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GENERAL MANAGEMENT ASSISTANCE CONTRACT (GMAC)

Contract No: 674-C-00-01-00051-00

Liquid Petroleum Gas and Black Entrepreneurship Empowerment Project

Contract or Grantee number: 0134-1203-G-GA40

Partners for Sustainable Energy and Environmental Solutions

International Institute for Energy Conservation (IIEC-Africa)

This report was produced for review by the USAID. It was prepared as a performance milestone under Mega-Tech, Inc.'s prime contract. The contents of this report address activities performed under USAID/South Africa's Strategic Objective No. 6: Increased Access to Shelter and Environmentally Sound Municipal Services

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Activity Summary and achievements:

Two projects were proposed under this grant. The Liquid Petroleum Gas (LPG) Project aimed to actively transform within low-income residential communities through education, training and practical implementation in view of promoting the uptake of LPG as an alternative fuel. The BEE project aimed to support Black Economic Empowerment (BEE) Energy Services Companies (ESCos) in the Electricity Supply Industry and the residential construction industry to gain access to and participate in the various Demand Side Management (DSM) and residential thermal improvements.

With a focus on the LPG project, the aim was to develop, pilot and evaluate a model for increasing the uptake of LPG as an alternative to coal and paraffin among low-income households. The primary motivation for this is the need to improve indoor air quality in low-income households, thus mitigating the severe health impacts arising from current energy usage patterns. Secondary beneficial outcomes of a switch to LPG include: improved energy security by delaying or offsetting potential future increases in residential electricity demand; reduced greenhouse gas emissions; improved local environmental conditions. The final Report provides detail on the progress made and findings from this pilot project.

The aims of the BEE project were to gain a thorough understanding of the barriers to, and opportunities for, BEE ESCOs to become established in the market for providing thermal energy efficiency services in the residential sector, and to propose models and mechanisms for facilitating their establishment. The final Report provides detail on the progress made and findings from this pilot project.

Contents of this report:

1) Final Report: Switching from Paraffin and Coal to LP gas in low-income households of South Africa (Nov. 2005);
2) Final Report: Opportunities for Black Ecomomic Empowerment Enterprises in the Field of Energy Efficiency (Nov. 2005); and
3) Narrative Progress Report (FY2005);

GMAC Grantee Annual Narrative Report

Grantee _International Institute for Energy Conservation - Africa

Agreement No. _0134-1103-G-GA40

Report for the period:

☐ **October 1, 2004 through September 30, 2005**

Two activities are covered under this Grant Agreement:

1. Black Economic Empowerment Energy Efficiency Enterprises
2. Switching to LPG in low-income households

These are dealt with separately below.

Black Economic Empowerment Energy Efficiency Enterprises

This program is designed to capacitate, train and develop Black Economic Empowerment Enterprises in the implementation of demand-side management (DSM) and energy efficiency programmes. It furthermore seeks to evaluate where in the value chain of DSM activities, BEE firms could be most effectively involved. The Energy Service Company (ESCo) market has seen rapid growth recently, driven primarily by ongoing calls for project from Eskom Demand Side Management and interest garnered through IIEC's activities during this project. The urgent need for DSM is based on integrated energy plans from the utility indicating the additional electrical generating capacity will be required within 4 years. The long lead times for bringing supply side options on line highlights the urgency in getting demand side initiatives, with the inclusion of a strong black empowerment contingent, underway. Although ESCos and BEE ESCos in particular have made only minor inroads into this market traditionally the domain of utilities and large electrical customers, the notion of outsourcing energy management to third parties is steadily gathering momentum.

During the current period, a detailed survey of the current SMME / BEE ESCo sector in South Africa was carried out. This survey aimed to determine: the market segments that informants are currently active in, and are interested in entering; a skills and management profile of the existing ESCos and potential ESCos; their perception of their skills and managerial needs; their current sources of income and of project finance; their experiences of and difficulties with obtaining finance; their perception of the opportunities currently available in the market for energy efficiency services, and the barriers to exploiting those opportunities; their insights into the kinds of initiatives, incentives and interventions that would overcome these barriers.

Twenty responses to the survey were received, representing a response rate of 33.3%. The general consensus was that the main challenges facing SMME / BEE ESCOs are:

- lack of financial support to develop new business opportunities
- lack of technical skills, particularly in the area of energy auditing
- inadequate awareness of energy efficiency opportunities among the target market
- large investment in time and effort needed before prospective projects are accepted by Eskom as DSM projects

Following the completion of the survey, IIEC has entered into closer relationships with two smaller ESCOs. Under these relationships, the ESCOs will work under contract to IIEC, to develop a strong working relationship with their local municipalities, and draw up a detailed assessment of the opportunities for smaller ESCOs to partner with municipalities in the delivery of the energy efficiency components of housing developments.

Switching from Coal and Paraffin to LPG in low-income households

The aim of activities in the current period was to seek community involvement in identifying the types of approach that are most likely to succeed in raising public awareness about LPG, and persuading the public to consider LPG as one component of the portfolio of energy options at their disposal and to test different approaches in the field, which will inform the process of designing a comprehensive awareness programme. Following the scoping exercises that took place towards the end of FY04, the following conclusions were drawn regarding the optimum targeting of activities to the low-income residential sector:

- While affordability and availability of LPG are significant issues that are currently inhibiting its uptake by low-income households, the biggest barrier is fear. Although this fear is based on unfounded rumours and hearsay, the fear itself is genuine. Many householders reported that they perceive an LPG cylinder as 'a bomb waiting to go off'. Until the fear of LPG can be overcome, efforts to improve the affordability and availability of LPG will not result in significant uptake.
- A phrase often used in the scoping meetings by low-income householders is that 'they believe what they see'. Hence by far the most effective way of influencing them is through the use of practical demonstrations offering hands-on experience.
- The use of dramas to illustrate important issues was widely regarded as very effective. Dramas have been utilised previously in many cases, for example in raising awareness of HIV/AIDS and also in the 'Basa njengo Magogo' project to promote a cleaner burning technique for preparing coal fires.

A series of demonstration events were therefore held in the Orange Farm / Fine Town communities in Region 11, Gauteng Province, backed up with a drama created and performed by the fieldworkers. These demonstrations were designed to be held in public places such as clinics, churches[1], schools, community centres etc. Originally six demonstration events were planned, but the early events proved so successful that more were arranged, mainly in response to specific requests from local community groups. In total, eleven demonstration events were held, with the drama being performed at two of the demonstrations in schools.

A total of more than 1,000 members of the public witnessed the demonstration events, but of more significance is the number who were 'actively engaged', meaning that they entered into conversation with the fieldworkers and requested more information. Approximately 600 members of the public actively engaged with the demonstrations, and left contact details where they could be contacted in follow-up activities. A sample of these households are currently being contacted to determine the impact that the demonstration events have had on the populations exposed.

Because of the limited availability and affordability of LPG in the regions where the demonstrations took place, few respondents have immediately adopted LPG on the basis of having seen the demonstrations. However, preliminary results indicate that the demonstrations have had a significant impact in overcoming people's fear of, and unfamiliarity with LPG. About 90% of respondents commented positively on the demonstration events, and it is estimated that at least 30% of respondents (i.e. 180 households) were sufficiently affected by the demonstrations that they have expressed a definite intention to adopt LPG at some time in the near future.

During and immediately following the demonstration events, considerable effort was put into working alongside the LPG industry to develop common actions to promote the adoption of LPG in low-income households. A very good working relationship has been developed with both the LPG Safety Association of Southern Africa (LPGSASA – the industry body representing the LPG suppliers), the LPG supply companies and the suppliers of LPG equipment[2]. To date it has been difficult to develop common actions,

[1] Although the original plan had been to use churches as a venue, preliminary investigations indicated that they were unsuitable. The reason for this is that the available time-window is very narrow; churchgoers do not tend to spend significant amounts of time outside the church either before or after the service. This contrasts with clinics, for example, where patients queue for a considerable time, constituting a 'captive audience'.

[2] Useful in-kind contributions were offered by all three of these stakeholders: LPGSASA offered the services of their training manager to assist in training the project fieldworkers; CADAC provided the project with cylinders and cookers; gas, cylinders and cookers were provided by SafetyGas, EasiGas and AFROX. The money-value of these in-kind contributions is estimated at approximately US$2,000.

as the LPG supply companies have preferred to pursue their own individual approaches[3]. However, IIEC, through its sub-contractor Dikepolana Resources, has been directly involved in BP's pilot programme in eastern Soweto. BP has adopted IIEC's approach of community-based demonstration events in its entirety for promoting their pilot programme, as a result of which approximately 3,000 households will adopt LPG. Of course, even without IIEC's approach, BP would probably have reached these households eventually, but it is certain that the IIEC model has greatly speeded up the achievement of their target. Furthermore, many of the fieldworkers that IIEC has capacitated as part of their LPG programme are now actively involved in the BP pilot, and are in turn passing on their skills and expertise to local Sowetan young people.

Over the same period, IIEC has worked closely with the LPGSASA in its efforts to engage the support of the DME in promoting the adoption of LPG as a safer and cleaner residential fuel. One particular success from IIEC's perspective is that it has been invited to sit on the LPG Interface Panel[4], which was developed as a regular forum between LPGSASA and DME at which issues pertaining to LPG as a residential fuel could be discussed. IIEC has also been invited to speak at the LPGSASA Annual Conference in November 2005, and to participate in a workshop on Cooking Fuels in Low-Income Households, being conducted by UNDP, also in November.

In my capacity as the grantee agent, I hereby certify that to the best of my knowledge, the above information is accurate.

Authorised Signature: _____

Date: _____

[3] As an independent and impartial NGO, IIEC must be very circumspect in entering into an exclusive agreement with an individual supply company. Common actions are therefore the most appropriate way for IIEC to support the adoption of LPG.

[4] The Interface Panel currently comprises DME, LPGSASA, IIEC and GVEP.

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SWITCHING FROM PARAFFIN AND COAL TO LP GAS IN LOW INCOME HOUSEHOLDS OF SOUTH AFRICA

Final Report

Prepared for:

USAID

Prepared by:

Ian Household

IIEC - Africa

Date:

November 2005

CONTENTS

1 INTRODUCTION

This report is the final report for the project 'Switching from Paraffin and Coal to LP Gas in Low Income Households of South Africa' (Grant Agreement 0134-1103-G-GA40). Section 1 provides a brief background to the project, describing the current energy situation facing low-income households, the status of LPG in South Africa and the aims of the project. Section 2 describes the scoping activities that took place, which chiefly took the form of interactions with key community-based and national stakeholders. Section 3 summarises the core of the project, namely the implementation of a pilot awareness-raising and familiarity-building programme, aimed at demonstrating and testing a set of approaches to enhancing the acceptability of LPG among low-income households. Section 4 draws conclusions from the project activities, and makes some recommendations for the way forward.

1.1 Background

The South African economy is characterised by a huge disparity of income and living conditions between different social groups. This is particularly evident in the case of household energy use; high-income households use electricity for all their energy requirements and possess a wide range of modern energy-using appliances, while low-income households must use a range of polluting fuels to meet their thermal energy needs, either because they do not have electricity at all, or because it is too expensive to use for anything other than lighting and communications.

The most commonly used fuel for thermal needs (cooking, water heating and space heating) in low-income households is paraffin. This may be used either in a simple wick stove costing only a few tens of Rand, or in pressure (Primus) stove. In some parts of the country, coal is readily available and, when winter temperatures at night create a significant demand for space heating, householders switch to using coal instead of paraffin. Both of these fuels cause severe indoor air pollution, leading to greatly elevated levels of respiratory disease, particularly in children. Paraffin is also responsible for many thousands of fires each year, particularly when it is used in cheap and sub-standard wick stoves. In addition, there are many incidences every year of paraffin poisoning in children, because paraffin is often stored in old soft-drink bottles.

Liquefied petroleum gas (LPG) has the potential to meet the thermal energy requirements of low-income households in a safe, convenient and non-polluting way. However, the uptake of LPG in South Africa is very much lower than in comparable countries, indicating that there are significant barriers to its adoption, which should receive special attention if LPG is to form part of the solution to the energy problems of South Africa's low-income households.

Barriers to the adoption of LPG can be conveniently divided into three categories: accessibility, affordability, acceptability. Accessibility and affordability are closely linked, in that supply chain issues inhibiting access to LPG also tend to push up the price, so rendering it unaffordable for low-income households (see Section 1.2 below). However, perhaps a bigger barrier to affordability is the price of the associated equipment required to use LPG, rather than the price of the fuel itself. Some of the feedback from community members who participated in the scoping meetings of this project suggest that they do not perceive LPG itself to be particularly expensive, but are inhibited from adopting it by a combination of fear and an inability to afford cylinders and stoves.

The low level of acceptability of LPG among householders is made up of several factors, of which the most important is fear. Other components of the current low acceptability of LPG include:

- an aspiration to 'graduate' to the use of electricity, which leads to a perception that any efforts to persuade householders to use other energy carriers are merely efforts to fob them off with an inferior service
- the difficulty of gauging the amount of fuel remaining, leading to a worry that fuel may run out in the evening, part-way through the preparation of a meal.

However, these other factors are relatively minor compared with the fear of LPG experienced by many households. This fear is almost entirely based on hearsay and rumour, as official statistics show that LPG is in fact two orders of magnitude safer than paraffin[1]. However, the fact that the fear felt by householders has no statistical basis does not make it any less real. Simply informing households of the true safety statistics of LPG versus other energy carriers is therefore unlikely to yield significant results.

1.2 The LPG supply chain

One barrier inhibiting the adoption of LPG is the complexity of the supply chain relative to that of paraffin. Distributors require bulky, specialised equipment to handle it, and must also undergo training to enable them to operate safely. This makes it difficult for a dense network of small, local distributors to become established. As a result, potential end-users of LPG will often face a long journey carrying a heavy cylinder. By contrast, paraffin is usually available in small quantities from a wide range of locally accessible stores.

The retail price of LPG is unregulated and, largely because of the complex supply chain, there is an exceptionally high ratio between the retail price and the refinery gate price. In June 2005, the refinery gate price of LPG was approximately R 3.64 per kg[2], while its retail price was as high as R 12.00 per kg[3]. By comparison, the regulated retail price of illuminating paraffin is only about 1.8 times higher than the refinery gate price[4]. The Department of Minerals and Energy (DME) recognise that this situation is unsatisfactory, but have held off from introducing retail price regulation for LPG, preferring instead to allow the LPG industry the opportunity to address the issue of LPG affordability:

> "You [the LPG industry] have indicated a need for an affordable gas market price. Price Regulation, as you know is being investigated to make LPGas more affordable. We would prefer a market driven solution. But in all these years the market has not delivered to the communities. So unless that changes soon, we will have to do something." [5]

In any case, it is difficult to see how the introduction of retail price regulation alone could increase the adoption of LPG. Firstly, the most likely result of price regulation would be to reduce the availability of LPG, as existing retailers find it no longer a viable business to sell it. Secondly, the greatest barrier to the adoption of LPG is the high price of the end-use equipment (including the cylinder, which must either be purchased outright or acquired through the payment of a deposit), rather than the price of the fuel itself.

The supply of LPG is governed by regulations that restrict the number of supply options available to end-users. Smaller cylinders (up to, but not including 9 kg) are owned by the customer and, when they are empty, are taken to an LPG retailer, who refills them using their own equipment. The retailer usually keeps a number of 48 kg cylinders at its premises from which it fills the smaller cylinders.

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1 Lloyd (2002). Although the data is normalised per tonne of fuel used, it must be remembered that much of the current domestic LPG consumption is for outdoor recreational use, where the potential for injury and damage to property is much less. However, it is still almost certainly true that, tonne for tonne, LPG is considerably safer than paraffin under normal conditions of use.

2 www.shell.co.za

3 In November 2004, Springbok Hardware in Fine Town was selling a 4.5 kg refill for R 54.30, not including the cost of the cylinder itself. In larger volumes, the price per kg fell to about R 7.72 (see Table 1 below).

4 In early 2004, the retail price was 339c/l compared with a refinery gate price of 186c/l. (See for example http://www.dme.gov.za/newscentre/media_rel/media_27_feb_04.pdf)

5 Mlambo-Ngcuka (2004).

Larger cylinders (9 kg and above) remain the property of the gas company, with the customer paying a deposit for their use. When empty, they are taken to the retailer, who simply swaps the empty cylinder for a full one, charging only for the gas it contains. These larger cylinders are all filled centrally at the gas company depot and distributed full (and sealed) to the retailer. Table 1 below lists the costs of various cylinder sizes charged at a retail outlet in Fine Town, Gauteng Region 11, in November 2004.

Table 1 Typical costs for LPG cylinders and refills

Size	Price for fill	Price of cylinder
1.4kg (#3)	R 15.80	(buy) R 185.00
3.0kg (#7)	R 35.80	(buy) R 285.00
4.5kg (#10)	R 54.30	(buy) R 345.00
9kg	R 74.20	(deposit) R 75.00
19kg	R 156.00	(deposit) R 75.00
48kg	R370.50	(deposit) R 75.00

Source: Springbok Hardware, Fine Town

The relatively high purchase price of the smaller cylinders acts as a significant deterrent to the adoption of LPG by households. An empty 4.5 kg cylinder costs about R 345 to buy, compared with a deposit of only R 75 for the larger cylinders. However, the larger cylinders are not feasible for lower income households because of the difficulty in budgeting for the large lump sum that must be paid for a full cylinder (by law, cylinders must not be partially filled). A notable feature of coal and paraffin usage is that households are able to purchase a single day's worth at a time, whereas a 9 kg LPG cylinder may represent up to a month's worth of fuel.

1.3 Project aims and objectives

The aim of the project reported on here was to develop, pilot and evaluate a model for increasing the uptake of LPG as an alternative to coal and paraffin among low-income households. The primary motivation for this is the need to improve indoor air quality in low-income households, thus mitigating the severe health impacts arising from current energy usage patterns. Secondary beneficial outcomes of a switch to LPG include: improved energy security by delaying or offsetting potential future increases in residential electricity demand; reduced greenhouse gas emissions; improved local environmental conditions.

2 SCOPING ACTIVITIES

2.1 Initial contact with the target communities

Two communities were selected for the pilot project: Orange Farm and Fine Town. Both of these communities are situated to the south of Johannesburg in Region 11, within the City of Johannesburg municipality, but separated from the main conurbation of Johannesburg by about 40 km. The isolation of much of the region from the rest of Johannesburg, particularly the southern-most suburbs where this project was targeted, has led to a paucity of infrastructure and of employment opportunities. Out of a total population estimated to be 270,000 about 70% are officially recorded as unemployed[6].

According to the 2001 census[7], these neighbourhoods are predominantly black African, dwelling equally in formal and informal settlements. Many extensions in these areas are not yet electrified and lighting sources continue to be candles and / or paraffin. Even in electrified areas, the regularity of outages to the supply, combined with the high cost of electricity, result in cooking and water heating predominantly with paraffin, or coal during the winter months. Half of the households in the region do not have a regular monthly income, but for those that do, the annual household income is in the range of R 4,800 – R 19,000.

There were a number of reasons for selecting these communities as the targets for this project. Firstly, they have not yet experienced the 'donor fatigue' of many other localities such as Soweto and Alexandra. Secondly, being situated on the main N1 arterial route between Johannesburg and Bloemfontein, the heavy air pollution, especially from coal use in winter, is highly visible. Thirdly, and most importantly, members of the project team had already been involved in a number of previous energy-related initiatives in these communities, with the result that there existed a network of community members with experience and knowledge of household energy issues.

Initial scoping meetings were held with a range of community-based stakeholders during May 2004, with a view to developing local contacts, introducing the project and seeking feedback on the proposed approach. Brief summaries of the meetings held are provided in the following sections.

2.1.1 Greater Johannesburg South Metropolitan Centre, Environmental Health Division

Mr Jabu Sithole, director of the Environmental Health Division of the Greater Johannesburg South Metropolitan Centre, gave an introduction to the local government structures and initiatives relevant to the project. The office of the Environmental Health, Region 11 falls directly in the leadership of the Greater Johannesburg South Metropolitan Centre. Hence all developmental and other initiatives should interface with this office, to be able to filter down to the level of councillors, ward committees and hence the community at large. It is at this office where information to the actual structure of leadership, as well as information pertaining to past initiatives, successes and areas of interest can be found. Mr Sithole's office spearheads and supports all developmental portfolios that integrates environmental concern in the area.

The Region 11 has six mayoral priorities, which are:

- Good governance / customer care / Batho pele
- By-law enforcement and crime prevention
- Economic development and job creation
- Service delivery excellence
- Inner City

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6 City of Johannesburg Official Website (http://www.joburg.org.za)

7 See http://www.statssa.gov.za

- HIV/AIDS

Of these priorities, the current project could fit within priorities 3 and 4.

After presenting a brief introduction to the project, the project team were informed of the Region 11 Environmental Health Division's previous involvement in matters and studies pertaining to indoor air pollution, as well as with MRC on respiratory illnesses. Mr Sithole acknowledged that there is growing demand for energy; and that there had been an LPG pilot project at some stage in the past, but the major problem has always been accessibility and perceived safety issues. Mr Sithole mentioned that the community level of awareness to respiratory illness is increasing, and added that that can be reinforced by information to the lower grades in schools. He also mentioned that the public are increasingly using LPG as the energy source for ceremonial activities (weddings, funerals etc.), but that this has not translated to significant adoption for domestic use. He was of the opinion that suppliers are very much aware of these unserviced markets.

Mr Sithole went on to explain exactly how his office fits into the whole structure, highlighting in particular the route through which community members are informed of, and can provide feedback on, the projects and activities in which local government is involved (see Figure 1 below). Mr Sithole cautioned that there is a perception within communities that benefits of government initiated projects never filter down to the beneficiaries because they fail to adhere to proper communication channels. He clarified the role and mandate of the councillor as that of taking care of the health and welfare of the people, while having a developmental focus.

Mr Sithole closed the meeting by inviting the project team to present the project as part of the agenda on World Environment day (2nd June 2004) within the environmental activity week of 31st May – 5th June, 2004. These activities will be concentrated in Fine Town, which is one of the areas chosen for piloting this project.

2.1.2 Orange Farm Councillors' Office

The project team met with Councillor Alina Mahlangu and her personal assistant, Mr Amen Khumalo. After a brief introduction to the project, Councillor Mahlangu gave an outline of the structure of the ward committees. The City of Orange Farm has 4 wards and hence 4 councillors, each ward having a 10-member ward committee. Each committee member holds a different portfolio (e.g. housing, agriculture, NGOs, sports, religion, business, women, health and education). Subject to her availability, Councillor Mahlangu agreed that the project would benefit greatly from her presence at the National Stakeholders meetings, with two briefs: first as a representative of the Orange Farm leadership, and second as a representative of the household sector with an understanding of the issues around LPG and its uptake. As an aside, it transpired that Councillor Mahlangu had owned an LPG cylinder for years, but finally gave it away as she never used it, due to fear of LPG. She also mentioned that her area has since enjoyed the benefits of a free-basic electricity system since February 2004, which may affect the attractiveness of LPG to those households who receive it.

2.1.3 Springbok Hardware, Fine Town

A meeting was held with Joe Haata, the manager of Springbok Hardware in Fine Town. Mr Haata supplies a range of energy services, including retailing LPG. Sales typically range between 200 kg and 400 kg per week. Their supplier is Easigas, obtained from Vaal Gas in Vanderbijlpark, with whom they are very satisfied. Other energy services provided by Springbok Hardware are the retail of coal (in bags of 30 kg or 10 kg bag) and battery charging for radio, TV and welding, at a rate of R 4.50 per charge, which typically lasts for about 5 days. Springbok Hardware also sell a range of paraffin and LPG stoves, as well as lamps and space heaters. They also provide spare parts for, and basic maintenance of LPG equipment. Along with the shop next door, which sells paraffin, Springbok Hardware could be described as an integrated energy supplier.

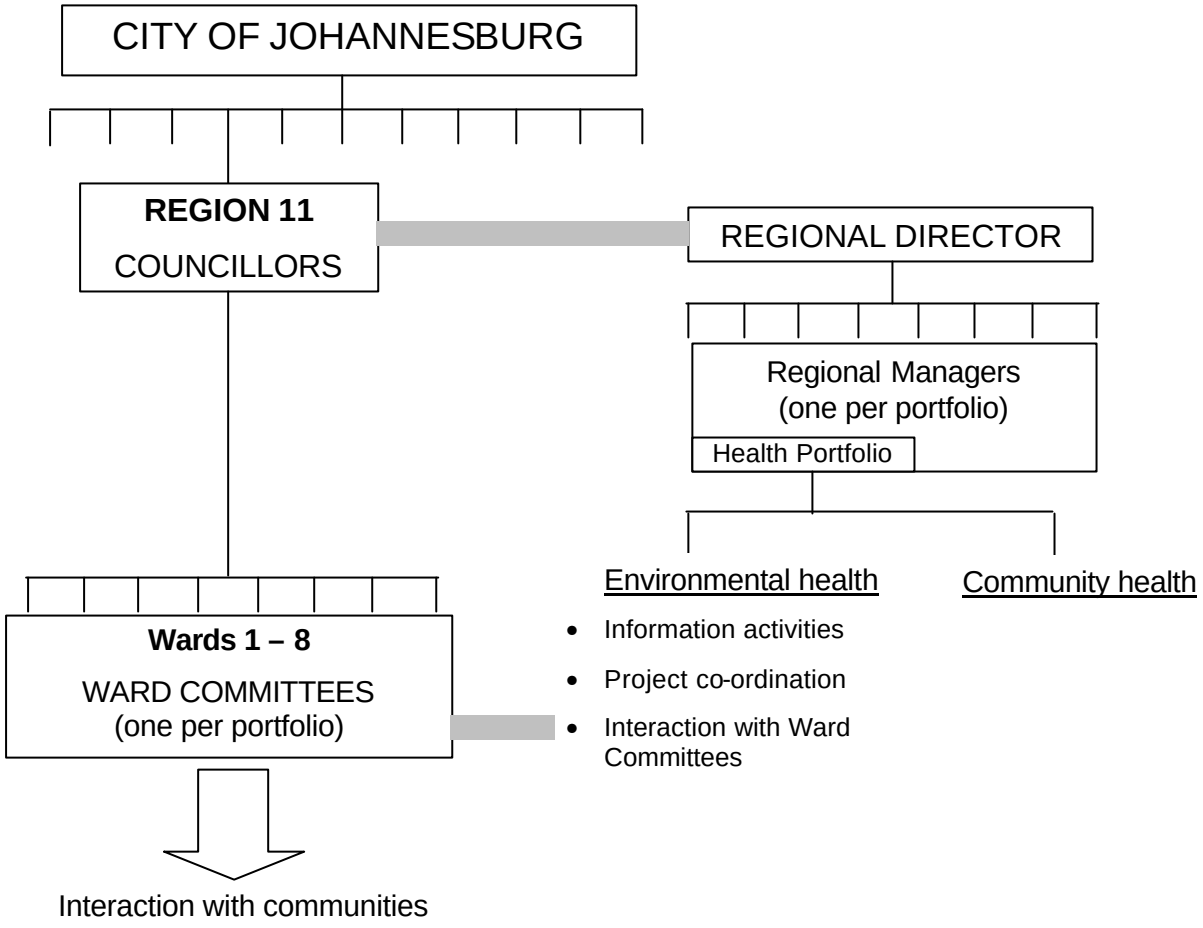

Figure 1 Local government structures relevant to the context of this project

Mr Haata expressed interest in the issues around the distribution and usage of LPG, and gave useful insights regarding the areas of attention to realise its effective promotion. Power failures and outages were some of the problem that persists in the area, and that is the time when alternatives are needed most. His opinion was that, with regard to LPG, the main focus of promotional activities should be educating the public on the safety measures. He said there is growing interest and application of LPG for lighting, but there is a need for wider dissemination of information.

