highly flammable fuels inside, e.g. bottles/cans of paraffin, this heightens the risk of fires in the area getting out of control.

The combination of close-together flammable houses, containing stocks of high-density flammable fuels, interspersed with pine trees, difficult access for fire control services, and high winds, can lead to raging fires affecting hundreds of households at a time, as shown repeatedly in Imizamo Yethu.

8.2 Practical approaches taken in the APPLES project

- Initial discussions confirmed that energy-related hazards (especially fires) were a serious concern.
- These were further discussed in workshops.
- The Paraffin Safety Association (which also has a broader *energy-safety* mission) was asked to take part.
- The PSA made special resources available to attend workshops and demonstrations in Imizamo Yethu, and to provide energy-safety training sessions for IY volunteers, and to help conduct various community energy-safety campaigns in the area, with APPLES assistance.

The outcome of these steps are discussed in more detail in the next sections.

8.2.1 Understanding and documenting experiences and causes of fires

To understand better the causes and consequences of such hazards, IY women volunteers collected local stories about such events, which were quite harrowing, particularly when examining the physical and emotional/social damages caused to local victims of fires (e.g. burnt children and their mothers).

Regarding *causes* of fires, the stories collected by the local APPLES team cannot be regarded as a representative assessment, because they only covered about 20 events, and even in this small sample, the information was usually second-hand and might not always be accurate.

Some of the stated causes of fires were:

- candles left burning
- paraffin stoves left alight, or knocked over
- “carelessness” by the person cooking
- drunkenness
- falling asleep, while leaving a stove or candle or electric stove burning
- there are also some accounts of fires which were started deliberately.

The collected stories, and subsequent discussions, revealed the terrible *consequences* of some of the fires. Although the project helped to collect some of these stories, and helped to document them in writing, photographs and video, they are too severe to describe in a report of this nature.

The activities undertaken by APPLES under theme two, reducing energy-related hazards, were centred around the following three events:

8.2.2 Engagement with the Paraffin Safety Association (PSA)

In a joint effort with the Paraffin Safety Association, the APPLES team helped organize a community energy-safety awareness campaign conducted in the form of two one-day training workshops on energy safety issues. The purpose was to increase the understanding of energy-related hazards, how these can be reduced, and what to do in the event of accidents such as fires or paraffin ingestion. This knowledge would increase the ability of the IY APPLES team to spread advice and organise safety campaigns in their community.

Door-to-door safety campaign

The door-to-door campaign focused on areas in Imizamo Yethu where there are greatest fire risks, arising from widespread use of paraffin, lack of electricity and insecure / inflammable housing. The IY APPLES team members visited many of these households, and provided advice, information materials and demonstrated safer ways of using candles, all supplied by PSA.

A community energy safety event

The main community energy safety event was very well attended, due to previous publicity and a social character that included various forms of entertainment in-between the educational sessions.

Safety advice and demonstrations were again provided by PSA staff, including a very-dramatic and effective presentation of safety messages by an actress, who portrayed a series of hazardous household situations with possibly grave consequences.

Limitations of energy-focused safety awareness campaigns

These actions towards energy-related safety risks in Imizamo Yethu benefited from the commitment and concerns felt by the IY APPLES team, and other community leaders/members; the experience, professionalism, commitment and community-outreach methods of the Paraffin Safety Association; the participation and contributions from municipal fire prevention and safety services and the engagement of children and youth. However, it needs to be recognised that even successful energy-safety awareness campaigns are limited in the extent to which they can reduce fires and other energy-related hazards.

While directly or indirectly reaching a thousand or so individuals through the APPLES/PSA safety campaigns is a valuable contribution, the fact remains that a greater proportion of IY residents would not have benefited from increased awareness on energy hazards, and it is possible that some of the people most likely to be causers and victims of unsafe energy practices, such as household fires, are more likely to be left out of the outreach campaigns (for example, new residents, single-males, etc.).

It is also widely recognised that energy safety messages need to be repeated at regular intervals to reinforce people's consciousness about the dangers and ways to reduce them. The PSA has discussed plans with the IY APPLES team to carry on with regular safety campaign events beyond the period of the APPLES project.

Many of the fires and other causes of injury arise from "accidents" which are of course not intended. To some extent, safety awareness campaigns help to reduce accident risks. However, they may not always reach the more accident-prone householders, or be in mind when people are not fully conscious – falling asleep, or intoxicated.