2.1.4 Community representatives

The project team met with community members in both Fine Town and Orange Farm, who had previously been involved in energy-related activities supported by the Department of Minerals and Energy (DME). These were an energy baseline study, and a demonstration project for the 'Basa njengo Magogo' top-down method for lighting coal braziers.

In Fine Town, the project team met with Jabu Mokgotho and Brenda Khumalo, two young and enthusiastic community members with a real interest in any energy / environment / development initiatives taking place in the community. The team met with them to establish their role in, and understanding of the project, with a view to engaging them as part of the reference group representing the community as a whole. The project was explained to them, and after that they were given an assignment to find out more about the status of LPG uptake, usage and issues in Fine Town, in both electrified and non-electrified areas.

In Orange Farm, the project team met with Forward Community Project, which was established as a result of the previously mentioned DME energy initiatives, and is now in the process of registering as an NGO. The group comprises twenty members who work voluntarily, without any

form of funding or support, in the care of tuberculosis out-patients, providing them with home-based care and care-giving for bed-ridden patients. They have decentralised points within the community, and have one central office at one of the church premises in the area. The group were keen to become involved in the project, whilst continuing with their own voluntary work.

The group present a unique opportunity of people already involved with the community and addressing the pressing health and related needs, whilst at the same time having enough background regarding energy use patterns in the area, due to their previous involvement in the DME projects. They viewed this project as a natural continuation of the previous DME project, which focused on smoke reduction and reducing the related pollution and health impacts. As in the case of the Fine Town community members, this group were asked to learn more about LPG, its usage in the area and the issues around its uptake.

2.2 National stakeholder identification and engagement

A database of national stakeholders was compiled, whose guidance and expert input would be sought in conducting the project. Involvement of these stakeholders would also ensure that this project complements other initiatives in progress. The stakeholder database is presented in Attachment 1. Members of the stakeholder database were invited to attend a meeting at the IIEC offices, with a view to soliciting their views and guidance on the development of pilot LPG promotion activities. Meeting participants were as follows:

Ronald Chauke (Department of Minerals and Energy)

Ntombifuthi Nkosi (Environmental Health, Region 11 Johannesburg Greater South Metropolitan)

Tieho Makhabane (Dikepolana Resources)

Jason Schäffler (IIEC-Africa)

Kevin Robertson (LPG Safety Association of Southern Africa)

Thomas Phooko (Department of Minerals and Energy)

George Mosiuoa (Totalgaz)

Charles Nkabinde (Easigas)

Apologies were received from Councillor Alina Mahlangu, Orange Farm Ward 2.

The meeting commenced with the observation from Jason Schäffler that this project would focus mainly on building acceptability, but that sensitivity to ongoing activities in enhancing accessibility and affordability will be critical in the design of campaigns to enhance awareness and build familiarity. Participants then introduced themselves along with their organisational affiliation and interest in the project.

Tieho Makhabane outlined the activities already undertaken in the community and detailed those envisaged. She outlined the community selection criteria and process. One of the primary reasons for the choice of Orange Farm and Fine Town is the high use of coal and paraffin. The process thus far has entailed identifying the leadership structures and meeting these people. The environmental health leadership was represented at the stakeholder meeting. Priorities of the region were determined with a view to aligning the project with these. Consultation was as inclusive as possible. Then there was also interaction with people functioning as an informal reference group.

The project is to be framed as an initiative by the community itself. This has the effect of motivating people to look beyond their problems. The reference group includes proactive people with some energy background. The health sector was also explicitly included in this group in the form of members from a group of HIV and tuberculosis caregivers, registered as a non profit in this sector. The awareness of LPG as an energy option was extremely limited in this group in particular. Assistance from people in the reference group means that they become empowered through the interaction. It builds a track record, experience and interest from them in the area.

Ms. Makhabane outlined the gravity of the problems associated with the use of coal, especially in winter, pointing out that this was particularly bad in Orange Farm. She also mentioned that the Basa njengo Magogo project undertaken in this area was a good match because that solution had been marketed as an immediate no cost solution but that there were also other solutions. This would overcome the perception and concern during that project that the Basa njengo Magogo intervention was to avoid the need to switch from coal. This allows for the project to be billed as an LPG switching project and the opportunity to determine the best way to promote the benefits.

Mr. Nkabinde of Easigas pointed out that they have a dedicated person dealing with awareness of LPG, although primarily with safety in use. Some participants discussed the complementarity of solar and LPG for thermal energy needs. This also highlighted LPG as a transitional fuel, bridging the gap between the most polluting fossil fuels of the present and a fully renewable future. Another issue discussed was the creation of a community-based distribution network and the search for similar models in the urban environment.

Mr. Chauke of the DME supported the idea of using a reference group to determine the acceptability of LPG to determine a baseline and thus the dynamics of the community response to an awareness or switching campaign. A community-based approach for inputs to campaign design is extremely useful. The reference group could be approached to determine community profile, consumption patterns and income profiles. Such baselines are available through the Basa njengo Magogo project but further work would be required to create a technology specific baseline.

National Stakeholder Meeting at IIEC Offices: (anticlockwise from right) Jason Schäffler, Tieho Makhabane, Ntombifuthi Nkosi, Ronald Chauke, Charles Nkabinde, Kevin Robertson, Thomas Phooko, George Mosiuoa

Mr. Mosiuoa of Totalgaz outlined their experience in Orange Farm. The existence of good community based network dealerships elsewhere was noted. Suppliers are involved in setting up these community based dealer networks. Their primary emphasis is not the same as the approach in IIEC's project but they are complimentary. Large suppliers' core focus there is to make it more affordable to those that are already buying it by addressing supply chain structures. The customers being included are already committed in appliance purchase cylinder rental or purchase.

Although this meeting was the only occasion in which members of the national stakeholder database were gathered together in one forum, the individual stakeholders continued to provide valuable inputs into the project throughout its implementation. In particular, a very close working relationship was developed with the DME, with the result that a member of the project team was invited to sit on the steering committee of the DME LPG in Low-Income Households Programme. Frequent meetings were also held with LPGSASA and the individual LPG supply companies, who continued to provide very valuable inputs into the project. The project team were invited to attend the LPGSASA Annual Conference, to produce a press release for inclusion in the conference delegates' pack, and to write an article for the LPGSASA industry magazine (see Section 3.4 below).

2.3 Identifying suppliers of gas and equipment

There are four LPG suppliers operating in South Africa (Afrox, BP, Shell-Easigas and Totalgaz) whose contact details are provided in the stakeholders list (see Attachment 1). Repeated attempts have been made over the duration of the project to obtain lists of local retail outlets for LPG from each of the four supply companies. However, the LPG suppliers appear to be very reluctant to share this information, and no such lists have yet been made available. The unwillingness of the LPG suppliers to share this information is somewhat surprising, as it is difficult to see how its public knowledge could endanger their respective shares of the market.

Unfortunately, the absence of information on local retail outlets for LPG seriously inhibits the effectiveness of the pilot demonstration activities that are being conducted as part of this project (described under Deliverable 7 below). A large proportion of the members of the public who engage actively with the demonstration events ask for information about where they can obtain LPG supplies. This in itself indicates that there is a latent demand for LPG that is unrealised due to problems of availability. Until this information is forthcoming from the LPG supply companies, the project field-workers are unable to respond to these requests, and there is a risk that a significant potential for fuel-switching is not being realised. At the time of writing, the project team are continuing to engage with the LPG supply companies in an attempt to obtain this information on retail outlets.

As a result of investigations by the field-workers, it appears that there are actually very few retail outlets for LPG in the regions in which this project is operating. A single BP filling station in Orange Farm supplies BP gas in exchangeable cylinders of 9 kg and above. Totalgaz gas is available from a hardware shop in Extension 7, Orange Farm (known locally as the 'Chinese Hardware Store') and Easigas can be obtained from Springbok Hardware, Fine Town. Both of these outlets can provide the larger cylinders of 9.5 kg and above on which a deposit is paid, as well as the smaller refillable cylinders that are owned by the user. Another store in Orange Farm (known as 'Wally's Place') supplies Handy Gas in 9 kg cylinders only, and report that their sales of LPG are very slow.

South African suppliers of appliances appropriate to low-income households appear to be limited to two firms, both of which have displayed a ready willingness to co-operate in the implementation of this project:

- **Cadac** (Industria, Johannesburg 2042) cater mainly for the outdoor leisure market, but manufacture two and three ring LPG cookers (both high-pressure and low-pressure) suitable for the residential market, as well as an integral 'cooker top' that screws directly onto a cylinder to provide a low-cost cooking option. Cadac also supply the smaller sizes of cylinder, from 1.4 kg up to 4.5 kg (note that only the gas companies themselves are authorised to supply cylinders of 9 kg and above).
- **Alva Gas** (Lynnwood Ridge, Pretoria 0040) manufacture a four-ring LPG hob, suitable for higher-income households, as well as a two-ring low-pressure stove, and an integral cooker-top similar to that supplied by Cadac. Alva also supply a range of cylinders from 1.7 kg up to 6 kg, many of which include a stabilising 'foot' to minimise the risk of the cylinder being tipped over.

The only retail outlets for LPG appliances in the areas in which this project was active were the two hardware stores mentioned above. These stores also supply some spare parts (e.g. replacement 'O' rings) and provide a maintenance service. Springbok Hardware also supply imported low-cost LPG cookers of unknown origin.

2.4 Community meeting – 24 May 2004

It was considered essential, in developing pilot programmes to enhance the acceptability of LPG, to consult with the intended target communities. To this end, a meeting was held at the Orange Farm Municipal Hall, to which a wide range of community representatives were invited. A total of about sixty people attended the meeting, comprising Ward Committee members, Region 11

municipal officials, national and local suppliers of LPG, representatives of community organisations and members of the public.

The purpose of the meeting was to provide the project team with an understanding of the energy needs of the people in the area, their awareness on the available energy options and the economics of each. Focussing on LPG, the meeting aimed to examine the issues, perceptions and main challenges and strategies to overcoming these challenges. Most importantly, the meeting aimed to learn directly from the community the best approaches to adopt in communicating messages to them on the benefits of LPG as an alternative to coal and paraffin.

The meeting commenced with an introduction of the project, the project team and the other official representatives attending. Following these introductions, the meeting participants were asked to give their perceptions of the main characteristics, advantages and challenges of the most commonly used energy carriers. These perceptions are summarised as follows:

- Electricity
    - Uses: Lighting, cooking, powering cell phones and other batteries, sewing and knitting machines and other machinery; cleaning equipment, heating, ironing, welding, television, radio, refrigeration, and many more.
    - Advantages: Multiple uses – one energy carrier can meet many different needs; clean, and safe if used correctly.
    - Challenges: Can be dangerous or cause house fires if misused; can be expensive, particularly if used for cooking and heating; frequent power cuts make it very inconvenient
- Coal
    - Uses: cooking and heating
    - Advantages: affordable; available; does not require special equipment; provides useful space heat when used for cooking
    - Challenges: very polluting, resulting both in health risks and unpleasant smells; dirty to handle; long delay between lighting and being useable for cooking; risk of burns to children
- Paraffin
    - Uses: lighting, cooking, heating, ironing
    - Advantages: affordable; easily available; can be bought in small quantities; easy to gauge how much is left; many non-energy uses (e.g. as a cleaning agent, or for making floor polish)
    - Challenges: causes pollution; causes unpleasant smells that can taint food; serious fire risk; risk of poisoning if ingested by children; sometimes adulterated or otherwise of poor quality
- LPG
    - Uses: cooking, heating, lighting, refrigeration, welding, transport
    - Advantages: multiple uses; long-lasting (a cylinder can last up to 3 months); appliances are mobile; fast to cook; no pollution or odours; gas geysers very fast; gas heaters do not dry the air as electric heaters do; cheaper than electricity;
    - Challenges: danger of explosion; no gauge to determine how much is left; very few local suppliers; can run out at inconvenient times; cannot be obtained in small quantities; heavy and difficult to transport; risk of explosion; risk of theft, as a cylinder full of LPG is very valuable

Given that a number of challenges exist for all energy carriers, discussion moved on the question of why the adoption of LPG was so low. The view of the meeting participants was that fear of LPG was the overwhelming reason. Some participants used the phrase 'a bomb waiting to go off' to characterise their perception of LPG. Although poor availability, risk of theft and lack of marketing were acknowledged as factors inhibiting uptake, fear was cited as the most important issue. Participants were generally in agreement that this fear was unfounded and based on hearsay, but was genuine nevertheless.

Two representatives of the LPG supply industry addressed the meeting in an effort to educate, alleviate fears and outline the benefits of using LPG. They went on to explain their companies' commitment to the communities, particularly the community at hand, as well as the oil companies' mandate and commitment to ensuring the supply of LPG, distribution and safety mechanisms to the nation at large. Mr Charles Nkabinde of Easigas went in detail to explain energy carriers as a whole, before focussing on the issues of safety, cleanliness and convenience of LPG.

Discussion moved on to the best approach for communicating with the public regarding LPG, and changing their mind-set. Participants were asked to validate each of the points they raised with real-life examples where the method / technique was able to induce some change in their perceptions or behaviour. The main views of the community members are summarised as follows:

- Demonstrations: the opinion of the participants was that they 'believe what they see', hence practical demonstrations are the most effective means of communicating messages about LPG. Furthermore, participants felt that demonstrating to and educating school-children is the most effective approach of all. Children are receptive to new ideas and very effective at communicating what they have learned to their parents. An example of this cited by participants was the education campaign of Johannesburg Water on sanitation, where the message was communicated mainly to schools, but rapidly taken up by parents and householders.
- Drama: participants felt that drama was a very effective communication medium, although it does not work for everybody. For many people, presenting a message as a 'story-tale' is very influential. Examples cited were dramas on AIDS and drug abuse that are carried on radio / TV, and on stage during some events. The 'Basa njengo Magogo' project drama was also cited as an example validating his point.
- Bill-boards: participants regarded bill-boards as fairly effective, especially if they are colourful and attract the eye.
- Newspaper advertisements: advertisements in the most widely read local newspaper (the Daily Sun) are regarded as an effective medium for communicating messages, since people in the target communities have a culture of reading.
- TV / radio advertisements: these were not regarded as particularly effective in the target communities.
- Pamphlets: in themselves, they are not regarded as particularly effective, although they are useful supplements to other

Pupils at the Sibekiwe Primary School enjoying a performance of the IIEC LPG Drama, 17 November 2004 (see Section 3.3.2)

approaches. It is important that they are available in all languages, primarily English, Sotho, Zulu and Xhosa.

The meeting concluded with the observation by some participants that addressing the issue of acceptability of LPG was the highest priority. The reason for this is that, by improving acceptability, the demand for LPG would increase, helping to bring the price down. Supply constraints would also tend to reduce once demand reaches a critical level. Conversely, attempts to address the issues of affordability and availability without first working to improve acceptability are likely to encounter difficulties.

3 PILOT AWARENESS-RAISING ACTIVITIES

3.1 Pilot project design

The principal source of guidance for the development of approaches to target the low-income residential sector was the interaction that took place during May and June of 2004, between the project team (IIEC and Dikepolana Resources) and the 'reference group', consisting of various representatives of the target communities themselves. The main findings can be summarised as follows:

- While affordability and availability of LPG are significant issues that are currently inhibiting its uptake by low-income households, the biggest barrier is fear. Although this fear is based on unfounded rumours and hearsay, the fear itself is genuine. Many householders reported that they perceive an LPG cylinder as 'a bomb waiting to go off'. Until the fear of LPG can be overcome, efforts to improve the affordability and availability of LPG will not result in significant uptake.
- A phrase often used in the scoping meetings by low-income householders is that 'they believe what they see'. Hence by far the most effective way of influencing them is through the use of practical demonstrations offering hands-on experience.
- The use of dramas to illustrate important issues was widely regarded as very effective. Dramas have been utilised previously in many cases, for example in raising awareness of HIV/AIDS and also in the 'Basa njengo Magogo' project to promote a cleaner burning technique for coal fires.

As a result of these discussions with the reference group, and scoping meetings held with other key stakeholders, it was decided to base the pilot LPG switching project around the use of practical demonstrations held in prominent public places. These demonstrations would be backed up with printed material (pamphlets and brochures), but the use of radio broadcasts and billboards was rejected as being unlikely to yield a significantly large impact to merit the cost involved. A drama was also created by the project fieldworkers to reinforce the message carried by the demonstration events.

Members of the public engaging with the IIEC LPG demonstration event, staged at the Orange Farm Social Development Services event, 27 October 2004 (see Section 3.3.2)

The project team have taken advantage of every opportunity to engage with the industry stakeholders (the LPG supply companies, the LPG Safety Association of South Africa, and the World LPG Association) to develop concepts that would encourage the uptake of LPG among low-income households. Discussions with the LPG supply companies indicated that all four suppliers were either already engaged in, or were planning, pilot activities to target low-income households. However, these programmes appear to place a very strong focus on the affordability criterion, also addressing the issue of availability of LPG to low-income households. Although details of these programmes are difficult to obtain because of commercial confidentiality, there appears to be almost no attempt to address the serious barrier of acceptability, as highlighted by IIEC's community-led focus group discussions.

Under this project, concerted attempts have been made to persuade the LPG supply companies to support the IIEC work on improving the acceptability of LPG to low-income households through demonstrations and awareness-raising. Such common actions would avoid duplication of effort and would have the result of improving the acceptability of LPG across the whole low-income residential sector, to the advantage of the whole LPG industry. Unfortunately, the LPG supply companies do not appear to be at all interested in pooling their resources to develop common programmes to overcome barriers to the adoption of LPG among households, preferring instead to implement their own individual programmes, the results of which are kept closely guarded. However, efforts to engage the involvement of the LPG supply companies are currently ongoing, and there is some indication that the DME may be willing to add their voice in support of IIEC's work in this area.

The findings of the scoping meetings with the reference group, conducted during May 2004, were the basis for the design of the pilot LPG switching project. The scoping meetings made it very clear that the most effective way of reaching and influencing the target group would be to focus on:

- Hands-on practical demonstrations of LPG in use
- Overcoming the barrier of unacceptability of LPG, specifically the fear that many of the target group have for the fuel

It must not be thought that the barriers of poor availability and non-affordability of LPG were considered less significant that the barrier of unacceptability. However, it became apparent in discussions with stakeholders from the LPG industry that the issues of availability and affordability were already being addressed through the programmes of the LPG suppliers. It was the feeling of IIEC and its partner consultancy Dikepolana Resources Pty. that acceptability was an important consideration that was not being adequately addressed, and that unless the barrier of unacceptability was overcome, attempts to improve the availability and affordability of LPG would have only limited success.

Simon Moahloli of LPGSASA leads a demonstration event at Mbale Primary School (13 October 2004) as part of the 'Training the Trainers' phase (see Section 3.3.1).

Based on these findings, IIEC in partnership with Dikepolana Resources worked together to design a pilot project aimed at testing and refining the methodology for instigating fuel switching among low-income households. Under this pilot project, practical demonstrations would be held at prominent public places, where members of the public would be encouraged to experience first hand the use of LPG as a cooking fuel. A team of community-based field workers were recruited from Orange Farm and Fine Town, who were trained with the assistance of a specialist from the LPG Safety Association of South Africa (LPGSASA). These field-workers, being fluent in all of the home languages of the target communities, constituted the main interface between the project and the general public.

The outcomes of the earlier scoping meetings led to the conclusion that schools, clinics and churches were the most appropriate venues for conducting pilot demonstration events. However, it became apparent from early discussions that churches were in fact not particularly suitable locations for conducting this type of activity. The main reason for this is that the flow of people passing the demonstration venue is concentrated into a period of only a few minutes after the service ends. Other locations having a flow of people more evenly distributed throughout the day are more suitable in this respect.

Between demonstration events, in order to make maximum use of the LPG equipment acquired for the project, stoves and cylinders were provided to selected households on loan for periods of one to two weeks. The immediate benefit of these equipment loans was to provide the recipient households with the opportunity to gain first-hand experience of using LPG. In addition, however, the recipient households were encouraged to communicate their positive experiences to friends and neighbours, so increasing the awareness-raising impact.

Although the conclusion was reached, as a result of earlier scoping meetings with the community, that this project should be primarily concerned with overcoming the barriers to the acceptability of LPG, the barriers of unaffordability and limited availability are also significant. Under the same USAID grant agreement as this project, IIEC has also been investigating the potential for small enterprises to enter the market for providing energy efficiency goods and services to low and middle-income households, and developing business models upon which this market entry could be based. One potentially promising business area that has emerged is that of providing an LPG service to households under a 'fee for service' model. Under this model, availability constraints would be overcome through a home delivery service for LPG, where full cylinders would be delivered and empty ones removed by the service company. Affordability issues would be tackled by providing stoves and cylinders under a leasing arrangement, and by spreading the cost of cylinder refills more evenly through time.

For the business model described to be successful, it must be adopted by a local enterprise, preferably one which already has experience in dealing with LPG. However, such enterprises are very few in number if the region that this project operates in. Furthermore, local LPG suppliers have commented that the supply of LPG represents only a very minor component of their total business and that, unless demand can be demonstrated to exist, they are unwilling to invest extra resources in developing this part of their business. This emphasises the importance of creating the demand for LPG through the types of demonstration projects described here, as a necessary precursor to activities to improve availability and affordability.

3.2 Cost-benefit analysis

At the time the pilot project was designed, an approximate cost-benefit analysis was conducted to determine the cost-effectiveness of the approach chosen. The original plan was to conduct a total of six demonstration events, with the estimated costs of these being summarised in Table 2 below. The total cost for conducting six demonstration events was estimated as R 32,820 (not including the cost of follow-up monitoring and reporting).

The likely benefits of the demonstration events were difficult to quantify, as there are many conceivable ways in which a demonstration could impact upon those exposed. For example, a small number of those reached by a demonstration may make the decision to switch to LPG purely on the basis of the demonstration itself, while a larger number may be encouraged to make further enquiries at a future date, having had their fear of LPG partially assuaged by the demonstration. It is almost impossible to make useful estimates of these numbers on the basis of an *ex ante* assessment. The cost-benefit analysis conducted at the time of project design was therefore limited to estimating the number of households reached.

It was assumed that each demonstration event would 'actively engage' a average of sixty people, each of whom would be the representative of a household. Active engagement means that the individual in question stops for a significant length of time and engages in conversation / discussion with the fieldworkers conducting the demonstration on the subject of LPG and / or residential fuel choices. All those who actively engaged were asked to leave their name and a contact telephone number or address for follow-up monitoring activities. It was felt that those who merely stopped briefly to observe the demonstration but did not ask questions / engage in discussion could not be considered to have been 'reached' by the demonstration.

Thus the estimated total cost per household reached amounted to approximately R 91. On a larger scale roll-out of this methodology, the cost per household would be slightly lower, because the

preparatory phases (refinement of the project plan, briefing and training of the fieldworkers) would be spread over a larger number of demonstrations.

Table 2 Ex ante estimate of pilot demonstration project costs	
ITEM	**ZAR**
Consultants' and field-workers' fees	
Contact and initial briefing of field-workers	1, 000
Drawing-up of detailed project plan	2, 000
Identification and coordination of locations for demonstration events	5, 000
Conducting demonstrations (x 6)	12, 000
Payment to field-workers	5, 120
Consumables for demonstration events	
Demonstration material (appliances, LP Gas, food)	2, 000
Transport and other logistical costs	3, 500
Venue hire / *ex gratia* payments for community venues	2, 200
TOTAL	**32,820**

This cost per household reached by the pilot demonstrations must be weighed against the total benefits that accrue for every household that switches to LPG. These benefits are wide ranging in scope and type; the major ones are as follows:

- Health and safety benefits to the occupants of households that switch from paraffin or coal to LPG.
- Reduced peak demand for electricity from households that switch to LPG[8].
- Reduced greenhouse gas emissions.
- Increased small business opportunities in the distribution of LPG and the manufacture, sale and maintenance of appliances.

Not all of these benefits are easily quantifiable, still less can they realistically be expressed in money terms. However, considering only the first of these benefits in detail indicates the scale of the potential money-benefit to society of fuel-switching away from coal and paraffin.

The second highest cause of infant mortality in South Africa is respiratory disease, a significant incidence of which is almost certainly linked to indoor air pollution caused by household fuel use[9]. Furthermore, poisoning from paraffin ingestion is responsible for the hospitalisation of 55,000 children each year, of whom an average of eleven die[10]. One of the top four causes of death in

[8] Although this project is primarily concerned with switching from coal and paraffin to LPG, the impacts on electricity demand cannot be ignored. Firstly, there is no way for the pilot demonstrations to selectively target only coal and paraffin users, so a small portion of the households reached are likely to be those who currently use electricity for cooking. Secondly, current users of coal and paraffin generally aspire to using electricity in the future, as this is seen as the fuel of choice for those who can afford it. If this project succeeds in convincing these householders that, in fact, LPG is a preferred fuel for cooking, then it will have had a significant impact on future demand for electricity.

[9] Howells (2002).

[10] de Swardt (2004).

children is burns, many of which can be attributed to paraffin-related fires[11]. Large-scale fires, such as the one that recently destroyed 3,150 informal dwellings in the Joe Slovo Settlement in Western Cape[12], make the headlines, but there are an estimated 46,000 paraffin-related fires every year in South Africa's informal settlements, causing property damage of about R 1.3 billion[13].

Since there are approximately 900,000 unplanned, informal urban dwellings in South Africa, there is therefore a risk of over 5% *each year* that a given shack will be damaged or destroyed by fire. This means that every shack in South Africa faces a risk-weighted annual cost of fire damage of about R 1,400. Compared with this figure, the R 91 one-off cost per household of LPG awareness-raising under the pilot demonstration project described here represents very good value. If one in fifteen of the households reached by the pilot demonstrations switches to LPG as a result, the cost of the demonstrations will have been justified within one year simply by the reduction in fire risk alone. The numerous other benefits that arise from fuel switching make the case in favour of awareness-raising demonstrations compelling.

3.3 Pilot project implementation

The core of this project was the piloting of a methodology to enhance the acceptability of LPG among low-income households. This methodology had to provide maximum impact per unit of cost, and complement other activities aimed an enhancing affordability and availability of LPG. Following the findings and recommendations arising from scoping meetings with stakeholders and community members, the main thrust of acceptability-raising was the staging of demonstration events in public places, at which members of the public would have the opportunity to gain hands-on experience of using LPG. Information on safe usage and on local sources of gas and equipment was also provided at the demonstration events. Following the recommendations arising from the community scoping meeting, demonstration events at schools were staged with the intention that, by building familiarity with LPG at a relatively young age, future generations will avoid the fear of LPG that affects the current generation of householders.

3.3.1 Training the Trainers

Before embarking on the demonstration events, it was necessary to recruit and train the fieldworkers who would conduct the events and be the main point of contact with the public. The fieldworkers were in general selected from the reference group of community members, so they already had some knowledge and experience of energy issues. All fieldworkers were fluent in Sotho and / or Zulu, the dominant languages in the target communities.

The main training event was held at the Orange Farm Municipal Offices on 13 October, 2004. Through the good working relationship that had already been developed with the municipal office and the councillors, the project was provided with use of the council boardroom to conduct training for the whole day, free of charge. A further in-kind contribution was provided by the LPG Safety Association of Southern Africa (LPGSASA), whose chief trainer Simon Moahloli conducted a session to familiarise the

Simon Moahloli of LPGSASA leads the preliminary 'Training the Trainers' session at Orange Farm Municipal Offices, 13 October 2004.

[11] Scholand (1999).

[12] Cape Times, 25th February 2005.

[13] de Swardt (2004).

fieldworkers with LPG and its safe usage. This session was considered essential, to ensure that the fieldworkers were fully equipped to demonstrate LPG to the public, and to field any questions that might arise.

Immediately following the training session at Orange Farm Municipal Offices, the fieldworkers conducted the first demonstration event at Mbale Primary School. Simon Moahloli of LPGSASA participated in, and oversaw this demonstration, giving the fieldworkers the opportunity to gain experience at handling LPG and interacting with large audiences.

3.3.2 Demonstration events

Although the original intention had been to conduct six demonstration events in the course of this project, it rapidly became apparent that the project would need to adopt a more flexible and opportunistic approach to these events. At many of the scheduled demonstration events, the fieldworkers were approached by interested parties with requests to stage additional demonstration events at particular venues. As a result of these solicitations, a total of eleven demonstration events were staged[14], as well as a wedding in Orange Farm to which the project team were invited and for which the project provided LPG equipment and gas.

Each demonstration provided an opportunity to evaluate this approach to building the acceptability of LPG among low-income households. In most cases, IIEC staff were present to observe the demonstration, and to participate where required. However, it was felt important to allow the fieldworkers maximum freedom to conduct the demonstration events themselves, as this more closely reflects the model that was envisaged for eventual roll-out. On three occasions, fieldworkers conducted demonstrations with no IIEC staff members present, owing to non-availability of staff. The following sections summarise the demonstration events staged under this project:

Mbale Primary School – 13 October 2004

The first demonstration event was held at Mbale Primary School, and also constituted the final stage of the fieldworker training. Approximately 150 school-children and five staff attended the demonstration event, whose main purpose was to build familiarity with LPG among the attendees. The event also served to build the confidence of the fieldworkers, many of whom had little previous experience of addressing large groups of people.

Social Development Service's Event (Orange Farm) – 27 October 2004

The Council Office alerted the project team to this event, and arranged for the provision of a gazebo, free of charge, in which to conduct a demonstration event. The fieldworkers demonstrated LPG usage to members of the public by using it to prepare tea, popcorn, meat and pap. Since the demonstration event was the only place within the broader municipality event where it was possible to obtain refreshments, this served as a strong draw to the public. A member of the project team was also provided with a five-minute slot in the event proceedings, to address the public on the subject of LPG and domestic energy use.

Approximately 100 members of the public actively engaged in the demonstration event, leaving their contact details for follow-up discussions. A number of developmental groups and organizations attending the broader municipal event showed interest in the LPG demonstration, inviting the inviting the project to participate at their forthcoming events.

Springbok Hardware – 30 October 2004

About 50 members of the public engaged in a demonstration event held at Springbok Hardware, Fine Town. LPG was used to prepare tea and popcorn, with members of the public being given the opportunity to use the equipment themselves, and experience lighting the gas. Since this location

[14] Two events were at clinics, five were at schools, three were at public businesses and one was at a municipal event.

was one of the few local retail outlets for LPG, the proprietors of the store could field any questions regarding price and availability.

Fine Town Clinic – 3 November 2004

Patients attending the Fine Town Clinic generally have to queue for some time outside the clinic. This provides an ideal opportunity for the project to interact with them at length, and the context of a health clinic allowed the fieldworkers to highlight the energy-health nexus. Again, the usual pattern was adopted of using LPG to prepare simple refreshments for the audience, while answering any questions that arise and distributing pamphlets. About 60 people engaged actively in this demonstration event and left their contact details.

Patients queuing at the Fine Town Health Clinic engage with the IIEC LPG demonstration event, 3 November 2004.

Mabo Supermarket Buy & Braai – 6 November, 2004

Mabo Supermarket in Orange Farm was the location of a 'Buy & Braai' facility, where members of the public could barbecue meat that they had purchased in the supermarket. The facility uses LP Gas for its braaiing, providing a good demonstration of LP Gas in use. The project set up a demonstration adjacent to the Buy & Braai area, using LPG to prepare pap and gravy for Buy & Braai customers. Despite inclement weather conditions for part of the day (strong wind and heavy rain), over 60 people engaged actively with the demonstration.

Thuthukani Tswelopele Secondary School – 8 November 2004

The fieldworkers were invited to stage two demonstration events at the Thuthukani Tswelopele Secondary School in Fine Town. About 50 pupils from 7th Grade attended the demonstration event, which was timed to coincide with the coverage of energy issues in the school curriculum.

Thuthukani Tswelopele Secondary School – 10 November 2004

The second event at this school was attended by over 100 6th Grade pupils.

Fine Town Clinic – 11 November 2004

A second demonstration event at the Fine Town Clinic was attended by about 50 members of the public. A feature of this event was that it was followed up by a more in-depth and interactive demonstration at the home of one of the fieldworkers. This was attended by an additional 20 members of the public.

Sibekiwe Primary School – 17 November 2004

Two separate demonstrations were held for the benefit of both parents and pupils at the Sibekiwe Primary School, Fine Town. Parents were specifically invited to these demonstrations – over 60 parents attended, along with about 200 pupils. The drama composed by the fieldworkers was also piloted at this event. The school is located in a non-electrified area, so LPG usage is already slightly higher here than in most areas. Food was prepared using LPG, which was provided to pupils and parents for lunch.

Thuthukani Tswelopele School Inauguration - 20 November 2004

Following the earlier demonstration events at this Fine Town school, the project was invited to attend the school inauguration event, marking the tenth anniversary of the school's founding as well as the tenth anniversary of democracy in South Africa. The event, attended by over 300 people, provided an opportunity for the fieldworkers to present the LPG drama, and for a member of the project team to address the attendees on the subject of household energy use and health. The project donated gas and loaned equipment for the preparation of the event banquet. The event was attended by a number of prominent officials from the provincial government, and a local radio station. The school also gave permission to the project to invite a range of national stakeholders from the LPG industry and the DME to attend the event.

Food for the Thuthukani Tswelopele School inauguration event (20 November 2004) being prepared using LPG donated and equipment loaned by the IIEC LPG project.

Score Supermarket – 25 November 2004

The Grand Opening of a new Score Supermarket in Orange Farm was identified by the fieldworkers as a good opportunity for staging an LPG demonstration event. Again, LPG was used to prepare light refreshments, at a stand erected outside the supermarket. Many other promotions and stands ensured that this event was very well attended. Over 150 people engaged with the LPG demonstration, during which the fieldworkers devised a short quiz on residential energy use, with prizes of food cooked on LPG for those providing correct answers.

Wedding – 28 November 2004

The final demonstration event was the wedding of the brother of one of the fieldworkers, in Orange Farm. The project donated the LPG and loaned the cooking equipment for this event. About 30 people engaged in detailed discussions with the fieldworkers attending the wedding on the subject of LPG and household fuel use.

3.3.3 Lending of LPG equipment to households

Between demonstration events, the LPG equipment was left within the community, with people who had expressed interest in exploring LPG further. This provided them with an opportunity to experience the benefits of LPG in a household context, and overcome any fears they may have. The intention was that householders would communicate their positive experiences to their friends and neighbours, so enhancing the impact of the project. A total of around fifteen lendings were made to households, and the experiences reported were entirely positive.

3.3.4 LPG drama

Following the recommendations arising from the community meeting in May 2004, the fieldworkers composed a short drama to illustrate the benefits of LPG in an entertaining and informative way. The drama was not rigidly scripted, as it was felt that this would reduce its immediacy and spontaneity. However, in order to permit the drama to be performed by groups other than those who originated it, an outline script of the drama has been recorded (see Attachment 2).

3.4 Project dissemination

The project team were invited to attend the LPGSASA Annual Conference, and to produce a short press release on the project, for inclusion in the conference delegates' pack (see Attachment 3 for a copy of the press release). The conference was significant as it marked the signing of an

agreement between the Minister for Minerals and Energy and the LPG supply industry to focus attention on the issue of enhancing the uptake of LPG among low-income households.

As a result of the strong working relationship developed between the project team and representatives of the LPG supply industry, including LPGSASA, IIEC was invited to write an article for the industry magazine, 'LP Gas Africa', describing the project's aims and achievements. The article appeared in the 1st Quarter 2005 edition of the magazine, and can be found at the magazine's web-site, http://www.plumbingafrica.co.za/LPGas_Mag.HTM . A copy of the magazine article is reproduced as Attachment 4. Since the publication of this article, LP Gas Africa magazine have requested further articles from IIEC on the subject of promoting LPG in low-income households.

Further dissemination of the project was achieved through the normal channel of IIEC's own web-site, and through the distribution of IIEC's electronic newsletter, 'E-Notes' (see http://www.iiec.org).

4 FOLLOW-UP ACTIVITIES

4.1 Monitoring and evaluation

Although recording the numbers of people attending the demonstration events provided an initial indication of their reach and impact, a more precise assessment of their effectiveness could be made only through a follow-up evaluation. At the time the pilot demonstration events were conceived, a monitoring and evaluation plan was therefore developed.

The first requirement of the approach taken for monitoring the impact of the pilot activities is that it must reflect the objective of these activities. This was to build familiarity with LPG, and overcome barriers to its acceptability (primarily fear), such that any concurrent activities to improve affordability and accessibility are more likely to yield results. Whether or not any such concurrent activities actually took place was beyond the control of this project. At the time the pilot demonstration events of this project were being planned, no information was available from the LPG supply companies regarding the locations of the pilot programmes they were planning, which would aim to address the issues of affordability and availability[15]. While every effort was made subsequently to persuade the LPG companies to locate some of their pilot programmes within the areas covered by this project, the project team were unable to influence this decision. Evaluation of the impact of this project must therefore be based on a contingent approach – if other initiatives had been in place to address affordability and availability, what impact would this project have had on the uptake of LPG among the target group?

During the pilot demonstration events, the fieldworkers requested the name and contact details of all those who had 'actively engaged' with the demonstration. 'Active engagement' was defined as spending a significant amount of time interacting with the fieldworkers, in the form of asking questions, providing useful comments or trying out the LPG equipment. Members of the public who merely lingered at the demonstrations to observe were not considered to have actively engaged with the demonstration. The resulting list of contact details provided an initial indication of the reach of the demonstration events, and formed the basis of the subsequent evaluation.

It was felt that a true indication of the impact of the pilot demonstration events could only be obtained if a significant time interval had elapsed since the events took place. Furthermore, the events took place during the spring season, and it was felt that monitoring their impact should not be attempted before the following winter, since it is easier to engage the interest of householders in energy issues at a time when there is a significantly increased demand for space heating. The evaluation therefore took place during September 2005.

A random sample of 120 demonstration attendees was selected from the lists of contact details collected at the time of the demonstrations (this sample is 20% of the total). The selected individuals were interviewed face-to-face by the project fieldworkers, to assess the real impact of the demonstration events. To provide a comparison, 30 householders from the target communities who did not attend the demonstrations were also interviewed. The aim of the interviews was to determine the extent to which exposure to the familiarity-building activities of the project brought about changes, or the potential for changes, in the energy choices made by households.

The interviews were based around a questionnaire, a copy of which is provided as Attachment 5. Before the evaluation survey commenced, the fieldworkers were provided with some training on conducting household surveys and given time to familiarise themselves with the questionnaire. The purpose of the questionnaire was primarily to assist the interviewer in structuring the discussion; the interviewees did not complete the questionnaires themselves. The fieldworkers were asked to encourage the interviewees to provide more expansive answers where appropriate.

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[15] Understandably, this information was commercially confidential during the period when these programmes were under development

A full report of the survey outcomes was prepared by the consultant engaged to undertake the survey, and is provided in Attachment 6. Given the nature of the questions asked and the types of response they were designed to elicit, a statistical analysis of the survey results was not considered appropriate. Instead, a number of more qualitative conclusions can be drawn from the survey results:

- Hands-on demonstrations and the use of drama as a communication tool were very widely cited by the survey respondents as particularly powerful means for communicating messages to this target audience. They tend to have more trust in what they have seen and experienced directly than in the printed media, and combining information with entertainment makes it more likely that the information will be assimilated.
- An overwhelming majority of those who were exposed to the demonstration events changed their perception of LPG as a result of engaging with the demonstration. The fieldworkers reported some cases where householders had decided to adopt LPG immediately as a result of seeing the demonstrations, although in most cases, affordability and availability remained barriers.
- A significant number of households in the target communities – perhaps even a majority – have illegal electricity connections. These households tend to use electricity for all of their energy needs, since it is effectively free. They view LPG as a convenient back-up for the frequent occasions when the electricity supply is interrupted.

This last issue is a particularly sensitive one, which cannot be ignored in any initiative that aims to address household energy use in low-income peri-urban communities. Data on the extent of electricity theft is very difficult to obtain, but as long as it remains prevalent, it will grossly distort the economic basis upon which household energy decisions are made.

4.2 LPG Imbizo

Throughout the duration of the project, one of its important functions was to provide an interface between the LPG industry and the low-income communities targeted in the project. By the time the project was drawing to a close, the LPG supply companies had all initiated pilot programmes to bring LPG to low-income communities. However, it was felt by IIEC that the Low-Income Household pilot programmes of the LPG supply companies were not paying sufficient attention to the needs and concerns of the communities they were targeting. The demonstration events conducted under this project, and the subsequent evaluation study, had the potential to provide vital information for helping the LPG suppliers ensure that their low-income household programmes had maximum impact and success. However, the project had provided very few opportunities for low-income communities to interact directly with the LPG supply industry. It was therefore decided to mark the closure of the project by conducting an LPG Imbizo[16], which would provide a forum within which the LPG suppliers and the low-income communities could exchange ideas and opinions.

The individuals (approximately 600 in total) who left contact details at the demonstration events were invited to attend the *imbizo* along with representatives of the LPG supply companies, national and local government, USAID, the NGO sector and local community-based organisations. A total of over 400 people attended the event, held in Orange Farm on October 27, 2005. All the services used to stage the *imbizo* were provided by local suppliers, and IIEC engaged the services of a local community-based organisation to act as rapporteur for the *imbizo* – their full report of the event is provided in Attachment 7. Sponsorship of the *imbizo* totalling R35,000 was secured from three of the four LPG supply companies and from the Central Energy Fund.

[16] The Zulu word *imbizo* is derived from the root '-biza' meaning 'to call', suggesting a calling together of the community for consultation. The plural is *izimbizo*.

The *imbizo* highlighted the fact that the availability of LPG remained a serious problem in low-income communities. Safety of LPG remained a concern, although not to a great extent, presumably because the audience was drawn largely from those who had attended earlier IIEC demonstration events, and so had their concerns over safety partly assuaged. The most common concern raised was that retail outlets for LPG were very scarce, necessitating a long journey with a heavy cylinder for most potential users. Several participants enquired about the possibility of setting up their own small businesses as local distributors, highlighting the potential of LPG distribution for employment creation.

The overall conclusion from the *imbizo* was that this type of event is an extremely valuable mechanism for facilitating dialogue between the 'grass roots' and those responsible for formulating and implementing policy. *Izimbizo* should be considered an essential component of any policy, programme or project that aims to change behaviour, perceptions or mindsets at the household level. However, particularly in the case of new energy technologies and practices, mass events such as *izimbizo* should certainly not be regarded as a substitute for the type of hands-on familiarity-building approach that proved so successful in this project.

4.3 LPG as a free basic energy source

Since 2003, a programme has been in place in South Africa for the provision of free basic electricity to low-income households. Under this programme, municipalities (who are responsible for residential supply in the great majority of cases) provide a free allocation of 50kWh per month to low-income households, the cost of which is covered by central government funds disbursed through the provincial governments. However, nearly 30% of South African households are not electrified, and are thus effectively excluded from the free basic electricity programme. These non-electrified households are almost exclusively low-income.

The original framing of the free basic electricity programme concluded that, at that time, LPG was mainly a commercial fuel and residential usage was insufficient to merit any particular poverty relief initiatives being taken[17]. However, during the final few months of the current project, some interest has been shown in extending the free basic electricity programme to encompass other energy carriers, in particular LPG. To this end, IIEC has worked closely with the LPGASA in advocating the piloting of LPG as a free basic energy source in a number of municipalities. Meetings were held with Ekurhuleni Municipality (Gauteng) and Thabazimbi Municipality (Limpopo) as well as with the Limpopo provincial government. The decision regarding how to spend the budget allocated for free basic services is made at the provincial level, so it is vitally important to liaise closely with the provincial government structures.

IIEC also attended the launch of a pilot programme for the provision of free basic LPG, in Winterveldt (northern Gauteng) during October 2005. This pilot was a partnership between Easigas and Tshwane Municipality, under which 500 cylinders with integral cooker-tops were distributed free to low-income households, each of whom would be entitled to one free refill per month. IIEC was not involved in the design of this pilot, and felt that it suffered from serious shortcomings. In particular, no effort had been made to prepare the households who were to receive free LPG. Most had no experience of using it, and suffered from the same negative perceptions and fear of LPG that were found in Orange Farm / Fine Town. Anecdotal evidence suggested that many householders had little intention of actually using the free cylinder of LPG that they had received.

In an attempt to remedy this situation, IIEC worked with Easigas and Tshwane Municipality immediately following the launch of this pilot, to facilitate the provision of training and familiarity-building among those households who had received free basic LPG. It was hoped that this might improve the likelihood of the pilot succeeding. Of course, conducting training and familiarity-building *after* the launch is unsatisfactory. It is for this reason that IIEC continues to lobby both the LPG supply companies and the municipalities who are considering free basic LPG programmes, to

[17] Department of Minerals and Energy, 2003

undertake intensive training and familiarity-building in the weeks leading up to the launch of subsequent programmes. Experience from IIEC's demonstration events in Orange Farm / Fine Town suggests that this approach can radically alter householders' perceptions of LPG, thus creating a receptive environment for free basic LPG programmes.

4.4 LPGASA Annual Conference

An indication of the extent to which the relationship between IIEC and the LPGASA has developed was that IIEC was invited to make a presentation of the project and its outcomes at the 2005 Annual LPGASA Conference in Vanderbijlpark. The presentation emphasised the women's empowerment aspects of the project – a crucial factor not just in this project, but in any initiative aimed at changing attitudes and behaviour with regard to household energy usage.

5 CONCLUSIONS AND THE WAY FORWARD

The conclusions that can be drawn from this project fall into two categories:

i. general conclusions that provide valuable guidance on conducting energy-related programmes and projects in low-income communities;

ii. specific conclusions pertaining to the wider roll-out of LPG promotion in low-income households.

5.1 General conclusions

- There is a huge demand for information and knowledge on household energy issues in the target communities. Most of those attending the pilot demonstrations were well-aware of the impact that their energy choices have on the local and indoor environment, and on their household budget, and many were dissatisfied with the energy carriers they are currently forced to use. Householders displayed a hunger for any information that would help them to make rational energy choices.
- The early involvement of key figures from local government ensures that projects and programmes can be aligned with other local initiatives, such as those concerning health issues. Close involvement of local government also provides access to networks of people who are experienced at working with the community.
- The target communities themselves are the best source of information and guidance on which approaches are likely to work best. Any project of this type must therefore include a period of community consultation very early on in its implementation.
- Low-income communities are a good source of motivated and enthusiastic individuals who can be trained to provide information on a range of energy issues. As householders who have themselves faced many of the same energy challenges as the target groups, these community-based providers of energy information are both accessible and trusted.
- The project has identified drama as being a very powerful medium for communicating messages to local the communities. Its use in similar future initiatives is strongly recommended. The *imbizo* also employed other arts-based communication – namely poetry, story-telling, music and dance, all of which proved to be highly effective. Information is much more likely to be assimilated if it is presented in a way that entertains.
- The optimum approach combines periodic mass events such as the *imbizo,* with a more intensive and close interaction with the target community, through the use of on-going practical demonstrations. The mass events provide a forum where issues and concerns can be aired and discussed, while the demonstration events allow the target audience to see and experience directly the technology in question.
- During the pilot activities described in this report, the fieldworkers were already known to the project team, so a relatively flexible approach could be taken to managing them. In a more general context, however, closer attention would need to be paid to managing the fieldworkers engaged. This would be achieved through the use of clear statements of roles and responsibilities enshrined in contracts, and through the appointment of one fieldworker in each project area to take a more responsible supervisory role.

As observed above, there is a hunger for information on household energy issues among the target communities of this project. There is a need for a reliable, trusted and impartial source of information on all aspects of energy, targeting low-income households. Although the Integrated Energy Centres (IECs) currently under development across South Africa aim to meet this need, they target mainly rural areas, and their density of the ground is not sufficient to provide

comprehensive coverage of all low-income communities[18]. A final recommendation arising from this project is therefore that diverse community-driven energy information initiatives (LPG, solar water heating, solar cooking, Basa njengo Magogo, Eco-Homes / Green Building etc.) are combined into an integrated service. To this end, IIEC have prepared a proposal for the creation of a network of community-led energy advisors, operating through a series of energy-awareness roadshows.

5.2 LPG-specific conclusions

- A significant but not overwhelming majority of those attending the demonstrations were already aware of LPG, having encountered it being used for catering at events such as weddings and funerals. However, their level of familiarity was fairly low, and very few had any first-hand experience of using it.
- A very clear majority of those attending the demonstrations expressed a feeling of fear when encountering LPG. Many were clearly nervous even being in the vicinity of the demonstration equipment, and most of those who tried lighting and controlling the LPG equipment themselves admitted to being apprehensive. However, the first-hand experience of using LPG at the demonstrations had a huge impact in overcoming people's fears, or at least helping them to manage their fears rationally.
- The low price of electricity makes the economics of LPG adoption less favourable. This is greatly exacerbated by the fact that electricity theft is rife. However, power outages are frequent, so even among those households who were paying little or nothing for electricity, there was considerable interest in LPG as a more reliable energy source.
- A significant number of those attending the demonstrations asked about where they could obtain LPG supplies and equipment locally. These were presumably individuals for whom acceptability was not a serious barrier, but who would benefit from initiatives to improve availability.

This last point illustrates the importance of complementing the familiarity-building activities piloted in this project with other activities to improve the affordability and availability of LPG. IIEC devoted considerable effort during this middle phase of the project to persuading the LPG supply companies to invest in common actions to improve LPG acceptability in low-income households, as it was felt that this would complement their newly launched pilot programmes to improve availability and affordability. These attempts were unsuccessful at that time, as the supply companies preferred to act individually, and did not appreciate the important of familiarity-building activities. However, towards the end of the project, the LPG supply companies began to realise that success would result only if adequate attention is paid to the issue of acceptability. To this end, IIEC is currently building bilateral relationships with each of the LPG supply companies.

As summarised in Section 3.2 above, the approximate cost of the pilot demonstration events was R 91 per household reached. For a wider roll-out programme, this amount would fall slightly, as some of the costs are relatively fixed, and would not scale up in a larger programme. The impact of larger scale demonstration activities is very difficult to estimate, as it depends to a large extent on the level of complementarity that can be achieved with activities to enhance affordability and availability. However, as observed in Section 3.2, if only one in fifteen of the households reached by demonstration events adopts LPG as a result, the cost of the demonstration events will have been justified within a single year from the reduction in paraffin fire risk alone. The case for a wider roll-out of an LPG familiarity-building programme would therefore appear to be very strong.

The recommended design of a wider familiarity-building programme is broadly in line with that adopted in this pilot programme. Some of the key recommendations for such a programme are as follows:

[18] Only twenty IECs are planned in total

- Perhaps the most crucial aspect of a programme to improve the acceptability of LPG is that it should occur simultaneously with, or shortly before, any initiatives that may be planned to improve the affordability or accessibility of LPG in the same locality. Since the location and timing of these initiatives are determined by the LPG supply companies, this implies that a very close engagement with the supply companies is essential to ensure success.
- The level of buy-in from the DME has been relatively disappointing during the pilot phase. Despite the apparent high priority being given to LPG in low-income households at the departmental level, it proved very difficult to engage the involvement or enthusiasm of individuals within the DME. It is recommended that, for a roll-out of LPG familiarity-building activities, efforts to engage the DME are redoubled.

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ATTACHMENT 1 – NATIONAL STAKEHOLDER DATABASE

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ATTACHMENT 2 – LPG DRAMA OUTLINE

Scene 1: It is early on Monday morning and the Pastor (Mfundisi) is preparing to visit a powerful member of his congregation who preached at the Sunday Service. Mfundisi prepares to leave and goes into the kitchen to say goodbye to his wife, Mamfundisi, who is busy preparing tea on a paraffin stove. She insists that Mfundisi cannot go out without his morning tea. Mfundisi graciously declines and sets out.