A further problem that cannot be overcome by an awareness campaign is that poverty, lack of proper housing and incomplete provision of services leave households no choice but to make use of dangerous energy practices.

And finally, it is difficult to believe that an energy safety awareness campaign can, by itself, be highly successful in avoiding large-scale fire damages unless the contributory non-energy factors are satisfactorily addressed. These are primarily to do with land access, settlement planning and regulation, and provision of proper housing.

8.3 Representations towards government, municipalities and service providers

The IY APPLES team made representations to the national government when they were invited to attend a hearing of the Parliamentary Portfolio Committee (PPC) on Minerals and Energy. Part of the presentations stressed the relationship between housing conditions and land access to township fires. This event reinforced the general opinion about the DME being rather inattentive, and inactive, in this regard. During their door-to-door safety awareness campaign, the IY APPLES team helped to collect community signatures for a further petition towards government. This petition was organised by the PSA, nationally.

At the end of the APPLES project, a roundtable discussion was held with a number of invited stakeholders, including people from local and provincial government, energy service suppliers and NGOs. This provided another opportunity for the APPLES team members to express and discuss their experiences, concerns and priorities, this time to a group of sympathetic participants, many of them directly involved in services provision, environment and health, and planning strategies. The discussions led to a number of useful recommendations. It was felt that relevant departments of provincial and local government were probably better positioned to help address the cross-cutting range of energy service and housing issues implied in the plight of informal and other low-income settlements, in cooperation with energy suppliers, etc., and in cooperation with community organisations.

8.4 Necessary or desirable best practices, at planning and supervisory levels

It is recognised that a reduction in energy-related hazards in lower-income communities would require a combination of:

- (i) measures directed towards the energy users, e.g. safety awareness campaigns and promotion of safer energy choices and practices, and
- (ii) measures at planning and supervisory levels.

The latter may involve local government departments and planners, service suppliers, standards authorities, and national government (especially with respect to harmonised policy/regulatory frameworks, and national government subsidies and budget allocations) but also, importantly, local community structures and facilitators.

A summary list of necessary or desirable best practices at a planning / supervisory level, relevant to Imizamo Yethu, would include:

- **De-densification.** Houses must be further apart. Roads must be passable. Access for service suppliers (including fire control services) must be secure, and unhindered by “in-filling” shacks or low-hanging electrical cables.

- **Community-government relationships.** Some of the regulatory implications above could be politically complex, and be sources of conflicts. A trusted relationship between government authorities and representative community organisations would be a crucial ingredient.
- **Electrification and support for electricity use.** The benefits of regular high-quality electricity supplies, especially for lower-income households, have been stressed in this report. These benefits (in terms of safety and economy, for poor households) should not be under-estimated or side-lined.
- **Appropriate safety standards.** High on the list would be the effective implementation of national safety standards for paraffin stoves – combined with the availability of affordable stoves which do meet the safety standards. Safety standards for aspects of informal electrification could also be recommended.

9. Theme 3: Addressing the energy needs of marginal communities presently “left out” from mainline urban services provision

In the context of urban and peri-urban areas under the jurisdiction of a fairly strong and capable municipality such as the City of Cape Town, the groups of “marginal communities presently left out from mainline services provision” are primarily

- people inhabiting informal settlements on areas of land which have not been approved for normal services provision, such as electrification and
- “backyard shack” dwellers.

9.1 Overlaps with Themes 1 and 2, and key issues

The themes covered earlier were “Enabling Rational Use of Energy for low-income households” and “Reducing energy-related hazards”. When focusing on the particular energy needs of marginal under-serviced urban / peri-urban communities, there are strong areas of overlap with the two themes above. However, the energy service supply and planning challenges are particularly great in the case of such marginal (and often dynamically changing) groups of households. Special policy attention, planning decisions and mitigation strategies are required.

Some of the key issues which will be discussed below include:

1. Do these groups of householders have the right (e.g. politically / morally) to receive full municipal services?
2. What are the main hardships and dangers they face?
3. How do these factors affect surrounding communities?
4. What rights does a service-supply and planning authority have to withhold the provision of services?
5. What measures and approaches can maximise benefits all round?

It has to be recognised that these are extremely complex and debatable issues, but also highly important ones in situations like South Africa.