Scene 2: On his way to the powerful woman preacher, Mfundisi passes by a shebeen, where the lady is making a coal fire with lots and lots of smoke. He coughs as he greets the lady, and she apologizes to Mfundisi for her polluting mbaola.

Scene 3: The woman preacher, Magumede, sees Mfundisi approaching her house from a distance, and tidies up in readiness for the Pastor's visit. Magumede uses LP Gas for cooking, which was bought for her by her husband who is asthmatic and reacts to the smell of paraffin and smoke/smog from coal. As Mfundisi comes into the house, Magumede offers him a chair and some tea. Mfundisi agrees to have tea from the LP Gas stove and it is served to him very quickly. He exclaims at the cleanliness and the speed of the LP Gas stove, and Magumede explains that her husband is susceptible/allergic/sensitive to smell and smoke, hence the reason for buying her the LP Gas stove. Both talk passionately about Sunday's preaching, and Mfundisi continues to enjoy his tea, which does taste exceptionally nice without the smell of paraffin (at his house tea usually takes the smell of paraffin from the stove!).

Scene 4: Gumede (Magumede's husband) arrives back and smells paraffin in his home (from Mfundisi's clothes!). He gets very angry, thinking that his wife had used paraffin to cook with. He starts shouting (*Mfundisi leaves the house quietly*) and ends up beating his wife. Magumede, in tears, tries to give an explanation to her husband but he would not listen and continues to beat her. She runs away to find refuge at a friend's house, the Shebeen Queen.

Scene 5: Magumede continues to cry and relates her story to her friend, who becomes interested in Magumede's usage of the LP Gas stove. She asks Magumede about the benefits of using LP Gas as opposed to their unhealthy mbaola and paraffin stove. Magumede is consoled and starts telling her friend about certain field workers who informed and educated her about LP Gas. She then promises to set up a demonstration appointment for the same field workers to come and promote LP Gas and its benefits to her friend.

Scene 6: Magumede calls everybody to the demonstration of LP Gas. The fieldworkers make a presentation, and demonstrate to the assembled crowd: Mamfundisi, Magumede, Shebeen Queen and her customers, and other community members are present. The field workers' presentation highlights the basic benefits of LP Gas (fast cooking, easy to use, saves money, safe and convenient) and gives the opportunity for questions. The Shebeen Queen wants to buy LP Gas there and then, and is referred to the shop where she can buy it. Mamfundisi is falling in love with LP Gas, owing to the fact that food and clothes do not smell and that her husband will appreciate tea more often in his own home rather than anywhere else, but she says that she fears LP Gas. The field workers demonstrate the simple lighting and operation of the LP Gas stove and invite Mamfundisi to try the same. At first she is scared and hesitant, but with the people encouraging her, she easily lights the LP Gas stove and immediately her fear goes. She now wants most definitely to use LP Gas herself. What a breakthrough…..

ATTACHMENT 3 – PRESS RELEASE

IIEC AFRICA: Switching from Paraffin and Coal to LPG in Low Income Households

Multiple fuel use and fuel switching to meet energy needs in low-income households can be approached in a way that also addresses the problem of deteriorating health in low income households, as a result of poor indoor air quality. Liquefied Petroleum Gas (LPG) is a clean form of energy that is efficient for cooking, water and space heating. Low income households in South Africa could benefit from switching to LPG for energy intensive end-users such as cooking, space heating and water heating.

To this end IIEC Africa is providing capacity building assistance to government and other key stakeholders in the transformation of the LPG market amongst low income communities in South Africa. This is undertaken by identifying a pilot community as a subject for developing a cost-benefit model for increasing access to, and acceptance of LPG; monitoring and verifying the impact of the intervention; communicating the project impacts through the media and directly to key stakeholders.

Phase I of this project entailed engaging with the national stakeholders as well as with the community structures of Orange Farm and Fine Town (both within Region 11 Gauteng Province) in order to identify how best to promote the benefits of LPG within low-income communities in South Africa. The content of the meetings focused on the methodology of creating awareness and improving acceptability, by promoting the benefits of LPG as an alternative household fuel for water and space heating, and cooking. This project, however, is not a blanket awareness creating project, but focuses of identifying where and how to intervene most effectively in the promotion of the benefits of LPG. The program aims to achieve a transformation within low-income residential environments through education, training and practical implementation.

Now Phase II, currently running until early next year, focuses of piloting some of the outcomes of Phase I, and providing inputs into the design of a methodology to promote LPG in low income communities more widely across South Africa. Practical demonstrations are now being conducted, and people in the pilot communities of Orange Farm and Fine Town are being given hands-on experience of LPG use. Training for the project Field Workers (all drawn from the pilot communities) was done with the support of LPGSASA. These Field Workers are now conducting demonstration at schools, clinics, churches and community centres to promote the benefits of LPG and, most importantly, to allay people's fear of LPG – identified during Phase I as the main barrier to LPG's acceptability. Some of the equipment is lent to households for a period, to give them experience in the use of LPG, and hopefully to communicate their positive experiences to their neighbours. IIEC acts as a facilitator and a point of reference for all the stakeholders involved.

ATTACHMENT 4 – LP GAS AFRICA MAGAZINE ARTICLE

IIEC AFRICA: Promoting LPG in Low Income Households

The International Institute of Energy Conservation, whose South Africa office is based in Johannesburg, is currently running a very successful project that promotes the awareness of LPG to low income households. This project, currently funded by USAID, involves the practical demonstration of LPG as a more healthy and environmentally friendly cooking fuel. The project is effectively engaging with the local community and has undertaken demonstrations in schools, clinics and commodity businesses within two townships in Region 11, Gauteng.

On Saturday 20th November, the IIEC LPG project was invited to demonstrate the benefits of LPG use at Thuthukani Tswelopele primary school in Fine Town. The school was holding an inauguration celebration; 10 years of its existence coinciding with 10 years of democracy in South Africa. This was a prestigious occasion indeed, attended by 300 of the school's current intake, their proud parents and all the local dignitaries of the township. The marble dedication plaque to commemorate this important event was unveiled by the IDSO for the region, Ms. B. Luthodi.

The IIEC LPG project's contribution to the event was two-fold; we assisted with the feast by providing LPG cooking equipment and our project field-workers premièred their drama about the health benefits of using LPG in the home. This allowed us the opportunity to raise awareness of the efficiency and cleanliness of LPG as a cooking fuel at first hand.

The official opening of the Thuthukani Tswelopele primary school was a fine celebration and we were fortunate to have been invited to play such a vital role. The feast was certainly enormous and the LPG cooking equipment most definitely put through its paces! Our drama was very well received, judging by the rapt attention of the audience. I should like to add that all our star actors are in fact field-workers who are now conducting demonstrations at schools, clinics, churches and community centres to promote the benefits of LPG and, most importantly, to allay people's fear. The training for these field-workers (all drawn from the pilot communities) was undertaken with the full support of LPGSASA.

Looking back over the celebration of the primary school's inauguration, we feel privileged to have been able to become so close to the communities within which we are promoting LPG. Our project is really taking off and the feedback that we receive from these communities is always so positive. Unfortunately our funding runs out early in 2005. It will be a great shame to see this dynamic programme lose its momentum. With this in mind, I feel that it is appropriate to ask – can we find sponsorship for this project from within the LPG sector?

Dr. J. Kleinot

24th November 2004

ATTACHMENT 5 – EVALUATION SURVEY QUESTIONNAIRE

IIEC LPG Project: Switching from Coal and Paraffin to LP Gas in Low Income Household of South Africa

Assessment of Impact and Needs Assessment for the Conducted Demonstration Activities in Orange Farm and Fine Town: September – October, 2005

Date:_____ Interviewer: _____

Respondent Name_____ Surname: _____

SECTION 1: GENERAL CONTACT INFORMATION, HOUSEHOLD CHARACTERISTICS AND SOCIO-ECONOMIC DATA

1.1 Contact Details:

Address: _____

Tel.:_____

1.2 Type of house/building structure.

( ) Shack ( ) RDP House ( ) township house ( ) Shack and township house

1.3 # of rooms for the household: _____

1.4 Total monthly household income (tick appropriate box)

R0 – R500	
R501 – R1 500	
R1 501 – R2 500	
R2 500 – R3 500	
R3 501 – R4 500	
R4 501 – R5 500	
R5 501 and up	

1.5 Sources of household income

Unemployed	
Pension	
Remittances (cash contribution by employed family member)	
Formal employment	
Part-time work	
Welfare allowances	
Selling (products)	
Farming	
Other (please specify)	

SECTION 2: ENERGY USE PATTERNS AND LEVEL OF AWARENESS OF ENERGY OPTIONS

2.1 Where does cooking happen? ( ) inside house ( ) inside shack ( ) outside house

2.2 Is there a kitchen, with windows? ( ) Kitchen ( ) windows ( ) no kitchen

2.3 Please indicate what fuels are used for specified end-uses?

Type of Fuel	Cooking	Lighting	Heating home	Water Heating	Ironing	Other (specify)
Electricity						
Paraffin						
Wood						
Gas						
Coal						
Other (specify)						

2.4 Is there a refrigerator within the household? ( ) Yes ( ) No

2.5 Factors that determines choose of fuels for cooking, water heating and space heating.

(*Use priority ranks 0 for least important and 5 for most important)*

Affordability: energy and appliances	
Availability	
Convenience of use (speed, portability, controllability)	
Clean (does not pollute; not dirty pots, etc)	
Safe (healthy)	

2.5 Have you made any significant change of fuel(s) or appliances used over the last year?

( ) yes ( ) No!

2.6 If Yes, what changes?_____

_____

_____

2.7 What were the reasons for these changes?_____

_____

_____

2.8 Did/do you use Gas ( ) In the past; ( ) Now? ( ) Not yet ( ) Never will

2.9 What did/do you use for? (Which applications?)_____

_____

_____

2.10 When do you use your LP Gas stove? *(fieldworker to listen and not to prompt answers and to record even additional answers)*

2.11

Where there is no supply of electricity (unelectrified area)	
When there is power cut/failure	
When we cook food that take long to cook	
When I travel	
When I have much time	
When I am around	
All the time	

SECTION 3: IMPACTS OF DEMONSTRATION ACTIVITES

3.1 Did you see the LP Gas demonstration? ( ) Yes ( ) NO

3.2 If Yes, where did you see the demonstration? _____

_____

_____

3.3 What was your perception of LP Gas as a household fuel before attending the demonstration? ____

_____

3.4 What did you like about the demonstration?_____

_____

3.5 What did you not like about the demonstration?_____

_____

3.6 What is your opinion about adopting of LP Gas as a household fuel? _____

_____

_____

3.8 Did your attending this demonstration event change your perception of LP Gas as a household fuel? ( ) Yes ( ) No! If so, in what way? _____

_____

_____

3.9 Did your attending the demonstration event cause you to change your household energy usage in any way? ( ) Yes ( ) No! If so, in what way?_____

_____

_____

_____

SECTION 4: ISSUES /BARRIERS TO ADOPTING LP GAS AS AN ALTERNATIVE TO PARAFFIN AND COAL

{For people who are not using LP Gas}

4.1 What are the main barriers to adopting LP gas as a household fuel for

cooking _____

_____

Water heating_____

_____

Space heating_____

_____

4.2 Any other barriers or issues pertaining to wider adoption of LP Gas? _____

_____

_____

_____

_____

SCETION 5: INPUT INTO THE INFORMATION, TRAINING AND COMMUNICATION METHODOLOGY TO PROMOTE LP GAS IN THE LOW INCOME HOUSEHOLDS

5.1 Under what circumstances would you consider adopting LP Gas as a household fuel? _____

_____

_____

_____

5.2 And other people, what do you think needs to be done to further promote LP Gas as a fuel of choice to meet the basic thermal needs of the households? _____

_____

_____

THANK YOU FOR YOUR TIME

ATTACHMENT 6 – EVALUATION SURVEY REPORT

Switching from Coal and Paraffin to LP Gas in the Low Income Households of South Africa: 2004 - 2005

Assessment of Impact and Needs for the Practical Demonstrations and Methodological Approach

SURVEY REPORT : September – October, 2005

Tieho Makhabane

IIEC Programme Consultant

November, 2005

INTRODUCTION

From May 2004, IIEC engaged Ms Tieho Makhabane, a community liaison consultant to engage the communities of Orange Farm and Fine Town in designing the methodology to promote the benefits of LP Gas as a fuel of choice to meeting particularly the thermal needs within households: cooking and water heating. The process entailed an establishment of the national stakeholder meeting and forum; followed b y a mass community meting to inform, consult and get input into the methodology to promote the benefits of LP Gas. The outcomes of the national stakeholder's meeting and the community meeting were documented, and further developed as the methodology for testing.

As part of the testing of the methodology, practical demonstration of cooking with LP Gas, coupled with strong training and information component were held at public places such as schools, clinics, businesses, functions and community events. A total of ten demonstrations were conducted, with participation of more than a thousand people; six hundred of which were formally registered on the daily registration sheets for future reference.

A year later, in September and October, 2005 IIEC re-engaged the field workers to conduct an assessment of impact and needs for the conducted demonstration activities in the areas. This study was followed up by the LP Gas IMBIZO, aimed and facilitating the debate and access of LP Gas to the people that had been prepared so much, through the year's activities.

OBJECTIVES OF STUDY

The objective of this particular study was to establish where people are, with respect to adopting LP Gas as their fuel of choice: their perceptions with regards the fuel, as well as their economic status still.

METHODOLOGY

A 5-page; 5-sectional questionnaire was developed, and tested. Field workers were thoroughly trained to conduct the research. The output and their work were really commendable. The sample comprised 20% of the total registered people, and each of the six fieldworkers completed 20 questionnaires of those people who saw the demonstration, and an addition of 5 interviews with people who were not exposed to the demonstrations, to be able to have comparative analysis of the study. So, out of the 600 registered people, a total of 120 people were re-visited and interviewed (which comprise 20%) of the total sample; as well as additional 30 informants who were previously not exposed to the demonstration, information and training activities.

FINDINGS OF STUDY

The findings below are more of a qualitative analysis, than quantitative. The reason being that a quantitative analysis requires more time and resources, and the qualitative would serve the purpose of the report. However, the questionnaires are kept safely for future reference in terms of any quantitative needs that may arise at a later stage.

Geographical Coverage and Socio-Economic Data

As mentioned above, the study covered Orange Farm and Fine Town, both under the Region 11 of Johannesburg Metropolitan City, where all the pilot activities were conducted. Orange Farm is all electrified, with most of it being RDP houses with a relatively few shacks. Fine Town on the other hand comprise of areas which are formal settlements with proper housing structures, electrified and other areas where there are informal settlements. Some areas in Fine Town are electrified, while some are not electrified at all.

The housing structures in these locations vary from shacks to RDP housing, and/or a combination of the two. Most people have more than one room, and even shacks can be divided into rooms up to four. However, income levels are very low and even those people who are working mostly depends on welfare allowance, grants and part-time work.

Unemployment is high in these areas, particularly youth and women are experiencing high levels of unemployment.

Energy-Use patterns and Level of Awareness of Energy Options

For areas with electricity: all of Orange Farm and part of Fine Town; people use electricity to meet all (or most of) their energy needs, and the majority have tapped (illegal connections) the said electricity. Those that have not tapped use pre-paid metering; and substitute electricity with paraffin in summer and coal in winter to meet the thermal energy needs of the households. This is a sensitive issue, and since it was not the focus on the research, it always comes up if one wants to understand the energy-use patterns in the locations.

Many people had not physically changed their household cooking fuel mainly due to lack of disposable income to acquire new appliances. The other factor is could be that those who are using electricity (even illegally) are not under a lot of pressure, given that they are still going on without aggressive intervention by ESMOM/ electricity suppliers, i.e. municipality or City Power in some cases.

So even the move/change from unclean, unsafe fuels such as paraffin and coal were not highly evidenced in this period; though results conducted recently mod 2005 on the impact and level of retaining the Basa Nje Ngo Magogo (BNM) method, conducted in Orange Farm and Fine Town by the very same IIEC field workers under the auspices of Nova Africa revealed that the people who learned the BNM method about a year (18 months to be precise); the retention levels were high (more that 50 %). This shows that demonstrations are effective, and in cases

where one does not need disposable income to change, then the change is retained at high levels.

The continued activity within these communities have exposed the people to energy options and has given them more choice over which sources to use for specific purposes.

Impacts of Demonstration Activities

Just like the majority of South Africans, many people (often more than 90%) have the perception that LP Gas is dangerous and explosive – ***its a BOMB!*** The other perception would be that it is not readily available; not affordable and not so prestigious as electricity. For most people, electricity seemed an answer to all energy needs, though later people do appreciate its disadvantages, hence the rife tapping.

The table below represents the responses pertaining to perceptions of LP Gas after being exposed to practical demonstration, and training on safe use and handling of LP Gas; as well as information on the benefits of LP Gas:-

Changed perceptions after demonstration activities	**Did not change Perceptions after demo**	**Did not see demos**
95%	~5%	20%

Of the people who saw the demonstration activities. Most of them had completely changed their perceptions about the danger of LP Gas. That being the main barrier to the acceptability of the fuel, many people were willing to buy the fuel is it was made available and affordable. In fact before the survey, there were reports from fieldworkers that people have gone searching for, and have bought LP Gas appliances, even from the areas hat were piloting different Low Income Household programme.

The survey re-iterated the importance of demonstration and drama! Though many people would not remember in detail all that had been demonstrated to them after sometime, they still remembered how educative and entertaining the drama was, and many kept referring to that mode of education and information, as being very effective.

The engagement of local communities, particularly youth, women and health volunteers has been the major highlight of IIEC initiatives. This made all stakeholders to be comfortable to work with, and support IIEC in the quest to take energy and power to the people! There are many spin-offs that came with IIEC's approach: peoples capacitation and empowerment, hope, knowledge and most importantly passion about energy as a subject.

Issues and Barriers to adopting LP Gas as an alternative to Paraffin and Coal

As one would expect, at first when the project started the main barrier to the adoption of LP Gas was fear: fear that LP Gas can explode; fear that it is dangerous. After all that education and demonstration, the main barrier was unavailability of LP Gas in the locations; followed by affordability. This portrayed the readiness of the community; hence the immediate planning of the IIEC LP Gas IMBIZO to facilitate the industry's delivery of the fuel to the people.

As discussed earlier, people who were exposed to the demonstration activities had moved fro fear being the main barrier to other issues such as accessibility, availability and affordability. Those who were not exposed to the demonstration still had 'fear' (sometimes of the unknown) of the fuel.

Input into further promotion, information, training and communication Methodology to promote LP Gas in the Low Income Households

The three outstanding elements of the successful promotion of the benefits of LP Gas, as confirmed by this research are:

- **Conducting of practical demonstration**s, and letting people touch, feel and experience (even through tasting of food cooked with) LP Gas
- **The educational and promotional drama**. At all levels and incidences, people have enjoyed the drama so much, and most importantly have learned from in an amazing and amusing way. There is frequent mention of the drama as being effective in the data analysis from this research.
- **Community consultation, training and involvement** in the whole delivery of the programme. The fact that IIEC first went to the community and said 'give us inputs, how best to communicate with you such that you may change your mind-sets and perceptions?' was critical to the effectiveness of the employed methodology. That was a proper 'entry' which necessitated a proper 'exit' strategy, which was achieved by the IMBIZO.

The other elements such as a stakeholder's facilitation and support; communication and feedback, as well as local government and local leadership consultation and integration within other developmental activities cannot be taken for granted. All these are critical to implementing a successful project of this nature.

POINTS FROM THE ANALYSIS

I It was evident that the demonstration are a powerful tool to changing peoples perceptions and mindsets. When it comes from issues of LP Gas, people want to feel, touch and see LP Gas being used. They want to experience that for themselves, before they can be comfortable to use it.

II Whilst most people have accepted LP Gas given its benefits, the challenge still prevails of availability, particularly the LIH Programme, within which LP Gas is subsidised, made available and convenient for the first time user.

III Electricity tapping is very rife in the locations, more to the detriment of the adoption of LP Gas as a fuel of choice. Surprisingly, given the continued training and awareness creation, LP Gas usage is being taken-up by the communities. This means that more up-take would be evidenced if the electricity 'stealing' was not that rife.

IV People and communities are ready for LP Gas, hence the industry has to see their products into the markets. However, **training, support and servicing** of customers has to continue from the service providers' perspective – to ensure continuing and continued usage of LP Gas.

RECOMMENDATIONS

6.1 Given their involvement within the IIEC work for three years, the field workers has learned so much of energy stuff that they have interest and passion. They hence went on to enrol into other relevant training such as community development through the municipality; fire management and first aid courses. It is recommended that these people be profiled in some way, and marketed with all that they have acquired on their own. As companies' social responsibilities, these could be adopted, further trained and be given tasks to further empower their communities, through information.

6.2 Something needs to be done by ESKOM, and or DME to cab the electricity 'tapping'; otherwise the country is heading towards 'electricity' or rather, an 'energy crisis' soon.

IIEC together with impartial organisations such as DME, CEF and others should work together to address the problem of energy security, meeting the demands with supply options.

6.3 Whilst IIEC has done its fare share in promoting the technology, the industry has to step-up efforts to make it easily available, affordable and acceptable. In line with national policies and trends, IIEC has to continue supporting the government's mandate of making information and energy more accessible to people; hence the partnership between the government (national and local) and municipalities have to be strengthened and taken to the next level. This will be done through a project focusing solely on local government structures and municipalities in advising and supporting them in the basic energy suppliers and strategies.

6.4 Given the experience and insight gained buy IIEC's implementation of this project, IIEC should further expand its scope of energy carriers beyond LP Gas; identify trends and scope to meet the cooking, water (and space) heating needs of the low income households of South Africa - to be done within the overall housing delivery mechanisms. IIEC's strength lies within its "unique "three L's" community framework approach: **L**ook at the area; **L**isten to the community and **L**earn from the community', (Christelle Beyers, *Sustainable Homes Initiative, IIEC*, 2002).

6.5 IIEC should make use of the local expertise to inform the roll-out of their work and strategies. Within this time, We came across very insightful individuals, who may not necessarily be energy experts, but can contribute to the success of our strategy. These resources may be tapped to the advantage of the individuals, as well as IIEC as an organisation making a difference in household energy efficiency and options.

6.6 Last, but not least, the LP Gas industry, particularly the LIH programme has to appreciate the benefits of partnership with IIEC in their 'commercial, yet social responsibility endeavour' to bring LP Gas to the people. IIEC prepared the ground and that can happen with a month or two of aggressive information, training and support to communities. Otherwise if the industry goes on their own, particularly given the 'pressured' trends, the programme will experience more problems and breakthroughs.

CONCLUSION

The IIEC LP Gas project has been exposed to a great deal in the LP Gas sub-sector and industry. Stakeholders have come a long way to appreciating the role, impacts and value of the project, and are now beginning to tap into the benefits, whilst supporting the project. The impact analysis study, coupled with the LP Gas IMBIZO created a smooth exit of the project, whilst facilitating exposure and linking communities to service providers in the area of meeting the basic cooking and water heating of the low income household.

Given the relationships, partnerships and support that has been generated out of this project, its time to roll-out the methodology deployed to deliver training, information and support of communities in the uptake of LP Gas as a fuel of choice, given its benefits and the underlying pressure for ESKOM to meet the ever-rising electrical demands.

There are many breakthroughs that IIEC is starting to evidence as a result of persistent, continued quest to promote fuel efficiency and demand-side management at household, residential level. Key stakeholders and municipalities are more receptive to IIEC interventions, more especially when there is no commercial interest, but support to ensure energy security and sustainability in the long run.

ATTACHMENT 7 – REPORT ON LPG IMBIZO

BACKGROUND

The IIEC LP Gas IMBIZO was a culmination of two years' work conducted in Orange Farm and Fine Town, both within the Region 11 of Greater Johannesburg Metropolitan. The IIEC work entailed a baseline research coupled with community meeting, intended to understand fully where communities are in term of energy use patterns and resource availability. These were then followed by intensive and targeted demonstrations and information campaigns held at public places within the Orange Farm and Fine Town areas, to educate people on the benefits of LP Gas as a fuel of choice. This was to alleviate the negative perceptions, and hence fear and other barriers to switching from paraffin and coal to meeting the thermal energy needs of low income households. A year later (September and October 2005), IIEC conducted a two-month research to evaluate the impacts of conducted demonstrations; as well as to assess the energy needs of the people in the locations. The two-month research necessitated the very IMBIZO that was held In Extension 6A, of Orange Farm.

The IMBIZO

The IMBIZO was attended by more than four hundred people. The participants/stakeholders included:-

- **Members of the communities** (Orange Farm, Fine Town and surrounding areas such as Ernadale, Lenasia, Thula Mtwana and Wheeler's Farm).
- **Community and Developmental NGOs**. Particularly from the health and social development sectors, such as SOS children's village; Zenzele Counselling project; Kopanang Training Centre; Emthonnjeni Community Centre, and many others
- **The LP Gas Industry** comprising of the four LP Gas supplier companies (Afrox/Safety Gas; BP, Easigas and Totalgaz); the LPGSASA; The LP Gas Africa Magazine; and Individual Business people dealing with LP Gas
- **The Media**, including SABC radio; Local community radio – Thetha; and other media people
- **The Local government**: National government, and region 11 regional directors and managers: social services, environmental health, etc
- **The Local leadership**: Local councillors, ward committee members and community leaders, including community policing form (CPF)
- **The local services departments**: fire fighters and police
- **Community Development Workers**
- **The National Government**: Department of Minerals and Energy; Department of Local Government and Housing; and GVEP – Global Village Energy Partnership – an initiative of SA government, UNDP and World Bank
- **The IIEC Project Donor**: USAID and Megatech
- **The energy resources companies/service providers**: Mzanzi Energy, Parallax and Dikepolana Resources
- **The IIEC LP Gas Edu-promoters/ field workers**: 3 from Orange Farm and 3 from Fine Town;

Apart from the participation support; the IMBIZO was financially supported by the following companies: -

Totalgaz	**PLATINUM Sponsor**
BP Gas	**Gold Sponsor**
Easigas	**Silver Sponsor**
Central Energy Fund (CEF)	**Silver Sponsor**

IIEC's LP Gas programme is made possible with support from:

United States Agency for International Development (USAID)

IIEC is very grateful to all the companies which made this event such a success with financial contributions and material sponsorship! Thank you INDEED.

The IMBIZO Service providers

The Imbizo was held in the park; hence marquees (2 very big; 7 small); tables, chair, catering, stage and lectern/podium, PA system, Music, Entertainment, exhibitions, Videos, transport for local communities and report compilation all formed part of the budget. However, the service providers were **all** sourced from the communities, and whilst they provided an excellent service and delivered really well; their prices were not as high. We thank them for their excellent service and keeping to the standards of the event.

Once again, the IMBIZO registered over three hundred people, and the catering registered more that four hundred people, a number which included the service providers who did not have chance to register. Well done to all of you!

Tieho Makhabane
IIEC Programme Consultant

Ian Household
IIEC Senior Programme Manager

1 November, 2005

IIEC LP Gas IMBIZO
Orange Farm
Thursday 27 October 2005

REPORT ON THE IIEC LP GAS IMBIZO

Report compiled by Solly Ndweni and edited by Dr Jacqueline Kleinot

"To boil 1 litre of water, Paraffin that has smoke and health hazards would take 15 mins, whereas Gas with its' clean burn and affordable refill only takes 7 - 10 minutes" George Mosiuoa (Totalgaz)

1. Introduction

The International Institute for Energy Conservation (IIEC) Africa planned and implemented an Imbizo on the 27 October 2005 held at Orange Farm. The Imbizo was geared towards the facilitation of dialogue between members of the community and the national stakeholders, to provide a platform for the community to interact with LP Gas industry and DME; and to also get the opinion/issues of the community about the LP Gas.

This report intends to cover the main proceedings of the Imbizo namely, speeches, presentations, issues raised by the community, merits and demerits of the Imbizo and the brief action plan borne logically from the issues that warrant guided intervention(s).

2. Speeches

2.0 Opening and welcome (Mr Paul Madondo)

- Mr Madondo (Ward Committee member) on behalf of the Ward Councillor welcomed all guests and the Community at large.
- He re-iterated the support and continued interaction between the IIEC and Orange Farm community; through the involvement and consultation of the local leadership;
- Pointed out that education, information sharing and awareness creation form a critical part of sustainable development and job creation
- That they communities have come in numbers to hear what the LP Gas Industry has to offer, to enhance the lives of people in the localities.

Mr Paul Madondo addressing the imbizo on behalf of the Ward Committee (*photo: Ntombifuthi Nkosi)*

2.1 Jabu Sithole (Environmental Health Division, Region 11)

- Air Pollution Studies conducted reveal that urban and rural public are exposed to high levels of air pollution from the burning of fossil fuel for cooking and central heating.

- South African primary energy source is derived from coal estimated at 73% and coal is largely used for domestic activities. Soweto uses bituminous coal during low temperature months contributing to 74% particulates 53% SO_x and 28% NO_x.
- Electrification of townships, which began in the late eighties and was accelerated to nineties, also received little success in the reduction of township air pollution.
- Incorporating thermal efficiency in the provision of shelter can be achieved through Orientation (solar radiation), Building envelop (Energy conservation) and Roofing design (Cool in summer and hot in winter)

2.2 Ian Household (IIEC – International Institute for Energy Conservation)

- There's a need for a readily available and affordable energy especially amongst low-income households
- There have been demonstrations held within communities with the help of fieldworkers regarding the safety of the LP Gas. These assist in dispelling the myths and negative perception about the LP Gas.
- The assessment of energy issues and concerns from the public including their perceptions about the LP Gas would be a continuous venture with the help of dedicated Fieldworkers. Such a project would also be rolled-out nationally.
- The IIEC upholds the principle of aaa i.e. affordability, accessibility and availability; whilst addressing the critical area of unacceptability of LP Gas as a household fuel of choice.

Mr Ian Household, Senior Programme Manager, IIEC (*photo: Ntombifuthi Nkosi*)

- He urged communities to express their views regarding the LP Gas safety and any other matters for improvement.
- Ian concluded by expressing his appreciation for all people who were in attendance and further thanked sponsors for honouring the invite thus making the Imbizo a resounding success.

2.3. Kevin Robertson (LP Gas Safety Association of Southern Africa)

- The organization exists solely to ensure the safety and attends to LP Gas concerns and perception for instance; LP Gas is said to be expensive which is not true.
- He emphasised the need to move from the traditional and wood fires to a healthier way of LP Gas. The latter would be made possible by the Low-income household project, which is geared to bring the LP Gas to the people in a very affordable way.
- The low-income project would enable the users to access the LP Gas for a deposit of only R50. Subsequently one would only pay for the gas refill, which becomes cheaper than paraffin. By implication one would only pay for the gas and the container cylinder is regularly taken to the dealer for inspection thus making the Minister's call for free basic energy a reality. A coupon system through municipalities would be introduced to facilitate the access of free basic energy.

- Kevin urged residents to liase with their respective Councillors for this programme and finally he emphasised the importance of visiting stalls to explore job creation opportunities.

2.4. Elizabeth Marabwa (Department of Mineral and Energy)

- Some sources of energy are not good for our health and they are harmful to the environment.
- In an endeavour to improve access to LP Gas, DME is embarking on a Low Income Household programme. Several pilot projects have been launched by individual companies, and the DME is currently implementing its own pilot; soon throughout the country.
- Marabwa requested residents/communities to give government their opinions and feed-back on the safety, price, and affordability as they are planning and intend to have a national roll-out.
- She then emphasised that the Imbizo is providing an opportunity for the community to assess the employment opportunities and further stated that training on the safety of LP Gas must be prioritised.
- In closing, she thanked everyone for attending and IIEC for the organizing the Imbizo.

2.5. Tieho Makhabane and Fieldworkers/Edu-promoters.

Ms Makhabane introduced fieldworkers and the work they all have done under the auspices of IIEC for the past two years i.e. education on all aspects of and promotion of LP Gas as a safe and clean energy to local Communities particularly Finetown and Orange Farm. The Fieldworkers shared their experiences and challenges with the community as follows:-

Sithembile Ntombela

- The inaccessible (not within reach) refill suppliers remain the most common challenge. Distributors and Gas Companies must bring Gas closer to the people.
- There is an emerging trend to use Gas-stove during family functions and funerals because it is believed that gas is safer outdoors than indoors.

Jabu Mokgotho

- There is a high demand for Gas in areas with no electricity like Mountainview yet in some areas like Finetown easy access to Distributors for refill is a common concern amongst Gas users.

Thembinkosi Radebe

- There is a perpetual concern of LP Gas safety amongst community members. The truth of the matter is that if you follow the rules on how to use the gas you'll be safe. Gas is far much cheaper than the electricity.

Brenda Khumalo

- Brenda raised a matter of great concern for the children in the Crèches. These crèches normally use the traditional paraffin stove commonly known as a "*Primus-stove*" whose fumes have an unpleasant smell and are detrimental to the health of children especially their eyes.

Tsheko Molopyane

- He appealed to Gas Companies to bring Gas to the people by ensuring that community members are given training to be Gas Distributors thus creating employment.

Dipuo Mokgotho

- She encouraged community members to switch to Gas because of common power cuts at Orange Farm.
- She has worked with energy issues and technologies for the past three years: she is not longer a field worker but an 'Energy Champion' providing advice and information of energy issues.

2.6. Presentations by four LP Gas Industries

Facilitator: Dr. Jacqueline Kleinot (IIEC)

2.6.1. Easigas : Charles Nkabinde

- Gas is a safe, clean and affordable energy. He encouraged community members to visit the Easigas stall for more information.

2.6.2. Totalgaz : George Mosiuoa

- The role of Total Gas to is to ensure that the access of Gas to Low income household is enhanced. They have introduced *Shesha'* cylinder, which is distributed by 27 Dealers throughout Gauteng and 71 in the Orange Free State. They also have 3 shops (KCFI) owned by women in Langa, Gugulethu and Khayelitsha.
- A total of 22 000 household have been reached through community members, NGO's, Businessmen etc
- He further introduced local dealers from Evaton (Golden Flames); Zamdela (Gas Zamdela); Orange Farm (Mr Maduna). These distributors are given further incentives when they meet targets.
- In conclusion, He stated that Totalgaz has adopted a school in Dobsonville.

2.6.3. Safety Gas : Kholeka Bovungana

- Safety Gas started in 2004 as a joint venture between SASOL, AFROX and Wild Orchards. Their product has a child safety valve.

2.6.4. B.P. Gas : Ntshimane Mekoa

- Their product has a pizo lighter for complete convenience. BP has a toll-free number for further clarity and for placing an order. They normally deliver the product to the household and provide on-site training on how to use the Gas in a safe way.

3. **Speech : Amen Khumalo**

- The African Peer Review Mechanism (APRM) was unpacked and its bone fide intentions to community members.
- An announcement regarding the APRM meeting to be held on the 28 October 2005 was relayed to the community.

Exhibitions, Performances and Information

IIEC Imbizo
27 October 2005

4. QUESTIONS AND RESPONSES

Facilitator: Tieho Makhabane, IIEC

Q1. Can you use LP Gas as a heater especially in Winter?

A1. Yes, you need to buy the detachable heater gadget, which is not so expensive.

Follow-up Issue (s):

- Where possible include all LP Gas accessories in the demonstrations.

Q2. B.P. is said to have a lighter for safety, How safe is the cylinder?

A2. LP Gas is very safe if you only follow the rules and take necessary precautionary measures. Its funny smell is also a safety feature in that, the Ethel mecaptin was meant to have this smell so that even a blind man could tell when the seal is not properly shut or when there's leak. Even so it remains a clean burn for the environment. Furthermore, companies would elucidate more on the safety features of their products during the visit to their stalls.

Follow-up Issue (s):

- More aggressive campaigns needed particularly in the mass media to dispel the ever lingering perception of LP Gas as unsafe and dangerous way of life/energy option.

Q3. How compatible is the cylinder to the braai stand?

A3. It all depends on the cylinders some can and some cannot. Regulators and adaptors to connect three appliances to one cylinder are now available in Supermarkets.

Follow-up Issue (s):

- Refer to question 1

Q4. Why are the prices of LP Gas so different?

A4. The price has been reduced due to the low-income household project. The packagewould now cost R85.00

Follow-up Issue (s):

- The low-income household project is an answer to the problems of intended beneficiaries but may fail if not properly marketed at the grassroot i.e. informal settlement, RDP settlement, rural areas etc through a triangular joint venture between DME, IIEC and LP Gas Suppliers.
- Low-income household projects need to be intensified.

Q5. Why is it that the refill places are scarce and not within reach.

A5. People were asked to challenge each LP Gas companies on the question of accessibility for refill when they visit each stall.

Follow-up Issue (s):

- Unavailability of accessible refill areas provides an opportunity for business initiative to gratify this need.

Q6. How long does a cylinder last?

A6. It depends entirely on how each individual use it and for what purposes? However one needs to note that. To boil 1 litre of water,

- Paraffin with its smoke and health hazards would take 15 mins, whereas
- Gas with its clean burn and affordable refill only takes 7 - 10 mins.

Follow-up Issue (s):

- A message/fact that should be the backbone of the marketing drive amongst the LSM 1-3 (low income earners) i.e. Gas is not only clean but it saves money.
- Marketing need to be diversified by also targeting the higher income earners who are concerned about efficiency and saving money.

Q7. *Is it possible or allowed to change from one dealer to another as a need arises?*

A7. No, because each cylinder after refill exchange is taken for thorough inspection to detect any defects and therefore each company must check its own products otherwise changing to a different dealer could mean that e.g. Easigas would have to inspect the BP Gas cylinders which amounts to unethical conduct.

Follow-up Issue (s):

- This challenge calls for equitable access amongst all suppliers may it be for refill or purchase purposes especially were competition conduct permits.

Q8. How different are these LP Gas from one another?

A8. The content of the cylinder is the same; the product design differs due to varying safety features and brands.

Follow-up Issue (s):

- Note that life provides variety for choices and varying customer's needs.

Q9. Why is it that the Thula'mtwana informal settlement is not serviced by LP Gas distributors despite its plight of not having electricity?

A9. Residents were advised to raise this critical question with LP Gas companies in their respective stalls so that they could get commitment from companies rather a generic response to satisfy or justify the problem area.

Follow-up Issue (s):

- A group of women must be identified to initiate LP Gas income-generating project at Thula'mtwana informal settlement.
- One of the companies needs to adopt the project in question.

Q10. Where are these LP Gas obtainable?

A10. Residents were advised to verify availability of these LP Gas and the prices with dealers when they visit the stalls.

Residents were also encouraged to explore business opportunities with the companies.

Follow-up Issue (s):

- Business opportunities needs to be directed and prioritised for areas that has a potential for business i.e. areas with no electricity.

Summary of Challenges/Concerns

i. The refill services / distributors are not accessible

ii. The Low Income Household project need to be taken to the masses

iii. Perceptions about LP Gas as unsafe energy and the preference of outdoor gas stove for cooking calls for continued information and education campaigns.

iv. Areas without electricity need to be serviced with LP Gas.

v. LP Gas delivery should be coupled with continued demonstration to alleviate the wrong perception of LP Gas

vi. Imbizos of this kind are good to promote the benefits of LP Gas and the programmes our government are implementing.

5. Entertainment Items

5.1. Drama: IIEC LP Gas Reference Group

5.2. Poetry: Nokuthula Ngomane, Poet, Alexandra

5.3. Story-telling: Nokuthula and group, Alexandra

5.4. Dance: Ubuntu Entertainment Dance, Orange Farm

5.5. Drama: Orange Farm

5.6. Music: Themba, Young DJ, SOWETO

6.	Merits and Demerits of the 27th October, 2005 Orange farm LP Gas IMBIZO

Merits	*Demerits*
i. Imbizo successfully targeted the intended/potential beneficiaries ii. The venue and the use of tents were appropriately planned and implemented iii. LP Gas industries fully supported the function and enlightened the community on critical issues. iv. The audience were co-operative and participation was excellent. v. Programme Director was versatile and flexible especially by interpreting English speeches to the Vernacular. vi. The entertainment items like dance, drama, poetry etc were not only entertaining but also educative and excellent indeed. vii. IMBIZO was planned well in advance; people informed and followed-up to ensure attendance and support. viii. The diversity of participants was ensured, and that covered transport costs and payment for people/communities that came from outside of Orange Farm	i. The sound and the microphone were somewhat dysfunctional, inaudible and a bit irritating for some people in the audience. ii. APRM item seem less relevant for the nature of the Imbizo.

7. Proposed Imbizo Action Plan (Activities are not exhaustive to those listed)

Activities	Goal	Resources required	Implementers	Timeframe	Performance Indicator (s)
1. Meeting IIEC and stakeholders	Assess /evaluate the goals and objectives of the Imbizo	Venue/ Refreshments	IIEC	02 November 2005	Merits and demerits of Imbizo unpacked
2. Meeting with LP Gas Industries, sponsors, DME etc	Devise a project plan to address gaps identified during the Imbizo	Venue/ Refreshments	IIEC Convener and Project Manager Shared responsibilities amongst all stakeholders in term of project plan	As per the project plan	A detailed project plan with a clear implementation plan with necessary resource allocation, clarified roles and responsibilities.

3. Implementation of Imbizo Project Plan	Ensure that concerns and issues raised in the Imbizo are attended with speed and determination.	• Finance • Human Resources	• IIEC • DME • LP Gas role players • LPGSASA	Jan – June 2006 [Phase A]	*Thulamtwana LP Gas Distributor *150 low income household benefit from access to LP Gas and free basic energy *10 new LP Gas refill facilities throughout Finetown, Orange Farm and Thulamtwana area(s)
4. Monitoring and Evaluation of Imbizo Project Plan	Reporting and adhering to the Implementation and Project plan	Monitoring Team	Monitoring Team	Project lifespan	Deviations to the plan thoroughly addressed

Conclusion

The event very successfully achieved its primary objective of providing a forum at which:

- the LPG industry could showcase their products and, along with the DME, explain the LPG Low-Income Households programme
- the general public and community-based organisations were able to voice their views regarding the role of LP Gas as a household fuel, provide feedback on the Low-Income Households programme and express opinions on approaches to promoting LPG

The imbizo also reinforced the view of IIEC that, although mass events such as this are an essential component in the package of measures necessary to change mindsets with regard to LPG, they are no substitute for the closer interaction that results from the type of hands-on demonstrations that were conducted during the earlier phase of the project.

This event provided a good opportunity to showcase the work that has been done by IIEC in the past 18 months, and the valuable contributions from our fieldworkers. It is hoped that this will allow others to adopt and adapt the approach taken by IIEC when conducting projects of their own which involve the changing of mindsets.

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OPPORTUNITIES FOR BLACK ECONOMIC EMPOWERMENT ENTERPRISES IN THE FIELD OF ENERGY EFFICIENCY

Final Report

Prepared for:
USAID

Prepared by:
Ian Household
IIEC - Africa

Date:
November 2005

CONTENTS

1 INTRODUCTION

This report is the final report for the project 'Opportunities for Black Economic Empowerment Enterprises in the Provision of Thermal Energy Efficiency Services in the Residential Sector' (Grant Agreement 0134-1103-G-GA40). Section 1 provides a brief background to the project, and outlines the main aims. Section 2 provides an assessment of the market for thermal energy efficiency interventions in the residential sector. Section 3 describes the business models that were initially devised through which thermal ESCOs could provide energy efficiency services in the residential sector. Section 4 describes the process whereby stakeholders were consulted and their inputs incorporated into the implementation of the project. Section 5 outlines the plan for monitoring the impacts of this project. Section 6 summarises the main conclusions that can be drawn and makes recommendations for the way forward.

1.1 Background

Black Economic Empowerment (BEE) has been defined by South Africa's Department of Trade and Industry as follows:

> *"BEE is an integrated and coherent socio-economic process that directly contributes to the economic transformation of South Africa and brings about significant increases in the number of black people that manage, own and control the country's economy, as well as significant decreases in income inequalities.*
>
> *Broad-based black economic empowerment (Broad-Based BEE) means the economic empowerment of all black people including women, workers, youth, people with disabilities and people living in rural areas, through diverse but integrated socioeconomic strategies, that include, but are not limited to:*
>
> *a) increasing the number of black people that manage, own and control enterprises and productive assets;*
>
> *b) facilitating ownership and management of enterprises and productive assets by communities, workers, co-operatives and other collective enterprises;*
>
> *c) human resource and skills development;,*
>
> *d) achieving equitable representation in all occupational categories and levels in the workforce;*
>
> *e) preferential procurement; and*
>
> *f) investment in enterprises that are owned or managed by black people."*

BEE became part of South African law with the passing of the Broad-Based Black Economic Empowerment Act (2003). Section 12 of the act provides for the creation of 'transformation charters' for individual sectors of the economy, which serve as "…structured collaboration between government and the private sector for the sustainable achievement of BEE"[1]. These charters generally represent a voluntary commitment on the part of the sector in question to meet the objectives of the BEE Act. Several sectors and industries have prepared BEE Charters at the time of writing, but within the energy sector, the only charter prepared to date has been the Petroleum and Liquid Fuels Industry charter.

The most significant BEE initiative in the field of energy efficiency has been the announcement in May 2005 that Eskom are to commit R 100 million to building the capacity of BEE Energy Service

[1] Naledi Policy Bulletin, December 2003

Companies (ESCOs). Although it is likely that the project reported on here may have influenced the decision to commit these resources, the announcement came towards the end of this project, and so did not affect the environment within which the project was conducted.

1.2 Eskom DSM programme

South Africa's DSM programme came into being in 1994. From its inception, Eskom grappled with conceptual, policy, institutional, legal, financial and management issues. In the recent years, particularly since 2004, the programme has gathered momentum and is now running at a promising capacity. However, there are difficulties, perhaps the most significant of which is the failure of the majority of the ESCOs registered with Eskom to propose any DSM projects.

With the exception of large industrial enterprises that have in-house energy expertise, a key agent for the implementation of DSM projects is the Energy Services Company (ESCO). Where a DSM project results in energy savings, the ESCO would usually receive a payment from the client corresponding to a share of the energy saving achieved. Eskom pays 50% of the investment cost of energy efficiency DSM projects. For load management projects, where there is a reduction in peak demand but no energy saving, Eskom pays the full investment cost and the ESCO receives a flat fee. ESCOs proposing DSM projects must have undergone a process of registering with Eskom, during which Eskom satisfies itself that the ESCO's technical and financial credentials are sound.

At the time of writing, 106 ESCOs were listed as having been approved by Eskom for implementation of DSM projects. Of these, 44 were designated as either BEE or SMME, with only 3 being BWO (black woman-owned). Only a very small proportion of the BEE / SMME ESCOs were active, in the sense of having implemented any DSM projects. It is therefore apparent that there are some serious barriers that are preventing the smaller BEE ESCOs from meaningful participation in the DSM programme.

A further potential shortcoming of the DSM programme is the very small fraction of residential sector projects it has spawned, particularly in the area of thermal energy services. Much of the future increase in peak demand for electricity is set to arise from households who currently use fossil fuels (coal and paraffin) or wood, adopting electricity for providing thermal energy services (cooking, water heating and space heating). A broadening of the scope of the DSM programme to specifically include projects designed to avert this increase in demand could play a significant role in delaying the need to construct new generating capacity. Examples of such projects could include: fuel switching from coal / paraffin to LPG to pre-empt a possible future switch to electricity; installation of solar water heaters in households; thermal insulation and passive solar design of homes. These latter two measures could also be done pre-emptively, in households that are not yet using electricity for the energy service in question, with the aim of minimising future increases in demand.

1.3 Aims of this project

The aims of this project were to gain a thorough understanding of the barriers to, and opportunities for, BEE ESCOs to become established in the market for providing thermal energy efficiency services in the residential sector, and to propose models and mechanisms for facilitating their establishment.

2 REVIEW OF THE MARKET FOR RESIDENTIAL THERMAL ENERGY EFFICIENCY

Across South Africa as a whole, residential energy use accounts for about 17% of total energy consumption. While the average household spends only 0.6% of its income on energy needs, this disguises a huge variation between income groups. The lowest income quintile devotes 5.1% of its total household expenditure to energy needs, making it the fourth most important item in the household budgets of this group[2]. For the lowest income groups of all, the importance of energy increases still further, accounting for up to 20% of household expenditure in the very poorest of households.

2.1 Analysis of residential energy consumption

2.1.1 Disaggregation by energy carrier

A 2001 analysis by the Department of Minerals and Energy (DME)[3] gives the following breakdown of residential energy consumption by energy carrier:

Table 1 Residential energy consumption disaggregated by energy carrier

Energy carrier	Percentage of residential energy consumption
Coal	22%
Electricity	38%
LPG	2%
Natural gas	0%
Paraffin	9%
Solar	0%
Biomass	29%

This breakdown does not include candles, dry-cell batteries or lead-acid batteries. Candles and dry-cell batteries are insignificant in terms of their energy content, although for those households that use them, they can represent a significant component of household expenditure. Lead-acid batteries are generally charged from the mains, and so are presumably included under electricity in the DME breakdown.

Electricity is the most important energy carrier in the residential energy mix, and in terms of expenditure it is even more dominant, being significantly more expensive per unit of energy than most of the other carriers listed. Electricity is 4 – 10 times more expensive than coal per unit of energy (the price of coal varies greatly with location), and 50% - 90% more expensive than paraffin. However, the dominance of electricity is mainly the result of its heavy use in higher-income households. Among lower income groups, coal and paraffin still dominate for thermal needs, with electricity being used mainly for lighting and communication / entertainment uses.

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[2] du Toit (1998)

[3] See for example http://www.dme.gov.za/energy/pdf/iep.pdf

2.1.2 Disaggregation by energy service

The same DME analysis for 2001 provides the following breakdown of residential energy consumption by energy service provided:

Table 2 Residential energy consumption disaggregated by end-use	
Energy carrier	**Percentage of residential energy consumption**
Cooking	10%
Lighting	14%
Space heating	17%
Water heating	42%
Other*	17%

*(includes household appliances and communications / entertainment)

No information is available for the breakdown by energy carrier for each energy service measured in terms of energy content. However, in terms of the number of households using each fuel, a breakdown is provided by the 1996 census, while a number of more recent studies have provided such a breakdown for sub-sections of the population (either specific regions or particular income groups) or for individual activities.

Nationally, about 47% of households use electricity as their main energy source for cooking. Wood and paraffin are the other most widely used cooking fuels, accounting for 23% and 21% of households respectively. The 1996 census did not report on the energy source used for water heating. In higher-income households, electricity is usually used for water heating. In many low-income households, the same fuel would be used for water heating as for cooking, but it is not unusual for households to use different energy sources for water heating depending on other circumstances e.g. whether any cooking is going on at the time, how quickly and in what quantities the hot water is needed, and whether there is a need for space-heating at the same time.

For space heating, electricity, wood and paraffin are also the three most widely used fuels, used as the main fuel by 45%, 27% and 14% of households respectively. About 57% of households use electricity as the main energy source for lighting, with 29% and 13% relying on candles and paraffin respectively. A complete breakdown by energy source for all three energy services is shown in Figure 1 below. Note that, since electrification has progressed significantly since this census was conducted, and that newly electrified households generally adopt electric lighting almost immediately, the number of households using electricity as their main energy source for lighting is now likely to be much higher.

It is worth emphasising again that these figures represent the number of households who use a particular fuel as the main energy source for that activity, but say nothing about the actual amounts used. There is considerable multiple fuel usage in South African households, so many households who use, for example, electricity as the main fuel for cooking, may also use considerable amounts of other fuels for the same purpose.