9.2 Contextual factors

The Cape Town Municipality has a broad policy of trying to provide regular infrastructure services to informal settlements, where they are considered to have taken on a fairly permanent nature, and where there are no health, danger or environmental (etc.) risks associated with living on particular areas of land. However, for various reasons, there are quite large numbers of households at any time who have built shacks on unapproved areas of land. These may be provided with a reduced level of basic services (such as water outlets and sanitation facilities) but not with more invested services like electricity.

Another rather similar grouping of households who often do not have access to full regular services are “backyard shack” dwellers. Their dwellings have an “in-fill” nature, usually within established and serviced residential communities. They may be within the property-boundary of an existing home (hence the common “back-yard” description) or at times spill over into public spaces such as roadways. The in-filling results in increased housing densities. Sometimes there are dangerous implications (e.g. greater risks of fires spreading, and greater difficulties of fire control, if houses are densely packed together and access roads are impeded). However, this in-filling is difficult to restrict, partly because communities and authorities alike recognise the very real pressures to find housing; backyard shack dwellers are quite often friends or relatives of the main household, or else valued tenants; and any interventions to restrict this practice (by municipal authorities or by community organisations) could prove unpopular and would be resisted. Typically “backyard-shack dwellers” share access to services such as electricity through informal connections to the main household, but this may be a restricted, unreliable and more costly service for these adjoining households.

In Imizamo Yethu, informal shack houses should obviously be regarded as temporary and insecure, if only because hundreds of them have been destroyed this year (and other years) in fires, affecting thousands of people. This does not imply that such affected residents consider Imizamo Yethu a temporary place of residence.

Government policies towards informal settlements appear somewhat vague, and if this is true, it probably reflects the scale of the challenges, the difficulties of meeting them, and the cross-cutting nature of meeting the challenges, involving coordinated policies and actions across a number of different government line departments.

Some urban planners, probably basing their judgement partly on the experiences in other developing countries, recommend regarding informal settlements as a permanent (if dynamic) feature of urban life, within a planning timeframe of the next few decades, and would rather emphasise possible ways of improving the living conditions and the environmental, social and economic sustainability of livelihoods in such circumstances.

The following sections focus on related energy issues. They are mainly informed by community discussions in Imizamo Yethu, and by discussions with local planners and energy suppliers. The discussions with national-level energy planners and policy-makers should be regarded as rather incomplete.¹⁴

The main sections below deal with

- electrification issues, as they affect presently under-serviced households in communities such as Imizamo Yethu
- opportunities for improved supply, use, affordability and safety of non-electric fuels, especially for households not able to use electricity

In these regards, specific context points which have had major impacts over the period of the APPLES project have been

- electricity power shortages in South Africa, resulting from growth in electricity demand and insufficient investment in new generation and distribution capacity
- very high increases in international crude oil prices, affecting the local prices of petroleum-based domestic fuels such as paraffin and LPGas

9.3 Electrification issues affecting marginal urban households

Current electrification

At the start of the APPLES project period, a significant proportion of households in Imizamo Yethu were already electrified. During the course of the project, electrification of the area continued, albeit with certain limitations (households on unproclaimed land were not eligible for electricity services, additional regular metered connections were not provided for the growing number of in-fill housing units such as backyard shacks and slow restoration of destroyed electricity supply infrastructure restoration).

Electrification subsidies

The electrification (i.e. the provision of electricity connections and meters) is subsidised. Imizamo Yethu householders in 2007 reported paying a nominal R2 charge to record their wish to be connected. However, where connection costs exceed the available national/local government subsidy for electrification in the area, households may be required to pay off the excess amounts in tariff instalments (see below).

Pre-payment meters and tariffs

The standard connections make use of pre-payment meters. They are designed especially for lower income households and aim to reduce the barriers to electricity use among poorer households consuming lower quantities of electricity. Generally, they are able to pay a flat rate per kWh (42 to 49 cents/kWh if their monthly consumption was up to 400 kWh/month, and about 65 cents/kWh if their monthly consumption exceeded 400 kWh/month), and very low or zero connection fees.

¹⁴ A few interviews and discussions took place with members of the Department of Minerals and Energy, but the levels of participation and communication were generally low in the present period.