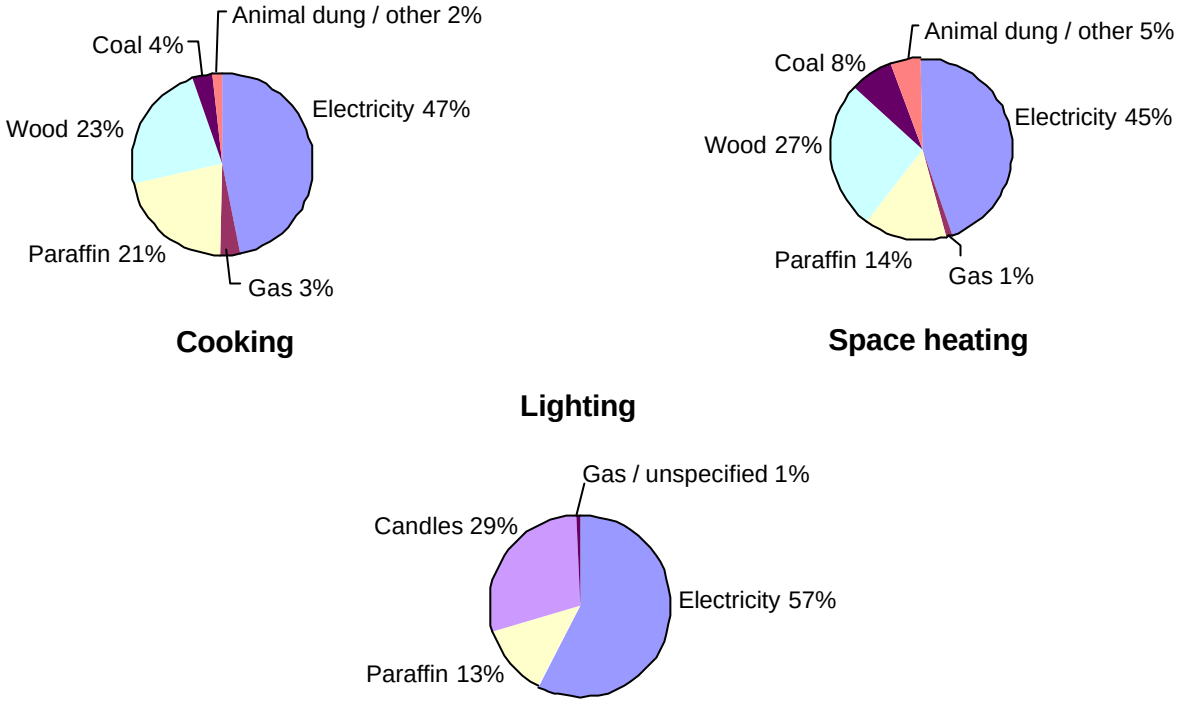

Figure 1 Main fuel used for providing residential energy services (by percentage of households)

2.1.3 Disaggregation by region

There are wide regional variations across South Africa in the relative importance of different fuels for each household energy service. Table 3 below summarises this regional variation, in terms of numbers of households, rather than by energy content. The relatively greater importance of electricity in the more prosperous and more urbanised provinces of Gauteng and Western Cape is to most striking feature of this regional disaggregation. Also notable is the greater role played by coal in the provinces where coal is mined, most significantly Mpumalanga. In the provinces where rural poverty is greatest (Eastern Cape, Limpopo and KwaZulu Natal), wood is the dominant fuel for both cooking and heating. Eastern Cape and Limpopo provinces also show the lowest proportion of households using electricity as their main energy source for lighting.

2.1.4 Disaggregation by income group

Energy consumption patterns are strongly influenced by income, and this is most apparent in the case of electricity usage. In higher income groups, electricity is used for almost all energy services, whereas in lower income groups, its high price precludes its use for anything other than lighting, telecommunications / entertainment and sometimes refrigeration. Although a full disaggregation of energy consumption by income band is not available, the 'All Media Product Survey' provides some information on electricity use by 'LSM' group[4], summarised in Table 4 below.

[4] See Box A below

Table 3 Breakdown of energy source for residential energy services by region

	Cooking	Heating	Lighting	Key
Eastern Cape				Proportion of households using: Electricity, Gas, Paraffin, Wood, Coal, Animal dung / other, Candles as the dominant fuel for cooking, heating and lighting.
Free State				
Gauteng				
Kwazulu-Natal				
Limpopo				
Mpumalanga				
Northern Cape				
North-West				
Western Cape				

Note that the information in Table 4 relates to ownership of different electric appliances, but says nothing about their level of usage. For example, households that own electric stoves or hotplates may nevertheless choose to use other fuels for cooking at least some of the time, in order to save money. A similar argument applies to space-heating. Data for electric lighting is not provided, since it can be assumed that all electrified households use some electric lighting. Ownership of electric geysers is very strongly skewed towards the higher income groups, although a proportion of those in the middle-income groups who own electric stoves and hotplates may therefore use electricity for water heating at least some of the time.

Box A: A note on Living Standard Measures (LSMs)

The LSM (Living Standards Measure) scale is a way of stratifying the population of South Africa into eight bands according to a set of 29 variables. Most of the variables relate to ownership of particular items, or access to particular services. Although income is not one of the variables used, the LSM banding correlates closely with income, with LSM 1 being the lowest income group and LSM 8 the highest.

LSMs 1-2 are almost exclusively rural and, since the main subject of this analysis is the urban residential sector, these LSMs are not considered in detail here. LSMs 7-8 live almost exclusively 'suburban' type homes, so those parts of this analysis that relate to low-cost housing generally ignore these LSMs. The vast majority of those living in low-cost urban housing belong to LSMs 3-6.

Table 4 Ownership of electric thermal appliances by LSM group						
LSM	Average monthly household income (R)	% electrified	% of households owning electric:			
			stove	hotplates	heater	geyser
1	593	3	0	2	0	0
2	777	20	1	7	1	0
3	929	25	3	12	4	0
4	1,245	54	14	28	10	1
5	1,663	92	40	42	28	10
6	2,263	100	73	30	44	36
7	5,714	100	93	23	69	83
8	10,012	100	98	20	80	98
Source: South African Advertising Research Foundation (SAARF); "Consumer Scope '98"						

2.2 Potential for Energy Efficiency Improvements in the Residential Sector

2.2.1 Technologies and fuels commonly in use

Table 5 below shows the most commonly used technologies for each combination of energy service and fuel. The table also gives the range of efficiency typically achieved with each technology, taken from Simmonds and Mammon. Note that the figures for efficiency for lighting technologies represent the efficacy of the lighting technology expressed as a percentage of the theoretical maximum efficacy for apparently white light, namely 350 lumens per watt.

Table 5 Technology-fuel combinations commonly in use in households				
	Electricity	Coal	Paraffin	LPG
Lighting	Incandescent (3-6%) Fluorescent tube (14-26%) CFL (14-20%)	N/A	Wick lamp (0.09%) Pressure lamp (0.34%)	Portable lantern (0.28%) Fixed mantle (0.28%)
Cooking	Hotplate (55-75%) Electric stove (55-75%)	Mbawula (6-10%) Stove (20-30%)	Wick stove (20-35%) Primus stove (30-55%)	LPG ring (40-60%) LPG stove (40-60%)
Water heating	Electric geyser (48-92%) Hotplate (55-75%)	Mbawula (6-10%) Stove (20-46%)	Wick stove (20-35%) Primus stove (30-55%)	Gas geyser (75-92%) LPG ring (40-60%)
Space heating	Electric heater (100%)	Mbawula (17%) Stove (20-60%)	Wick heater (45-100%) Primus stove (45-100%)	LPG heater (40-100%)
Source: Simmonds G., Mammon N.; "Energy services in low-income urban South Africa – a quantitative assessment". EDRC, 1996.				

It should be noted in relation to low-income households that, although dedicated space heating appliances are used, a significant fraction of space heating derives from the 'waste' heat given off by cooking and water heating appliances. Water-heating itself may be performed either with a dedicated water-heating appliance, or with the main cooking appliance. Finally, it is important to

repeat that many households, particularly in the low-income bracket, use a mix of fuels and technologies for meeting a particular energy service need. The fuel-technology combination used at any one time depends on, among other things, the availability and affordability of the fuel at that time, and whether there is a need for space heating.

Table 6 below gives the typical prices per MJ for the most commonly used energy carriers. Note that these prices are for the energy carrier alone, and do not include any of the other costs of usage (for example, the cost of purchasing an LPG cylinder). The price range quoted for coal represents the difference in price between Gauteng and Western Cape.

Table 6 Retail fuel prices in terms of energy content of fuel

Fuel	Price (R¢/MJ)
Electricity	8.9
Paraffin	9.9
LPG	16.2
Coal	0.85 – 1.96

Sources: Eskom website www.eskom.co.za
Shell website www.shell.co.za
LPGSA website www.lpgas.co.za
Winkler H. *et al.*; "Cost-benefit analysis of energy efficiency in low-cost housing". EDRC Report No. EDRC/00/R9 (2000).

Combining the information on appliance efficiencies with that on fuel prices, it is possible to calculate the price per unit of *delivered* energy for each technology-fuel combination. The prices are presented in Table 7 below for cooking, water heating and space heating, using Johannesburg coal price. The table clearly shows that, even allowing for the extremely low efficiency of the coal mbawula, coal is so cheap that it remains competitive with other fuel-technology combinations in terms of the price per unit of energy delivered.

2.2.2 Technical potential

The technical potential for improvements in residential end-use energy efficiency is not easily defined. It is very difficult to talk meaningfully about the energy efficiency of an appliance in a situation where there is an unmet space heating demand, as any 'wasted' energy is actually providing a useful heating function. For example, in a household heated by electricity, it makes very little difference whether a watt of heat is generated intentionally using an electric heater, or arises as 'waste' heat from an incandescent light bulb.

In many households, the cooking or water-heating appliance serves also as the main space heating appliance, so in physical terms it is extremely efficient in fulfilling that combined role *at times when space heat is needed*. For these households to adopt water-heating or cooking appliances that are nominally 'more efficient' would be counter-productive if the households in question then needed to consume more energy in the space-heating appliance, or even buy an additional appliance for space heating. In many cases, a household will have more than one option for heating water or for cooking, and will decide which to use according to the time of year and need for space heating. For example, low-income households in Gauteng generally switch from coal to paraffin for water heating and cooking in summer, as the latter fuel gives rise to less space heating effect.

The potential for improvements in the efficiency of cooking / water heating technologies is therefore greater (and the task of assessing this potential, somewhat easier) where there is a relatively small requirement for space-heating. Under these circumstances, improvements in the efficiency of water heating and cooking appliances will have an additional spin-off benefit of not causing the discomfort of unwanted space heating. In areas where the demand for space heating is significant, there is therefore little to be gained in trying to achieve improvements in the energy efficiency of appliances until the problem of poor thermal performance of the buildings themselves has been addressed.

Table 7 Fuel prices in terms of delivered energy

Fuel	Appliance	R¢/MJ delivered
Coal	Mbawula (cooking and water heating)	9 – 14
	Mbawula (space heating)	5
	Stove (cooking and water heating)	1.8 – 4
	Stove (space heating)	1.4 – 4
Paraffin	Wick stove (cooking and water heating)	28 – 50
	Wick stove (space heating)	10 – 22
	Pressure stove (cooking and water heating)	18 – 33
	Pressure stove (space heating)	10 – 22
LPG	Ring / stove (cooking and water heating)	27 – 41
	Geyser	18 – 22
	Space heater	16 – 41
Electricity	Hotplate / ring (cooking and water heating)	12 – 16
	Geyser	10 – 19
	Space heater	9

2.2.3 Socio-economic potential

The economic potential for energy efficiency improvements is generally defined in terms of the number of energy efficiency measures that yield a positive net present value (NPV) at some specified discount rate. However, the situation is more complex when social factors such as health, convenience and status are considered, and it is no longer possible simply to say that changes having a positive NPV are desirable while those with a negative NPV are not.

Rather, the usual yes / no criterion of financial cost-effectiveness has 'fuzzy edges'. Energy efficiency improvements with a negative NPV may be acceptable to households, providing those changes bring about other non-financial benefits, and providing the additional financial cost is affordable. For example, many households using coal as their main fuel source would probably be willing to pay slightly more, if the same energy service could be obtained more cleanly[5]. Of course, a certain proportion of households will be simply unable to pay more, no matter what additional benefits accrue. Conversely, energy efficiency improvements that carry a positive NPV are likely to be unacceptable if they score negatively against other factors. The most important factors to consider are:

- *Affordability*. Energy efficiency improvements that require a large up-front expenditure will be rejected unless provision can be made for this expenditure to be made affordable, for example through lease payments.
- *Convenience*. Fuels must be easily available when needed, in affordable and convenient quantities. Energy efficiency improvements that require significant additional time and effort on the part of the user are likely to be rejected.
- *Health*. Both coal and paraffin usage cause health problems among users, so an energy efficiency improvement that impacts positively on health may prove attractive even if it is not cost-effective from a purely financial perspective.

Paraffin is liked as a fuel because it is widely available in small quantities, with no need for a special container, and the appliances that use it are cheap to purchase. Coal is liked for similar reasons. Even though both coal and paraffin are the cause of poor indoor air quality and severe respiratory problems, the benefits of affordability and convenience are sufficient to outweigh these objections. Conversely, LPG requires expenditure on a cylinder and more expensive appliances, and is currently less widely available. Fuel switching to LPG will only become popular if these shortcomings can be overcome, or if the financial benefits of doing so become compelling.

In addition to the factors mentioned above are others that are more subjective, and therefore subject to change. For example, LPG is perceived by many households in South Africa to be unsafe, even though accident statistics do not support this perception. Although this perception may slow down the acceptance of LPG initially, it can be overcome in time with awareness-raising activities and the sharing of positive experiences.

2.3 Summary of the most cost-effective measures

2.3.1 Building Insulation

Building insulation in areas where there is a significant space heating demand must be the top priority, as this not only saves vast amounts of energy in its own right but will also make other improvements in energy efficiency more desirable. Without good building insulation, improving the thermal efficiency of other energy-using processes will merely reduce the level of incidental space heating, requiring more energy to be consumed elsewhere to provide adequate heating levels. In other words, where a demand for space heating is unmet because buildings are poorly insulated, other energy saving possibilities will cease to be cost-effective.

The three types of building insulation that are most likely to be cost-effective for most South African homes are (i) the installation of ceilings; (ii) wall insulation; (iii) insulation of the roof-space where a

[5] There do not appear to have been any studies on the subject of willingness to pay for cleaner energy sources among South African households, but most household surveys indicate that coal is generally chosen because it is versatile and affordable, but that it is otherwise disliked.

ceiling is in place. While the insulation of floors and the installation of double-glazed windows would undoubtedly save energy, the costs of these interventions is prohibitive in virtually all cases.

Although weatherisation (e.g. draught-stripping) could undoubtedly yield considerable energy savings in many low-income households, it has not been considered here. In the majority of low-income households, there is considerable fuel combustion within the living space, which depends on the ingress of sufficient air for complete combustion to take place. Unless careful provision is made for controlled ventilation, the over-application of weatherisation could have dangerous consequences, such as carbon monoxide poisoning.

Costs

Ceiling A number of estimates are available for the cost of installing a ceiling in a formal low-cost dwelling:

- Klunne[6] reports the cost to range from in excess of R37 per m^2 for a 'traditional type' of ceiling, falling to R18 per m^2 for a 'new, innovative low-cost' ceiling. For a typical 30m^2 low-cost house, this gives a range of costs of between R540 - R1,110.
- An analysis conducted by the EDRC[7] uses a figure of R957 as the cost of a ceiling for a typical 30m^2 low-cost dwelling. However, this was the incremental cost of including a ceiling at the time of construction, so the cost of retrofitting an existing house is likely to be somewhat higher.
- In a pilot project in Khayelitsha, Cape Town, Morris *et al* report the cost of a ceiling installation in a 30m^2 house to be approximately R2,900[8].
- Midrand Ecocity report the development and trial of a low-cost ceiling at Ivory Park[9] which costs only about R380 per household.

There is thus a huge spread in the costs reported for the installation of a ceiling, probably indicative of the wide range of different qualities of product considered. For example, the ceilings installed in the Khayelitsha project were fairly sophisticated, with considerable attention being given to the aesthetics of the finished ceiling.

Wall insulation Wall insulation is probably the next most cost-effective form of insulation after the installation of a ceiling. The potential energy savings are greater than for the installation of a ceiling, but the costs are also higher. The cost depends on the thickness of insulation chosen, which in turn is determined by the local climate conditions. In areas where winter nights are less cold, it is not as cost-effective to install thick layers of insulation, since the additional cost would not be repaid over an acceptably short period. Very few estimates have been made for the cost of wall insulation for low-cost homes in South Africa. The EDRC estimate[10] for a 30m^2 house is between R400 for the thinner insulation necessary in Durban up to R1,500 for the thicker insulation needed in Gauteng. It must be remembered that these estimates are for the incremental cost of including wall insulation at the time of construction.

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6 Klunne (2002)

7 Winkler (2000)

8 Morris (2003)

9 See http://www.ecocity.co.za/news/0002/0002-03.htm

10 Winkler (2000)

Savings and payback period

Ceiling Simmonds & Mammon[11] cite estimates for the savings that can be achieved from the installation of a ceiling, ranging from 60 – 85% of the overall space heating bill in an low-income home. A low income home heated using paraffin typically uses 126 – 196 litres of paraffin for heating annually. At current paraffin prices, this would therefore give an annual saving per household of between R185 and R294.

A description of the Khayelitsha project[12] does not explicitly state the estimated energy savings achievable from the installation of a ceiling, but it claims an annual saving of 460 tonnes of CO_2 across 2,309 homes. Assuming that the main heating fuel used is paraffin, this equates to an annual saving of about R147 per household at current paraffin prices.

A summary of the Midrand Ecocity demonstration project in Ivory Park[13] suggests a fuel saving of R190 – R780 for their low cost ceiling. While the lower figure of this range is of the same order as the two estimates reported above, the upper figure seems somewhat high, although LSM 6 households using mainly electricity for heating could conceivably achieve savings of this magnitude.

The Ivory Park design of ceiling appears to offer an affordable solution for many low-income households, with a simple payback period of two years or less. The simple payback period for the more well-established types of ceiling seems likely to fall in the range of 3-10 years. Insulating the roof space at the same time as the ceiling is installed yields small additional energy savings, estimated to be about 5%. EDRC estimates the additional cost of this to be R419 for a typical low-income home.

Wall insulation Few estimates have been made of the energy saving that can be achieved by the installation of wall insulation. Estimates of the percentage energy savings possible are difficult to interpret, since this depends on the presence or absence of insulation elsewhere in the building. Since the installation of a ceiling is the most thermally effective and cost-effective intervention, there would be little point in insulating the walls of a dwelling unless a ceiling has already been installed, or is to be installed at the same time.

The EDRC estimates the percentage fuel savings arising from wall insulation are 30% for Durban up to 85% for Gauteng[14]. This higher figure equates to and annual saving per household of about R160 – R250, giving a simple payback period of 6 – 9 years. Matthews *et al* estimate that, in informal housing, where the installation of a ceiling is in any case impracticable, simple low-cost insulation can save approximately 50% of heating costs, with a payback period of less than three years[15].

2.3.2 Solar Water Heating

Costs

As in the case of building insulation, there is a vast spread in the various estimates that have been made for the cost of a solar hot water system. Some of these systems are ‘off the shelf’ items more

[11] Simmonds (1996)

[12] UNIDO (2003)

[13] See http://www.ecocity.co.za/news/0002/0002-03.htm

[14] Winkler (2000)

[15] Matthews (1998)

suited to a high-income home, while others have been specifically designed to be affordable by, and suitable for a low-cost home:

- the EDRC estimates the cost of a 1.8 m^2 100 litre SWH system as R4,000 including back-up heating (it does not specify what the back-up heat source is, but it is most likely to be electricity).
- Solarheat's lowest price for a basic system is about R2,800.
- Solardome quotes a price of R4,150 for the installed cost of a 2.9 m^2 200 litre system.
- Solar Beam's 'Solar Hot Dog' system has a capacity of 55 litres, and costs R2,000 not including installation.
- a USAID-funded pilot in Durban offered two fixed SWH options of 20 litres and 25 litres (along with one portable model) costing R980 and R1,600 respectively. The cheaper model was hand-filled, while the more expensive model was plumbed in, and included an insulated storage tank.
- Midrand Ecocity are working with a design at the Ivory Park site with a 25 litre capacity, costing R710. However, feedback from householders using similar sized SWH in a 1999 pilot project[16] suggests that 25 litres is likely to be considered inadequate for a significant proportion of households.
- a Brazilian design for a DIY user-installed system is claimed to heat 150-200 litres of water daily to 55°C costs US$60 (equivalent to R380)[17].

There is therefore a factor of more than five in price between the more expensive, professionally installed systems and the basic low-cost designs being piloted. It is possible that a simple user-installed system may offer an even cheaper alternative, although this design has not been tested in a South African setting.

Savings

Whereas estimates for the cost of a solar water heater vary greatly between different sources, there is much closer agreement regarding the level of energy savings that can be achieved. Most reports estimate that a domestic solar water heater can provide approximately 60-70% of the energy used for water heating.

Based on usage data from Simmonds & Mammon and updated fuel prices, households using paraffin for water heating typically spend R148 – R229 per year, those using gas spend R240 – R475 annually[18], while those using coal spend R113 – R229 annually. Electricity is used for water heating mainly in higher-income households, where the typical annual expenditure is about R1,100[19].

For low-income households whose expenditure on water heating is quite modest, the payback period for one of the more expensive SWHs is extremely long – up to 40 years. However, a high-income household using electricity to provide relatively large amounts of hot water would see their investment paid back within six years. Where a low-cost system is installed in a low-income household, simple payback periods of about 5 – 10 years could be expected. A simple DIY user-

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16 Manyaapelo (2000)

17 Osava (2001)

18 Since gas geysers are not very widespread, this estimate is based on water heating using a pot on an LPG cooker. Where a geyser is used, the figure would be about half to two-thirds of that quoted.

19 Based on a daily consumption per person of 90 litres of water at 65° C (see Meyer, 1999), average household size of 2.7 and a heating efficiency of 85%.

installed system – if such a design were available locally – could yield a payback period of less than four years in low-income households.

Perhaps the most effective use for a low-cost solar water heater in low-income households is to pre-heat the feed water for an LPG geyser. This combination would provide all the advantages of LPG (cleanliness, safety, convenience) while partially avoiding the high fuel costs that are associated with it. This hybrid solar-LPG system is explored in more detail below.

2.3.3 Efficient cooking / water heating appliances

Cooking and water-heating are the two most energy intensive activities undertaken in households. There are two possibilities for increasing the energy efficiency of these activities:

- adopting more efficient fuel-burning systems (e.g. Primus stove versus wick stove for burning paraffin)
- switching to an intrinsically more efficient fuel (e.g. LPG instead of coal / paraffin)

The first point to note is that, in terms of price per unit of energy, coal is typically between 3 and 7 times cheaper than the next cheapest fuel, paraffin. However, burning coal in a stove is typically only about 30-40% less efficient than using paraffin or LPG, although burning coal in a brazier (mbawula) *is* many times less efficient. In the absence of subsidies or other financial incentives, the low price of coal means that fuel switching away from coal would never occur purely on the basis of money savings. Among coal users who rely on mbawulas, significant money savings can be achieved by adopting zero-cost options such as the Basa njengo Magogo method[20] of lighting the fire, or by switching to a stove, and these changes also bring about significant health and comfort benefits. However, fuel switching away from coal will always be motivated primarily by considerations such as health and convenience, rather than cost. The majority of those who rely on coal would prefer not to have to – the challenge is to provide them with a versatile and affordable alternative.

A similar argument applies to LPG for cooking. The fuel itself costs almost three times as much as paraffin for a given energy content, but can be used only twice as efficiently. With LPG prices at their current level, factors other than fuel cost – mainly convenience – will therefore be more important in determining whether a household switches. In the case of water heating, however, an LPG geyser is considerably more efficient than the paraffin-based alternatives, so fuel cost could play a significant role in a decision to switch fuels.

The initial cost of switching from paraffin to LPG is considerable. First, a gas cylinder must be acquired, either through purchase or by payment of a deposit. The typical deposit payable on a 9.5kg cylinder is R85, while the outright purchase of a 6kg cylinder costs about R200. A range of LPG-using appliances are available, from a simple high-pressure single ring cooker at about R85 up to a four-ring stove with oven at about R5,000. A more simple two-ring cooker is available for R400-900, a four-ring cooker costs about R1,200 while an LPG geyser costs around R3,000.

However, LPG cooking devices have much longer lifetimes than some of the simple paraffin burning appliances that they would replace. For example, a typical paraffin wick stove, although costing only R35, is estimated to last for only 9 months. In estimating the cost of ownership of an LPG cooker, the avoided cost of replacement paraffin stoves should therefore be taken into account – perhaps as much as R700 throughout the 15-year lifetime of an LPG cooker. Over its

[20] The Basa njengo Magogo method of lighting a coal mbawula is a zero-cost change in behaviour that is shown to yield significant coal savings. Most respondents in a pilot study of the method reported savings of coal amounting to one 50kg bag per month, worth a total of R104 over a four-month winter period (see Department of Minerals and Energy, 2004).

lifetime, a simple LPG cooker may therefore represent a considerable saving relative to paraffin stoves.

To summarise, patterns of appliance and fuel use for cooking and water heating are very complex, and there are many different possibilities available for switching fuel and / or technology. Many of these switches are not cost-effective in purely financial terms, but become so when health costs and convenience are taken into account. The following sections characterise some of the switches possible.

Switch from coal + paraffin to LPG stove

A very common pattern for cooking and water heating in areas where coal is easily available is to use a coal mbawula in winter (when it also provides space heating) and a paraffin stove at other times. Switching from this combination to an LPG stove would require an initial expenditure of from R170 to R500 (including cylinder deposit), depending on the type of LPG stove chosen. Note that fuel switching away from coal will be acceptable to households only if the need for space heating in the winter months is drastically reduced, through effective insulation.

In order to simplify the analysis, it will be assumed that households in this group use *only* coal in the four months of winter, and *only* paraffin at other times. Using data from Simmonds and Mammon, it is possible to infer that monthly energy expenditure is about R48 on coal during the winter, and R95 on paraffin at other times. The cost of LPG per unit of delivered energy is about three times that of coal (see Table 5), so there would therefore be an additional fuel cost of approximately R96 per month during the four months of winter. The cost of LPG per unit of delivered energy is approximately the same as that of paraffin, so fuel costs would remain the same for the other eight months of the year. Offset against this additional expenditure would be the avoided cost of replacing short-lived paraffin burners, amounting to about R35 per year, as described above.

The additional monthly fuel expenditure associated with a switch to LPG is unlikely to be affordable for the majority of coal users, most of whom choose coal primarily because of its affordability. The price of LPG would need to fall significantly for this switch to be financially attractive. With the LPG price at two-thirds of its current level, monthly increases in fuel costs during winter would be about R48, while there would be monthly savings of R32 during the rest of the year. Taking into account the avoided cost of replacement paraffin burners, the payback period for this switch becomes about 2 – 5 years. The other benefits of LPG relative to coal and paraffin may then be regarded by householders as sufficient to merit the initial expenditure necessary to switch fuels.

Switch from paraffin stove to LPG stove + LPG water heater

Outside of Mpumalanga, Free State and Gauteng, coal is more expensive and less easily available. In these areas, paraffin is the most popular non-biomass fuel used for cooking and water heating. The efficiency with which paraffin is used depends on whether it is burned in a simple wick stove, or in a 'Primus' type pressure stove.

Considering first the case of those currently using a wick stove: assuming a current annual expenditure on paraffin of R925 for cooking and R410 for water heating, and taking into account the costs per unit of delivered energy given in Table 4, the annual expenditures on LPG after switching would be R806 for cooking and R210 for water heating. There would therefore be a saving in fuel costs of R319 per year, in addition to savings of at least R35 in the avoided cost of replacing short-lived wick stoves. Switching from paraffin to an LPG stove for cooking and an LPG water heater (either a geyser or an instantaneous water heater) would require initial expenditure of about R3,500. This gives a simple payback period of about 10 years.

Paraffin pressure stoves are substantially more efficient than wick stoves, so there is less potential for reductions in fuel costs by switching to LPG. In fact, current users of paraffin pressure stoves probably would probably see an increase in fuel cost after switching to LPG. Again, the price of

LPG would need to fall to about two-thirds of its current level before those currently using paraffin pressure stoves would benefit financially from switching to LPG. The fuel switch described would then result in a simple payback period of about 10 years. With an appropriate financing mechanism to make the initial cost affordable, such a fuel switch would become realistic for a significant number of households.

Switch from paraffin stove to LPG stove + LPG water heater with solar pre-heating

Adding a low-cost solar water heater to the system described in the previous section substantially reduces the monthly fuel cost, but requires an additional initial expenditure. Assuming the availability of a low-cost solar water heater at R700, the total initial cost of the switch would be R4,200. The expenditure on cooking would remain unchanged, while the fuel cost for water heating would fall to only about R74 per year, giving an annual fuel saving of about R456 and a simple payback period of 9 years.

As in the previous example, for current users of paraffin pressure stoves, this switch would not yield any fuel cost savings. For cooking, there would be an increase in fuel costs, because of the higher cost of LPG per unit of delivered energy relative to paraffin in a pressure stove. This increase would be greater than the fuel cost saving in water heating resulting from switching from a paraffin pressure stove to a SWH-geyser combination. A fall in the price of LPG to two-thirds of its current level would be required to make this fuel switch financially viable for those using paraffin pressure stoves. Under this scenario, the simple payback period would be about 10 years.

2.3.4 Lighting

Although the focus of this project, and of the current analysis, is on thermal energy efficiency, a short summary of the potential market for energy efficient lighting in the residential sector is included for comparison. Compact fluorescent lamps (CFLs) use about 80% less electricity to produce a given level of light output relative to incandescent lamps. They are currently the only feasible alternative to incandescent lamps in households. Although fluorescent tubes offer slightly greater energy savings than CFLs, they would require new fittings to be installed, and are unlikely to be acceptable for ordinary domestic illumination.

Costs

CFLs currently retail at approximately R25 each in South Africa, although the price is still falling as demand continues to increase. It is only cost-effective to fit CFLs in lighting points where the usage is heavy, so there is likely to be only one lighting point per low-income households where a CFL would be justifiable, rising to approximately 4-5 lighting points per high-income household. The total cost of adopting CFLs therefore ranges from about R25 to an upper limit of about R125.

Savings

The real energy savings achieved by switching from incandescent lamps to CFLs are difficult to estimate. Where there is a demand for space heating, the 'wasted' energy from an incandescent lamp is actually providing a useful service – namely space heating. In electrically heated households, the energy savings will therefore be zero during the heating season. In non-electrically heated households, money savings will result from a switch to CFLs because electricity is generally more expensive per unit of energy than the alternative space heating fuels.

Outside the heating season, energy savings are more straightforward to estimate. Assuming a certain level of 'take back'[21], each CFL installed will result in the household reducing its demand by

[21] This refers to the phenomenon whereby part of the benefit of an energy efficiency improvement is taken in the form of increased energy service, rather than in reduced energy consumption.

approximately 45W. Assuming a daily usage of six hours, and a non-heating season of nine months this results in an annual saving of about 74kWh per lamp, worth about R19 at the current residential tariff.

In most countries, an important source of money saving accrues to the householder from the longer lifetime of CFLs relative to incandescent lamps. A CFL usually lasts at least 10 times longer than an incandescent lamp (up to 10,000 hours compared with less than 1,000 hours), and generally costs only about six times more. Usually, this saving alone is sufficient to justify the higher cost of CFLs, without even considering the energy savings. However, because there are no local manufacturers, CFLs in South Africa are very expensive, costing approximately ten times more than incandescent lamps (R25 compared with R2.50). As a result of this high price, CFLs cost about the same over their lifetime than the equivalent number of incandescent lamps. The simple payback period to the householder of adopting CFLs is therefore marginally over 1 year.

Another significant saving resulting from the use of CFLs accrues to the power generation sector, in the form of avoided peak capacity. Clark[22] conservatively estimates that each 15W CFL installed results in the avoidance of 39W of peak capacity. Assuming a cost of generating capacity of R3 per watt, this represents a saving to the generator of almost R120.

2.3.5 Electric storage heaters

Electric storage heaters provide a means of shifting the electrical space-heating load to off-peak periods (night-time). Within the storage heater, special bricks with a high thermal capacity are enclosed in a heavily insulated enclosure. The bricks are heated with off-peak electricity and, when the heat is needed during the day-time, air vents are opened to allow heated air into the room. Sophisticated timing and temperature monitoring circuits ensure that the correct amount of heat is stored and that this heat is released at an optimum rate.

Although electric storage heaters are not found in South Africa at present, they are very widely used in many other countries where electrical space heating is widespread. Since there is not currently a residential time-of-use tariff in place, there is no reason for the relatively more expensive storage heaters to be chosen over their non-storage equivalents. However, Eskom is currently piloting a residential time-of-use tariff (Homeflex), which prices off-peak electricity at as little as one-quarter of the price of peak power. The general adoption of such a tariff would provide a strong incentive to adopt technologies such as electric storage heaters. There is little point in trying to estimate the payback period that this technology could yield, since it is impossible to know at what price electric storage heaters would sell if they ever appeared on the South African market. However, in countries where they are widely used, they yield significant cost savings.

2.4 Size of the markets

A number of factors need to be taken into account when estimating the size of the markets for residential energy efficiency interventions:

- Applicability For some households, a given energy efficiency intervention may simply be inapplicable. For example, a roof-top solar water heater is of no use in a household where there is no running water within the building, while the installation of a ceiling may be impractical in an unplanned, informal ('shack') dwelling.
- Affordability There are two components to the affordability of an energy efficiency measure. The first consideration is whether the pay-back period is sufficiently short for the measure to represent a good investment for the householder. The second consideration is whether the initial cost of the measure is affordable to the householder, or whether a financing model can

[22] Clark (1998)

be devised to make it so. Both of these aspects of affordability are affected by the availability of grants, soft loans or other financial incentive schemes.

- Acceptability The final factor to consider in estimating the market size for energy efficiency measures is the acceptability of the measure proposed. For example, households that are using electricity for cooking are less likely to accept a switch to LPG than those who are using coal, because LPG is regarded as being an inferior fuel to electricity. A very low-cost ceiling may, because of its appearance, be unacceptable to those living in planned, formal housing.

For a residential energy efficiency investment to be considered affordable, there must be some 'slack' in the finances of the household in question. An indication of the affordability of energy efficiency measures is therefore provided by the fraction of households that are able to put part of their income into savings, and the amount that these households save each month. This information is provided in Table 8 below, for LSMs 3-6.

Table 8 Savings among low-middle income households

LSM	Average monthly income (R)	% who save	% having a bank savings account	Average monthly savings (R)
3	929	37	11	152
4	1,245	46	20	214
5	1,663	46	28	303
6	2,263	42	56	266

Source: South African Advertising Research Foundation (SAARF); "Consumer Scope '98"

Within LSMs 3-5, there are considerably more households who save than there are who have savings accounts. The difference is explained by the non-bank savings vehicles that are widely used among low-income households, such as post-office savings accounts, 'stokvels' (savings clubs) and burial societies. The fact that there are more households in LSM 6 having savings accounts than there are claiming to save presumably means that a significant fraction of these households save only occasionally. Overall, these figures suggest that about 40% of households in LSMs 3-6 have some slack in their households budgets, which could presumably be used to pay for cost-effective energy efficiency measures.

2.4.1 Thermal insulation

According to Midrand Ecocity, almost 4 million homes in South Africa do not have ceilings[23]. However, a large proportion of these are likely to be informal, unplanned 'shacks' and rural huts, in which fitting a ceiling is impracticable. Confining the estimate of market size to formal and planned informal urban housing (predominantly LSMs 3-6), the total number of households stood at 1.86 million in the late 1990s[24]. There is very little evidence of significant retrofitting of existing homes with ceilings, and only about 20% of new government-subsidised houses are being built with ceilings[25]. It is therefore safe to assume that the number of homes without ceilings is growing, and probably stands in the region of 2 million.

[23] Urban Green File (2001)

[24] South African Advertising Research Foundation (1998)

[25] Urban Green File (2001)

Of the approximately 2 million households where the installation of a ceiling is practical, some are located in areas where the space heating demand is insufficient to make this cost-effective. In terms of population, these areas are primarily the coastal regions of KwaZulu-Natal, but also include the low-lying parts of Mpumalanga and Limpopo provinces. Assuming that about 400,000 out of the 2 million households considered are located in these areas, this leaves a total of 1.6 million households in which the installation of a ceiling is both practical and cost-effective.

The estimated cost of R540 for a low-cost ceiling represents about half the monthly income for an LSM 3 household, and almost a quarter of the monthly income for an LSM 6 household. The low-cost ceiling being piloted at Ivory Park, at only R380, costs about one third of the monthly income for an LSM 3 household, and only one sixth of an LSM 6 household's monthly income. None of these amounts could be considered unaffordable for any of the LSM groups, providing payment by instalments is possible. For some LSM 6 households, a low-cost ceiling would probably be affordable as an outright cash purchase.

Financed through a loan, even the more expensive ceilings are probably affordable for many households in the income groups considered here. Paid for over three years at an annual interest rate of 15%, the monthly payments for a ceiling costing R1,100 would be just over R38. These payments would be partly offset by energy cost savings, although given that much of the space heating in low-income households arises as a side-effect of cooking and water heating, the full potential for energy cost savings would only be realised if appliance efficiency were improved.

Professionally installed wall insulation is slightly less cost-effective than the installation of a ceiling, so size of the potential market is smaller – perhaps of the order of 1 million households. Costing about R52 per month if financed over 3 years at 15%, professionally installed wall insulation is more expensive than a ceiling, but still affordable for the 40% of LSM 3-6 households that put money into savings each month. The potential market for professionally installed wall insulation is therefore of the order of 400,000 households.

In addition, there are an estimated 600,000 unplanned informal houses, where a ceiling is impractical, but that would benefit from user-installed low-cost wall insulation. A DIY home insulation kit aimed at low-income households is currently under development at the University of Cape Town[26], but is not yet available for purchase. Although the price at which this kit will become available is not known, it will presumably be pitched at a level that is affordable for all of the 600,000 households in this group.

2.4.2 Solar water heating

The potential market for solar water heaters can be divided into the simple, low-cost designs (including user-installed) that are at the pilot stage, and the higher-cost, 'commercial' designs. Generally speaking, the low-cost designs would be appropriate to the needs of LSMs 3-6, while the higher-cost models would be more suitable for LSMs 7-8. This division is by no means sharp (for example, about 38% of LSM 6 households live in suburban houses, where a higher-cost SWH might be more appropriate), but it is sufficient for the purposes of estimating approximate market sizes.

For practical purposes, roof-installed SWHs are further confined to those households that have piped water available in the house, as shown in Table 9 below. Approximately 1.8 million households in LSMs 3-6 have indoor piped water, but of these, approximately 600,000 households are suburban homes that probably form part of the market for higher-cost commercial SWHs along with LSMs 7-8. The remaining 1.2 million households would therefore constitute a potential market for low-cost SWHs.

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[26] See http://www.egs.uct.ac.za/eeu/project_summaries/home_insulate_proj.html

Table 9 Market size for SWHs in LSMs 3-6		
LSM	**Households with inside piped water**	
	%	**Number ('000)**
3	7	70
4	19	189
5	47	573
6	81	988
TOTAL		**1,820**

Prices for low-cost SWHs range from R700 – 1,000 (with the possibility that DIY user-installed designs may offer a very cheap option in the region of R400). This price range represents approximately the average monthly household income for an LSM 3 household, and about 40% of the average monthly income for an LSM 6 household. Although this probably places them out of range for outright cash purchase for these households, payment by instalments over a period of 2 – 5 years is certainly feasible, particularly when one considers that these monthly payments would be offset by fuel cost savings. The monthly payments on R1,000 over three years at 15% are less than R35, which is well within the amount that many LSM 3-6 households devote monthly to savings schemes and accounts.

Within LSMs 7-8, there are 2.36 million households with piped water in the home. In addition to the 600,000 in LSMs 5-6 that are in suburban homes, this makes a total market of almost 3 million for the higher-cost commercial designs of SWH. Almost 0.5 million m^2 of solar collectors are already installed in South Africa[27], of which a large proportion is presumably in the non-residential sector. It is therefore unlikely that the number of households already having SWHs is much in excess of 100,000 so the total untapped market can be conservatively estimated as 2.8 million households.

These commercially available systems typically cost in the region of R4,000 or more including installation, which represents almost twice the average monthly income for an LSM 6 household. However, financed over three years at 15%, a system costing R4,000 would require monthly payments of only R139. This is only about half of the amount that many LSM 6 households put into savings each month, so even the more expensive SWH systems can be considered affordable by the 600,000 LSM 6 households living in suburban-type homes, providing appropriate credit is available.

For households that do not have piped water, mobile SWHs are a possibility. The market size for these devices is constrained not only by considerations of cost-effectiveness or affordability, but also by appropriateness and acceptability. The need for mobile SWHs to stand outside for hours at a time renders them vulnerable to theft, and so unsuitable for households that are unoccupied for part of the daytime. In a consumer survey of a pilot trial of mobile SWHs[28], a significant minority of respondents were dissatisfied with the amount and / or the temperature of the water provided by a mobile SWH. However, half of the sample of households interviewed felt that the mobile SWH offered good value for money. With about 2.6 million households in LSMs 3-6 having no piped water in the home, this suggests a potential market of well over 1 million for mobile SWHs.

[27] Engineering News, 8 July 2004.

[28] Manyaapelo (2000)

According to census data, the number of households having no indoor piped water actually increased between 1996 and 2001, so it is unlikely that this potential market for mobile SWHs will decrease in the near future. Costing about R800-900, the mobile SWHs currently available could be purchased over three years with monthly payments of around R30, assuming an interest rate of 15%. This should be comfortably affordable for the approximately 40% of LSM 3-6 households that put by R150-300 monthly into savings.

2.4.3 Efficient cooking / water heating appliances

The basis of the potential market for more efficient cooking / water heating appliances is the 25% of South African households that use coal and / or paraffin for these energy services. These 2.8 million households are predominantly in LSMs 3-6 (LSMs 1-2 are strongly dependent on wood, while LSMs 7-8 mostly use electricity).

With the current relative prices of fuels, switching to LPG is only cost-effective for those who currently depend on paraffin and who burn it in a simple wick-stove. However, for these households, it is even more cost-effective, and considerably more affordable, to switch instead to a paraffin pressure stove. For households already using paraffin pressure stoves, and for households that use coal during the winter months, switching to LPG would result in additional fuel costs, as well as the up-front costs of LPG cylinders and appliances. At the current price of LPG, the total market size for LPG cooking and water-heating therefore depends on households' willingness, and ability, to pay for the improved convenience and health benefits that result.

The cost of equipping a household to use LPG, including an LPG geyser or instantaneous water heater, is likely to be in the region of R3,500. Financed at 15% interest over 3 years, the monthly payments on this amount would be R121. In addition to this are extra fuel costs of as much as R90 per month, placing a total additional monthly burden of about R211 on the household. It is unlikely that this additional monthly expenditure would be affordable by most households in LSMs 3-6. About 40% of households in LSMs 3-6 are able to put away an average of about R240 into savings each month, so some of these households could afford these additional costs. But it is by no means certain that these households would be willing to pay this much to secure the health and convenience benefits. At current fuel prices, the upper limit on the potential market size for switching to LPG is probably in the region of 250,000 households[29].

The potential market for the adoption of an LPG stove only (i.e. without an LPG geyser) is likely to be somewhat larger. At the lower end of the market, a household could be equipped to use LPG for as little as R250, which could be financed over three years with monthly expenditures of as little as about R100, including the additional cost of the fuel consumed. At a very approximate estimate, this would provide a market of somewhere in the region of half a million households.

The prices of paraffin and LPG are currently converging, a trend that is likely to accelerate if demand for LPG increases significantly. If this trend continues, LPG may soon be cheap enough that its use would yield fuel cost savings. If the price of LPG were to fall to two-thirds of its current level relative to paraffin, fuel switching from paraffin (and coal, where this is used) would become cost-effective in its own right, without taking into account the additional health and convenience benefits. Under these circumstances, the market size for switching to LPG could potentially encompass all of the 2.8 million households that currently use coal and / or paraffin, providing suitable loans are available to allow payment to take place over periods of up to 10 years.

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[29] Based on 2.8 million households using coal and / or paraffin, 40% of which have any available disposable income. Assume that half of these households (0.56 million) have sufficient disposable income to afford the additional costs, and that half of these are willing to pay the additional amount for the advantages that LPG brings.

2.4.4 Lighting

As of the end of 2003, there were 7.1 million electrified households in South Africa. It is a fairly safe assumption that virtually all households that have electricity use it for lighting (even though some low-income households may supplement electric lighting with other sources of light). However, not every lighting point in a house is suitable for fitting with a CFL – for lighting points that are used for less than about three hours per day, it is not cost-effective. To estimate the total number of lighting points where CFLs could be cost-effectively fitted, it is assumed that electrified households in LSMs 1 – 4 have one such point, those in LSMs 5 – 6 have two, and those in LSMs 7 – 8 have four. This data is summarised in Table 10 below, giving a total of about 15.3 million suitable lighting points, the vast majority of which are in the upper LSM groups.

Table 10 Estimated total market for CFLs

LSM category	No. of households (millions)	% electrified	Lighting points per house appropriate for a CFL	Total CFLs (millions)
1	0.877	3	1	0.026
2	0.820	20	1	0.164
3	1.01	25	1	0.253
4	0.995	54	1	0.537
5	1.22	92	2	2.24
6	1.22	100	2	2.44
7	1.14	100	4	4.56
8	1.28	100	4	5.12
TOTAL				**15.34**

The Efficient Lighting Initiative aims to achieve a total of 18 million CFLs in use in South African households by 2015. Allowing for a moderate growth in the number of suitable lighting points, this probably represents close to saturation of the residential market for CFLs. The number of CFLs already in use in South African households is probably well in excess of two million, given that annual sales of CFLs across all sectors stood at 2.5 million in 2001.

2.4.5 Electric storage heaters

There are approximately 1.8 million households in LSMs 7-8 that are electrically heated. Electric storage heaters are not currently available in South Africa, and in any case they would not be cost-effective because there is no residential time-of-use tariff. However, if the current pilots being undertaken by Eskom lead to the introduction of a time-of-use tariff, electric storage heaters will become a very attractive option for heating higher-income households. Under this circumstance, they are likely to be both cost-effective and affordable for all of the 1.8 million electrically heated LSM 7-8 households.

2.5 Summary

The very poor state of insulation in most low-income homes is a serious problem in areas where there is a significant demand for space heating, and it impinges upon all initiatives to improve any aspects of residential energy efficiency. For example, the potential gains from improving the efficiency of cooking are limited in poorly insulated households, because the energy 'lost' from an

inefficient cooking appliance provides a useful space-heating service. Without first insulating the building fabric, the energy saving from adopting a more efficient cooking appliance is greatly reduced as this space heat would then need to be provided by other means. Building insulation can therefore be seen to be highly synergistic with other interventions to improve household energy efficiency.

Unfortunately, building insulation is also uneconomical and likely to prove impractical in unplanned, informal housing (shacks). Although some attempts have been made to develop insulation systems useable on shacks, unless payback periods are as short as a few months, insulation of shacks is unlikely to prove economically justifiable. Very few shack-dwellers would be willing to invest money in upgrading a structure that they perceive as being temporary. The difficulty in achieving a sufficiently short payback period to make the insulation of shacks economic is greatly exacerbated by the very low price of coal in areas where it is widely used.

The most promising thermal energy efficiency interventions in the residential sector, from the point of view of potential payback period and the size of the market, are: the provision of thermal insulation to the building fabric of households (including the insulation of hot water pipes); the installation of solar water heaters; the adoption of efficient LPG appliances for cooking and water heating. All of these interventions are applicable to a wide range of income groups, although the provision of solar water heaters in low-income households is conditional on there being a suitably reliable low-cost device available.

3 POSSIBLE MODELS FOR BEE / SMME ESCO INVOLVEMENT

Following the assessment of the markets for various thermal energy efficiency interventions in South Africa's residential sector, and a focussing on those interventions for which there are significant opportunities, the next stage in the project was to develop business models that prospective thermal ESCOs could use to facilitate the implementation process. Three business opportunities were envisaged: thermal insulation and passive solar design of homes; the installation of solar water heaters; the provision of LPG for cooking, water heating and space heating. Some possible models for exploiting these business opportunities are explored in more detail below.

3.1 Thermal insulation and passive solar design

As described in Section 2.3.1 above, interventions relating to the building fabric of homes present a potentially promising area for achieving cost-effective energy savings. In addition to the installation of ceilings, and the insulation of walls and roof-spaces, the design and construction of new buildings to optimise the passive use of solar radiation should be added to the suite of cost-effective building-related energy efficiency measures. However, these measures, particularly in a residential sector context, are less amenable to being included as part of a 'classic' ESCO-style performance contract, for two reasons. Firstly, they do not involve the installation of equipment that can easily be removed. Under a normal performance contract, the risk to the ESCO is partly mitigated by the collateral value of the equipment it has installed, which can be removed and re-sold or re-used in the event that the client defaults on the agreement. Clearly this is not possible in the case of thermal insulation and passive solar design, so it becomes that much more difficult for the ESCO involved to secure any loans that may be needed to implement the project.

Secondly, it is impracticable for an ESCO to enter into separate contracts with individual households and, unlike in many other countries where the ESCO model has been successful, there are generally no convenient bodies representing collectives of households in South Africa, with which the ESCO could enter into a contract. The bodies most appropriate for ESCOs to interface with in the context of residential sector energy efficiency projects are the municipalities.

The Constitution of 1996 and the 1997 Housing Act[30] place a number of duties and responsibilities on municipalities with respect to the provision of housing. The constitution obliges municipalities to give priority to the basic needs of the community, and to ensure that services are provided to communities in a sustainable manner, promoting social and economic development and a safe and healthy environment. Meanwhile, the Housing Act obliges municipalities to ensure that citizens have access to adequate housing on a progressive basis. The Act obliges municipalities allocate land for housing and to initiate, plan and execute appropriate housing developments The Act also requires municipalities to regulate health and safety standards with regard to housing developments[31]. The fulfilment of these obligations would appear to require attention to be paid to the thermal properties of the housing provided. Homes that are so poorly insulated as to be impossible to heat to a comfortable temperature, and which suffer from severe indoor air pollution resulting from the combustion of coal and paraffin, do not constitute a 'safe and healthy environment'.

Many of the low-cost homes that were provided in the early stages of the Reconstruction and Development Programme were little better than the shacks they were replacing from the point of view of their thermal properties. A home that requires the householder to spend over 10% of their

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[30] This Act is the main instrument for implementing Section 26 of the Constitution, which declares that every South African has the right to have access to adequate housing.

[31] Pillay (1998)

household income on heating cannot be considered 'adequate' according to the requirements of the Housing Act. The Department of Housing is now addressing this problem, as illustrated by the following extract[32]:

> "With the priority of ensuring that environmentally sound principles underpin all future housing policy, the Department of Housing has defined its role in terms of the following interventions:
>
> - The development of regulations to promote no-cost interventions such as passive solar design and we have already included standards relating to energy and water efficiency in the National Building Norms and Standards
> - The development of incentive programmes for promoting low-cost interventions related to insulation, ventilation and damp-roofing
> - The development of a financing mechanism to provide for interventions with a significant cost such as solar water heating systems, solar home systems and water-harvesting tanks."

However, given the urgency of providing homes for shack-dwellers, it is understandable if the attention of municipalities is focussed entirely on this. Many municipalities lack the capacity, both financially and managerially, to provide anything more than the bare minimum standard of housing to those currently living in shacks. A key role and significant business opportunity for ESCOs is therefore to work in partnership with municipalities, to assist them in the delivery of housing units that go beyond this minimum level, according to the Department of Housing principles outlined above.

The types of business activity that ESCOs would undertake in partnership with, and on behalf of the municipality would include:

- Participating in the design of housing schemes to introduce energy efficiency components and passive solar design into housing units aimed at low-income populations. At present, the majority of low-cost housing units probably do not include adequate insulation or passive solar design. There is therefore a need for ESCOs to play an advocacy role, possibly with the support of donor funds, to ensure that such features become mainstreamed. Once energy efficient design principles are firmly established, ESCOs will have a role as energy efficiency specialists in the teams responsible for the delivery of safe, healthy, comfortable and environmentally sound housing. Some models for the involvement of ESCOs in these activities are provided by the Eco-Homes Advisors programme and the Green Professionals scheme previously implemented by IIEC.
- Undertaking energy audits of the existing stock of housing in a particular municipality region. This would provide a base-line energy consumption level for the residential sector, essential for monitoring the effectiveness of future schemes to improve residential energy efficiency, and for monitoring progress towards the achievement of national targets for energy efficiency targets, as enshrined in the National Energy Efficiency Strategy.
- Designing and / or implementing schemes on behalf of the municipality to promote the installation of insulation in existing homes. Such schemes have proved very successful in the United Kingdom, where local authorities provide grants towards the insulation of the homes of vulnerable sections of the population (the elderly and those on state benefits). In a South African setting, higher-income households would probably pay a full market rate for insulation, the role of the municipality and the ESCO being mainly to promote the benefits

[32] Mthembi-Mahanyele (2001)

of insulation. Lower-income households would probably need to receive a grant towards the cost of insulation, and may also benefit from the possibly of paying the remainder of the cost in instalments. The ESCO would be responsible for managing the distribution of grants and the operation of instalment payment schemes, for installing the insulation itself and also for negotiating the bulk procurement of insulation materials to bring down costs.