The Free Basic Electricity allowance

The government has a policy of providing a certain amount of “free basic electricity” to lower-income households. This policy is implemented by Eskom and various municipal electricity suppliers, with some variations. In areas served by the Cape Town Municipality, households qualify for 50 kWh of free basic electricity per month, if their average electricity consumption is less than 400 kWh/month. However, only those customers with their own registered electricity meter, as recorded in the computerised system, will access that subsidy.

This means that households residing in backyard shacks or informal settlements, even though they may meet the qualification criteria, are unlikely to benefit from the FBE subsidy. A similar situation may occur when one meter is used by several households through informal extensions.

The FBE subsidy is worth approximately R30/month for qualifying households, in terms of reduced electricity expenditures. As explained below, the value of this subsidy can be far higher than this, making this subsidy an even more important social issue.

Reliability of supply

Imizamo Yethu residents have been affected, in the same way as residents in other areas, by rolling power cuts due to the national power supply system in danger of being overloaded. Apart from this, the reliability of supply experienced by particular households (this has not been quantified, except anecdotally) is likely to be less than in higher income suburbs, mainly due to the strains on the formal electricity supply caused by informal extensions.

Electricity-related safety issues in Imizamo Yethu

When interviewing local residents about fires and other energy-related hazards, the APPLES volunteers collected a number of reports attributing fires to electricity use. Occasionally this was ascribed to general “carelessness”, but in a number of cases this kind of fire-starting accident was linked to a power cut, where cooking was interrupted for a period, but the householder omitted to turn the stove off. Also related to the dangers arising from power cuts, people suggested that residents who normally rely on electricity would have less experience with using back-up alternatives, such as candles (compared with households regularly using non-electric fuels), and this increased the risk of fire accidents occurring.

Access to electricity vending stations

The accessibility of electricity vending stations (places where one can purchase pre-payment electricity coupons) is considered a problem for Imizamo Yethu residents. At present, the nearest electricity vendors are in supermarkets in central Hout Bay. This is beyond reasonable walking distance, and requires additional expenditure on taxi fares.

9.4 Benefits of service-suppliers and planners engaging with “informal electrification”

The benefits of extending affordable electricity supply to the poor have already been stressed several times (electricity being the cheapest and safest energy option which can significantly improve a household’s quality of life). Achieving those benefits for poor households that do not enjoy the benefits of formal electrification requires engagement of both service providers, policy makers and planners.

In areas like Imizamo Yethu, the dominant approach by the Electricity Department of the Cape Town Municipality appears to be a combination of tolerance and non-involvement. If the municipality were to become more directly involved in informal electrification practices, the options could range from relatively “light” interventions (focusing on safety and security issues around informal electricity connections and outdoor wiring) through to some forms of partnerships or assistance for informal electrification.

In the latter case, the electricity supply authority might find itself in a difficult situation, possibly at odds with a policy / regulatory environment which does not officially condone such informal electrification. However, should such regulatory hurdles be overcome, some of the options for a more direct engagement between electricity authorities and local groups of people involved in informal electrification include:

- the authority selects and approves materials (e.g. cables, switchgear, protection devices, etc.) for use in informal electrification, and possibly assists economical, regulated procurement channels for these supplies
- training courses are made available for local electricians
- the authority provides formal supply nodes for small-area informal (perhaps temporary) electricity distribution networks
- community groups are assisted to form small-area electricity distribution groupings, co-ops, etc., from such supply nodes

An important point here, affecting electricity supply and planning policies, is that if the major pro-poor strategy is to maximise regular *formal* electricity supplies in all urban settlements, opportunities for improving the safety and security of existing informal electricity distribution may be sidelined. This needs careful consideration by planners and electricity supply experts – again, preferably with community participation.

9.5 Metering and payment options

An obvious potential improvement for Imizamo Yethu residents is to set up local vending stations for the sale of electricity pre-payment coupons within the community, preferably in a few places, safely accessible for adults and children, and open at regular hours during the days and evenings.

This is not a simple objective. Electricity vendors need reliable computers and security for cash flows, storage and transmission of money. At present, Imizamo Yethu residents depend on outside supermarkets and garages for buying electricity tokens. These have the infrastructure required.

Regarding metering, a strong request from IY representatives was that, in situations where several household units at present share a single metered supply, they would prefer each household unit to have their own “box” (pre-payment meter). As far as known, the present regulations in this regard might need to be adjusted, if it is feasible to meet this request. If not, another possibility could be the provision of in-line Watt-hour meters.

9.6 Improved supply, use and affordability of non-electric fuels and appliances

9.6.1 Improved supplies of fuels

There is some scope for improved supplies of non-electric fuels for households without electricity, in an area such as Imizamo Yethu. In general, however, the scope for such improvements is rather less than in some rural areas, where fuel supply chains are longer and local choices are more limited.

There could be some scope for a more regulated, community-oriented paraffin supply station, mainly to do with fuel quality, and packaging. If paraffin becomes contaminated with water, or with other fuels like petrol, this can cause damage to appliances or in the latter case introduce explosion risks. A safe and clean local paraffin bottling facility, making use of specialised safer containers (e.g. clearly marked, visibly different from “cooldrink bottles” and with child-resistant safety caps, as promoted by the PSA), could reduce such hazards. Alternatively, local shops selling paraffin could be incentivised to follow such practices themselves.

At present, paraffin is the most accessible fuel, so much so, that sometimes even electrified households make use of a more dangerous and more expensive fuel, because it is more easily obtained (available in their neighbourhood shops as opposed to electricity re-charges available only at supermarkets and gas stations in towns).

This contrasts also with LPGas, where there have at times been supply bottlenecks (e.g. due to oil refinery outages, and increased demand) making it difficult to obtain gas re-fills, for periods of time. The impacts of LPGas supply problems have probably not been experienced as severely by Imizamo Yethu residents, compared with some other lower-income communities in Cape Town, since the usage of LPGas in IY is low.

The *local availability of LPGas* may be a constraint on wider utilisation of this fuel, which is generally regarded as statistically safer and more convenient to use than paraffin. However, the questions of its *affordability* to lower-income households, and *perceptions* that it can be more devastatingly dangerous, in event of accidents, probably predominate in this three-way equation.

The South African government has shown mainly ambivalence about whether to promote and support the use of LPGas among lower-income non-electrified (or electrified) households. As a result, it seems the following national-level issues have not yet been resolved:

- Is LPGas a viable fuel for the poor, in South Africa?
- Is there price-fixing in the industry?
- Should greater price regulation be introduced, and would it be beneficial?
- Would subsidies be justified?

Questions about the value of developing improved supply and accessibility of LPGas supplies in an area like Imizamo Yethu are affected by such higher-level national policy and industry issues.

9.6.2 Improved non-electric appliances

There is clearly scope for improving the quality, safety and performance of locally available non-electric appliances.

The most urgent requirement is for the ready availability of safer, affordable paraffin stoves, which comply with national safety standards – and which at the same time meet the typical cooking requirements of lower-income householders. Some of the recommended features required here are:

Safety features

- greater stability
- good extinguishing mechanisms stove being knocked over
- no paraffin leakage
- safer filling mechanisms
- safe temperature limits maintained
- clean-burning
- clear, high-quality instructions for proper use

Performance features

- adequate maximum power
- adequate and easily controllable turn-down ratio
- adequate efficiency
- sufficient tank size

Affordability features

- affordable purchase prices
- durable construction
- adequate fuel efficiency

The main recommendations for improved, affordable LPGas stoves would be:

- adequate maximum power delivery and controllable turn-down ratio
- the ability to turn down to a simmering rate
- non-slip cooker tops
- clear, high-quality instructions for proper use

9.6.3 Comments on “Free Basic Alternative Energy”

In principle, the *national government* has a policy of providing a “Free Basic Alternative Energy” subsidy (FBAE for short) to poor households who do not have electricity, and who accordingly do not benefit from the government’s “Free Basic Electricity” (FBE) subsidy. However, this policy does not have clear implementation guidelines and few sporadic examples of its application exist.

Some of the difficulties and challenges which would be faced by the City of Cape Town municipality, in attempting to implement the national FBAE subsidy policy, would include the following:

- *Identifying eligible (unelectrified) households for pro-poor energy subsidies*
- *Efficient, transparent administration of FBAE subsidy payments*
- *Possibilities for closer arrangements between local community structures and municipal authorities, in implementing an FBAE subsidy policy*

It is understandable that the dominant approach of the Cape Town Municipality is to focus on the upgrading of informal settlements, addressing the housing backlog, and in this process bringing full standard basic services to “all households”. However, as suggested earlier in this report, it is very likely that there will continue to be marginal communities left outside the practical scope of these efforts, and if so, their energy problems will remain more severe.