3.2 Solar water heaters

Solar water heaters have a huge potential to reduce electricity demand in homes that use electricity for water heating, and to avert potential future increases in demand in households that aspire to using electricity in the future. The provision of solar water heaters to households represents a promising business opportunity for ESCOs wishing to work in the residential sector. Caution must be exercised in recommending very low-cost solar water heaters to low-income households, as there are concerns over the reliability of some of these designs. Solar water heater designs that have a proven track record of reliability and quality cost upwards of R 2,500 and are a viable proposition only for higher-income households, the majority of which are already using electricity for water heating.

While many higher-income households could undoubtedly afford the outright purchase of such a device, very few have actually done so. As of 1999, only about 100,000 systems had been installed in South Africa[33], representing only about 4% of those households who could reasonably be expected to afford a solar water heater (LSMs 7-8), and only about 1.2% of all South African households. To set this figure in context, almost 80% of households in Israel have a solar water heater – a country whose latitude and hours of sunshine are comparable to those of South Africa. There is therefore clearly plenty of scope for a substantial increase in the number of household solar water heaters in South Africa.

The uptake of solar water heaters among higher-income households could be enhanced with the intervention of ESCOs, providing increased awareness of the benefits along with a relatively risk-free financing arrangement. With a potential to save about R 700 annually in higher-income households (see Section 2.3.2 above), and financed over three years at 12%, a solar water heater would need to cost less than R 1,680 in order for the energy savings to exceed the monthly repayments. If projects of this type could be implemented under an Eskom DSM agreement, 50% of the investment cost would be covered by Eskom, so solar water heaters costing up to R 3,360 could still prove cash-positive to the client. Even this higher amount is somewhat on the low side for a high quality appliance including installation costs. Furthermore, the minimum project size that Eskom DSM will support equates to a demand saving of 500 kW, so considerable bundling of individual projects would be necessary to qualify for support.

It is probably more realistic to assume that households adopting solar water heaters will not be cash-positive from the outset, but will face modest additional monthly expenditures for the period during which the solar water heater is being purchased. The potential payback once the solar water heater has been fully paid for still makes this an attractive investment from the point of view of the householder, as the following example illustrates:

A solar water heater is installed in a household at a total cost of R 4,500. The ESCO finances the installation over a three year period, with 80% of the total cost being covered by a bank loan at 8.5%, and the remaining 20% of the cost being financed from the ESCO's own equity, on which it requires a rate of return of 30%. The ESCO therefore charges the client a total of R 149.63 per month (R 113.12 to cover debt service payments, plus R 36.51 return on the ESCO's equity investment). The solar water heater saves the client about R 58.33 per month, so for the first three years, the client faces additional costs of R 91.30 per month. After three years have elapsed, the

[33] Hochmuth (1999)

client benefits from the full R 58.33 per month in savings. This represents a rate of return to the client of about 15%.

A more affordable means of financing the cost of a solar water heater is to include it in a mortgage on the home. Paid for over fifteen or twenty-five years, the monthly payments on a solar water heater become significantly smaller than the value of the energy savings that result. Under this model, the role of the ESCO would be to function as an intermediary between the house buyer and the home loan company, in addition to its normal role as the supplier and installer of the equipment.

3.3 Provision of LPG

A very high proportion of households who currently use paraffin and coal to meet their thermal energy needs aspire to switching to electricity as soon as they can afford to do so. Electricity is widely perceived as the energy carrier of choice, and its widespread adoption for household thermal energy services has the potential to cause an enormous increase in peak electricity demand in the relatively near future. The promotion of LPG as an alternative could form an essential part of a strategy to limit future growth in peak demand.

An associated project being undertaken by IIEC has identified widespread fear of LPG among householders, which greatly limits its acceptability as a residential fuel. Pilot programmes to help overcome this fear are being developed under this associated project. However, there are other barriers to its adoption, the most significant of which are:

- lack of local retail outlets, necessitating travelling long distances with heavy cylinders
- the need to buy relatively large amounts of fuel at a time, which challenges tight household budgets
- high up-front cost to users, in the form of a cylinder deposit and the purchase price of equipment.

A business model designed to overcome these barriers would involve: doorstep delivery of filled LPG cylinders (in the same way that coal is delivered at present); instalment payments for the gas itself; a leasing arrangement for the LPG equipment. The business model can be likened to a ‘fee for service’ model, where the client pays for the gas used as well as paying a small fee for the delivery service. A full description of the business model is presented in Attachment 1.

4 STAKEHOLDER CONSULTATION

The process of stakeholder consultation was a continuous one throughout the project, with frequent telephone conversations taking place between the project team and representatives of Eskom DSM, the National Electricity Regulator, E+Co and the individual ESCOs. Within this consultation process, their were also specific events described below: a workshop on BEE opportunities in energy efficiency, the collation of a database of potential BEE / SMME ESCOs, and the conducting of a survey of ESCOs. The process of stakeholder consultation led to the emergence of a range of alternative activities ('business models') that ESCOs could, and should, be engaging in as part of the process of delivering thermal energy efficiency services to the residential sector.

4.1 Workshop on BEE opportunities in energy efficiency

The first stage in the process of stakeholder consultation was to invite key stakeholders to a workshop, in order to seek their feedback on the aims of the project, and gain an insight into their perceptions of the opportunities for BEE ESCOs in the thermal energy efficiency market. The workshop took place at the Isisango Conference Centre, Midrand on 1 July 2004. About 35 people attended the workshop, representing ESCOs, NGOs, the energy supply industry, government departments, academia and the finance sector. The minutes to the workshop are presented in Attachment 2.

4.2 Database of potential BEE / SMME ESCOs

The basis for the collation of a database of potential BEE / SMME ESCOs had been the list provided on the Eskom website of ESCOs that had registered to participate in the Eskom DSM programme. Following a number of literature searches and telephone conversations, it soon became apparent that the Eskom list was reasonably exhaustive. Attempts to locate and identify small businesses that had the capacity and the wish to function as ESCOs, but who were not listed by Eskom, were of only limited success. The database used in this project therefore predominantly comprises all those firms that are listed on the Eskom list as either SMME, BEE or BWO (black woman owned), plus a small number of other enterprises not listed by Eskom. The database is provided as Attachment 3.

4.3 ESCO survey

The database of ESCOs described above was used as the basis for a survey of the perceptions of SMME / BEE ESCOs regarding the opportunities for, and barriers to their greater involvement in providing thermal energy services in the residential sector. A copy of the survey questionnaire is provided as Attachment 4. Approximately sixty survey questionnaires were sent out, and about twenty were returned, or were filled in as a result of telephone conversations, representing a response rate of just over 30%.

A draft report on the survey findings provided as Attachment 5. The main findings of the survey can be summarised as follows:

- There is a huge disparity in the size and resourcing of the ESCOs registered with Eskom, and a disproportionate number of the BEE ESCOs fall into the category of 'struggling', meaning that they have yet to have any projects approved for implementation under the DSM programme.
- Very few ESCOs focus to any extent on the residential sector, probably because of a relative lack of perceived opportunities for ESCOs in this sector. There is also a strong focus on electrical energy efficiency projects, which is understandable given the dominance of Eskom DSM in driving the development of the ESCO sector. However, most ESCOs

expressed a wish to get involved in thermal energy efficiency projects if opportunities were to arise.

- A needs assessment revealed that access to finance was perceived as the most pressing requirement. The smaller ESCOs rely almost entirely on injections of owner equity to sustain them, a source of finance that is inadequate to permit the development of DSM projects of the size required for approval under the Eskom programme. The lengthy process that must be undertaken in getting projects approved by Eskom is prohibitive for smaller ESCOs unless suitable financing can be obtained.
- The needs assessment also revealed a perceived skills gap in the area of energy auditing.
- There was a feeling that ESCOs choosing to focus solely on DSM projects would probably struggle to survive. Some newly established ESCOs had hoped that the DSM programme would provide the main basis for their continued development, but this seems to be unrealistic. ESCOs need to engage in a range of other income-earning activities in order to ensure their survival.
- There is a general lack of awareness of energy efficiency among municipalities, which severely constrains the scope for ESCOs to develop DSM projects in partnership with municipalities.

4.4 Emergence of alternative 'business models'

One of the most significant facts to emerge from the survey was that almost all of the BEE / SMME ESCOs that have undergone the Eskom registration process are now sitting dormant (at least with regard to the provision of DSM services), as they do not have the financial and technical capacity to generate a pipeline of energy efficiency projects. It is likely that a still greater number of ESCOs lack the financial capacity even to embark on the lengthy process of registering with Eskom. As many of these smaller ESCOs have close links with their local communities, they represent a potentially rich resource of expertise that could be mobilised for the implementation of thermal energy efficiency projects in the residential sector, especially among low-income households. Mobilising this resource to generate a project pipeline requires a number of barriers to be overcome:

- There are many stages of preparatory activities that need to be undertaken before projects reach the stage where they can be submitted to Eskom. Particularly in the case of smaller ESCOs, there is insufficient financial capacity to undertake these activities without outside support.
- In the case of residential sector thermal energy efficiency projects, a significant degree of capacitation of the municipality is required before a project pipeline can be created.
- The current interpretation of what constitutes DSM, and what activities ESCOs are expected to engage in, is relatively narrow and restrictive. The current parameters of the DSM programme implicitly (but probably not intentionally) exclude the provision of thermal energy services in the residential sector – yet it is the projected future growth of residential electricity demand for space heating, cooking and water heating that is the most serious threat to South Africa's ability to meet future electricity demand. There is therefore a need for a broadening of the current DSM / ESCO concept to explicitly include thermal and residential energy services.
- The last component of the DSM value chain is monitoring and verification (M&V). This may be particularly problematic in the residential sector, as conventional M&V protocols are not equipped to deal with the widely dispersed and relatively small individual energy savings characteristic of the residential sector. However, for the effective functioning of the client-ESCO relationship, there is need to ensure that all energy saving projects include measurement,

verification and documentation of savings. For this to happen, an M&V protocol specific to the residential sector in South Africa would probably be necessary.

Hence there are many business activities that an ESCO necessarily has to engage in, if it is to generate project pipelines in the residential sector, but which fall outside the scope of what an ESCO 'traditionally' engages in. These include:

- ***Capacitation of municipalities.*** Municipalities are the key players in the delivery of basic services, including energy and housing, to the populations they serve. One of the most important barriers identified by ESCOs that inhibits their involvement in residential sector energy efficiency is a lack of awareness on the part of municipalities regarding the role that energy efficiency can play in enhancing basic service delivery, and of the opportunities available for municipalities to improve household energy efficiency.
- ***Needs assessments.*** Any interventions aimed at improving energy efficiency in the residential sector must be based on a thorough understanding of the energy needs of households. 'Energy needs' as opposed to 'energy demand' implies a qualitative assessment of the types of energy technologies that households are likely to find acceptable. Further areas where preliminary needs assessments are required are: identifying the training needs of both the ESCOs themselves and the municipalities; identifying the need for public awareness-raising of energy efficiency, in terms of the type of material required.
- ***Baseline studies.*** There is currently very little detailed understanding of the energy usage patterns of low-income households, nor of the likely trajectory of growth in household energy demand. Without a thorough grasp of the 'business as usual' path, it will be very difficult to assess the true impact of interventions to reduce household energy demand, which in turn will render the usual performance-related criterion for ESCO remuneration inoperable. An important role for the ESCO sector to play is therefore the implementation of baseline studies on behalf of the local municipalities.
- ***Demand realisation.*** At present, the demand for energy efficiency goods and services within the residential sector is latent. To realise this demand, considerable effort is required by municipalities in partnership with ESCOs to enhance public awareness of the true costs of the energy decisions made by households, in terms of inefficient use of scarce cash resources, negative health impacts and sub-optimal comfort levels.

The emergence from discussions with ESCOs of these alternative business models does not invalidate the types of business model described in Section 3. However, the conclusion from the ESCO survey and discussions is that the residential thermal energy efficiency market, the municipalities who are the most likely proponents of project in the low-income sector, and the ESCOs themselves, are not yet in a position where they are ready to start implementing projects based on the more conventional ESCO business model. A significant amount of preparatory capacity building on all sides, along with market assessment and preparation activities, are required before a significant number of residential sector thermal energy efficiency projects can be developed.

5 MONITORING AND VERIFICATION PLAN

The expected impacts of the projects fall into the following categories:

- The formation of strong and lasting partnerships between the SMME / BEE ESCOs involved in this project and their local municipalities.
- The generation of a pipeline of thermal energy efficiency projects in the residential sector by the SMME / BEE ESCOs involved in this project, in partnership with municipalities
- The formulation of policy initiatives by Eskom and / or NER regarding the future implementation of the DSM programme, to facilitate the greater participation of SMME / BEE ESCOs.

Indicators to quantify the extent of these impacts are straightforward to define: they are simply the number of partnerships, projects and policy initiatives respectively, that are attributable to the project. There is no need to develop elaborate mechanisms for quantifying these impacts – simple observation and documentation will suffice. However, the extent to which the first two impacts can be attributed to IIEC's involvement will probably need further effort to determine, especially as both impacts will probably require some future capacity building effort in order to realise them.

The quantifiable impacts described above will generally not become apparent until some time after the project itself is finished. The monitoring plan must therefore continue for a period of about two years beyond the end of the project. As a result of implementing this project, IIEC has developed a close working relationship with two of the ESCOs covered by the survey, and intends to extend this relationship to other ESCOs. It is expected that these relationships will continue into the foreseeable future, during which time further capacity-building assistance will be provided to the ESCOs. Monitoring the first two impacts mentioned above will form an integral part of IIEC's ongoing relationship with these ESCOs.

The most effective way of determining attributability will be to use independent assessors to interview the partner ESCOs, with a view to obtaining a first-hand analysis of the impact of IIEC's involvement. Subject to the availability of resources, IIEC will therefore retain the services of an independent consultant approximately eighteen months to two years after the project has finished, who will be tasked with carrying out this activity.

The final impact described above – the formulation of policy initiatives – is much more difficult to attribute to the activities of this project. It is unrealistic to expect policy-makers to explicitly state the origin of new policies, and in any case it would be surprising if new policy initiatives could be solely attributed to a single cause. However, it is IIEC's intention to maintain a close working relationship with both Eskom DSM and the NER, with a view to the continuing advocacy of greater SMME / BEE involvement in the delivery of the DSM programme. It is therefore safe to assume that any new policies and programmes introduced in this area by Eskom DSM and / or NER will have been influenced to some extent by the activities of this project.

6 CONCLUSIONS AND THE WAY FORWARD

It is clear that the ESCOs currently registered with the Eskom DSM programme constitute a very valuable resource with the potential to contribute greatly towards improvements in South Africa's energy efficiency. However, this resource is currently being under-utilised, particularly in the case of the SMME / BEE ESCOs. It is also clear that, given the very poor state of energy efficiency in the household sector, the current Eskom DSM programme does not generate a sufficiently large number of residential sector energy efficiency projects. In particular, it neglects almost entirely the thermal energy demands of the household (cooking, water heating and space heating)[34].

A number of conventional business models can be devised (based around performance contracting) for SMME / BEE ESCOs to get involved in the actual provision of thermal energy efficiency services in the residential sector. These business models are valid, but the ESCOs in question are not yet in a position to engage at this level. A number of barriers were identified by the SMME / BEE ESCOs surveyed, which inhibit their ability to fulfil their potential as agents for the delivery of energy efficiency services under the current DSM programme:

- The DSM programme is structured in a way that does not facilitate the involvement of SMME / BEE ESCOs. Prospective DSM projects require a considerable amount of preparation before they are in a form that can be submitted to Eskom for approval. While larger ESCOs can carry these costs in their cash-flow, SMME / BEE ESCOs are ill-equipped financially to undertake this work at their own risk, with no assurance that the considerable investment of time and effort will be repaid in the form of project revenues.
- Smaller ESCOs find it very difficult to obtain finance, without which they can neither engage in project development activities nor undertake activities related to their institutional growth and development. With no assets to serve as collateral, they cannot secure bank loans, so their usual source of finance is periodic small injections of owner equity.
- The SMME / BEE ESCOs are well motivated and generally highly qualified, but some of them identified a need for some additional capacitation before they will be in a position to generate a pipeline of residential sector thermal energy efficiency projects. The specific skills gaps identified were generally in the area of energy auditing, including monitoring and verification of energy savings.
- Specifically with reference to the residential sector, municipalities in general are not yet sufficiently familiar with energy efficiency to appreciate the role it can play in bringing improved comfort and healthy living conditions to low-income communities.

There are many possibilities for municipality-ESCO partnerships to facilitate the delivery of high-quality, energy efficient yet low-cost housing units, and to implement programmes to improve the energy performance of existing housing. Furthermore, municipalities have a duty under the Constitution and the Housing Act to deliver comfortable and healthy homes to low-income populations, so they have an incentive to realise such partnerships. But the formation of these partnerships will require time and effort on the part of the ESCOs, and some capacity-building input.

A number of activities can be identified that will build on this project, a complete description of which can be found in IIEC's proposal "BEE ESCOs as agents for capacitating municipalities in energy efficiency delivery". These activities can be briefly summarised as follows:

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[34] The widespread implementation of ripple control of domestic hot water geysers under the DSM programme is aimed at load-shifting, not at energy efficiency.

- A continued capacity-building partnership with SMME / BEE ESCOs, under which the formation of strong partnerships with municipalities will be promoted.
- The creation of a limited fund from which SMME / BEE ESCOs can draw for specific and clearly defined activities relating to project preparation and institutional development.
- Working closely with SMME / BEE ESCOs to build the capacity of municipalities to incorporate energy efficiency design principles into housing projects, and to develop schemes to promote the installation of insulation in existing homes (c.f. IIEC's Green Professionals programme).
- A continued interaction with Eskom DSM and NER to advocate (i) broader interpretation of what constitutes a valid DSM project, to include the kind of thermal energy efficiency projects that are currently overlooked; (ii) modification to the way that the DSM programme is operated, in order to enhance the opportunities for SMME / BEE ESCO involvement. Note that there is already some evidence that changes are being considered – Eskom recognises that there are serious issues with regard to SMME / BEE ESCO participation in the DSM programme, and are beginning a process of engaging with them to explore their needs.

The delivery of healthy and comfortable housing to South Africa's low-income communities is a high priority, and improving household energy efficiency has a key role to play in achieving this goal. Municipalities are key players in bringing about improvements to the energy efficiency of South Africa's housing stock, but for this to happen, continued attention should be paid to building their capacity and facilitating the formation of partnerships with SMME / BEE ESCOs, who are in a strong position to interface between municipalities and the communities they serve.

7 POSTSCRIPT – BEE ESCO CAPACITATION

Following the BEE ESCO Survey conducted under this project, IIEC identified two ESCOs based in Limpopo, who appeared to be good candidates for the development of a closer capacity-building relationship with IIEC. This capacity-building was conducted outside the auspices of the USAID-supported project, but is reported briefly here because it arose as a direct follow-on from the main project. The ESCOs selected were Eternity Star Investments in Polokwane and Tsa Khomotso in Leboakgomo, chosen for the following reasons:

- Limpopo Province is one of the poorest in South Africa, and the Sekhukhune District in which Leboakhomo is located is one of the thirteen 'poverty nodes' designated for particular attention under the government's Integrated Sustainable Rural Development Strategy
- The responses that these two ESCOs provided to the survey conducted under the USAID-suported project were particularly perceptive and indicated a high degree of enthusuasm for exploring new business models incorporating residential thermal energy efficiency services

Following a period of discussion and negotiation, IIEC devised workplans for the ESCOs, and drew up consultancy contracts under which these workplans would be implemented. Given the conclusions that had been drawn in Section 6 above, and recognising that there had been virtually no engagement to date between ESCOs and municipalities in this region, the workplan was oriented strongly towards: (i) developing a strong working relationship with the local municipality with respect to the delivery of thermal energy efficiency services in the residential sector; (ii) analysing the needs of municipalities (in terms of skills and personnel gaps) in respect of residential energy efficiency delivery; (iii) identifying opportunities for partnerships between ESCOs and other stakeholders (including municipalities and IIEC) in the areas of information dissemination, promotion, education and training of personnel / staff to deliver energy efficiency.

Constraints on the amount of funds available meant that the workplans developed in conjunction with the partner ESCOs were limited in scope. However, given the limited experience that the ESCOs had in performing this kind of work, it was in any case desirable to proceed cautiously until the ESCOs had proved their capabilities. The scope of work and the deliverables under the ESCO consultancy contracts are given in Attachment 6.

7.1 Results

Neither of the selected ESCOs was able to deliver on the contracted scope of work within the deadline agreed. However, it was felt that good results delivered late were preferable to no results at all. IIEC was therefore flexible in regard to the contracts, and agreed to allow the ESCOs additional time to complete the programme of work.

One ESCO – Eternity Star Investments – has delivered an interim report on progress to date, and appears to be performing well. Their main findings to date are outlined below, and they are expected to deliver a full final report early in January. Tsa Khomotso appear to be more problematic; they have yet to deliver anything substantive, and have proved very unresponsive to attempts to organise meetings to discuss progress.

Eternity Star's work is still in progress, so the following is a brief summary of their activities to date. Following consultation with the local DME (Department of Minerals and Energy) representatives, three municipalities were identified as being promising candidates for pursukng further. These were Polokwane, Molemole and Makhado, which were selected primarily because of the willingness of key personnel to engage actively with the ESCO and provide the information they requested.

Eternity Star began by obtaining the integrated development plans (IDPs) from each of the municipalities. IDPs are intended to provide direction for the planning and implementation of

municipal programmes and projects. They are prepared on a three-year cycle, with the current IDPs covering the period up to mid 2007. The IDPs of the three municipalities are very different in quality and comprehensiveness, but none deals particularly well with issues related to the role of energy in local development. Molemole included a brief survey of household energy usage patterns and options, while the IDPs of the other two municipalities mentioned energy only in the context of the prospects for electrification.

Following a series of meetings with key municipality officials, Eternity Star identified a number of communities as targets for household energy baseline surveys to be conducted. The results of these surveys will be presented in the forthcoming final report. Their discussions with municipality officials were also oriented towards developing a better understanding of:

- the processes by which development projects are prioritised and funds allocated
- the role that energy efficiency could and should play in loacl development plans
- the particular gaps in terms of skills and management resources that may be preventing adequate attention from being paid to sustainable energy issues
- how ESCOs and municipalities can best co-operate with other stakeholders (DME, Eskom, the communities themselves) to provide sustainable energy solutions in the residential sector

These and other issues will be reported on in full in the forthcoming final report from Eternity Star to IIEC. A draft interim report is provided as Attachement 7.

7.2 Conclusions

The conclusions that can be drawn from IIEC's capacitation partnership with BEE ESCOs fall into two categories:

- conclusions relating to the ESCOs themselves and their capacity to undertake the kind of functions outlined here
- conclusions regarding the findings of the work undertaken by the ESCOs, and the direction of future follow-up

7.2.1 Capacity of SMME / BEE ESCOs

Many of the smaller ESCOs – particularly the micro-enterprises – are primarily engineers, whose personnel may have relatively little expertise or interest in undertaking the 'softer', more policy-oriented activities that are a necessary precursor to developing thermal energy efficiency projects in the residential sector. Of the two ESCOs that IIEC engaged with, one clearly fell into this category, and this manifested itself in the lack of substantive results from the contracted programme of work.

However, these micro-ESCOs constitute a very valuable and currently under-utilised resource for the implementation of 'conventional' DSM projects under the Eskom programme. New mechanisms clearly need to be devised to ensure the full potential of these ESCOs is utilised. As specialist engineers, the micro-ESCOs do not necessarily have the skills required to undertake project development, prepare detailed business plans and negotiate with Eskom DSM to obtain approval of projects under acceptable terms. Although some of these skills could undoubtedly be developed through targeted training programmes, a more efficient option might be for these skills to reside in an umbrella body (a 'super-ESCO') created specifically for the purpose. The micro-ESCOs would then be responsible for initial identification of opportunities, and for the actual implementation of the projects once approved. Meanwhile, while the super-ESCO would oversee the functions of business plan preparation and negotiation with Eskom.

Many of the small to medium (as opposed to micro) ESCOs possess much broader-based sets of skills. These ESCOs are well-equipped to enter into the kind of strong working relationships with

municipal decision makers that are necessary to generate a flow of thermal energy efficiency projects in the residential sector. However, partnership-building and capacitation of municipalities are not income-generating activities for the ESCOs. There may need to be up to two years of these activities before the energy efficiency projects from which ESCOs can earn an income begin to happen. The smaller ESCOs do not have the resources to sustain themselves for this long without income-earning projects. If these small to medium ESCOs are to fulfil this role – and the evidence from this project is that they are willing and able to do so – they may need to rely on a continued flow of donor assistance.

7.2.2 Capacity of municipalities and future direction

Only one ESCO has so far delivered anything substantial, and their work is still in progress. These conclusions must therefore be regarded as tentative. Eternity Star's preliminary work has shown that there is very little capacity in the municipalities for dealing with thermal energy efficiency in the residential sector. To the extent that energy is addressed at all, attention is almost entirely focussed on household electrification and how best to catch up with electrification backlogs given the limited resources available. Understandably, little attention is paid to other energy carriers, nor to activities aimed at improving the efficiency with which energy, including electricity, is used.

Electrification of households is correctly regarded as an important priority, and Limpopo Province has been one of the more successful in achieving this. However, the evidence suggests that even when electrified, low-income households in the region studied continue to use paraffin and biomass to meet their thermal energy needs. The allocation of electricity that is provided under the free basic electricity scheme (50kWh per household per month) is insufficient for a normal level of cooking, and would be consumed in only a few days if it were used for space-heating. Rapid electrification does not, therefore, obviate the need to pay careful attention to meeting the thermal energy demands of households in a socially and environmentally sustainable way.

As observed, the municipalities with which Eternity Star interacted are ill-equipped to address any energy-related matter other than the electrification of households as rapidly as possible. Their IDPs make virtually no mention of energy carriers other than electricity, despite the severe negative health and environmental impacts of paraffin and biomass use. There is also little in the IDPs to suggest that municipalities have the capacity to address the energy efficiency of the housing developments that they are mandated to implement under the Housing Act. Given the current capacities of municipalities, it therefore seems unlikely that they will be in a position to initiate streams of residential sector thermal energy efficiency projects in the near to mid-term, without considerable external technical assistance.

Eternity Star also pointed to a potential difficulty that may result from the establishment of the Regional Electricity Distributors (REDs). Municipal employees concerned with electricity distribution are expected to be transferred to the REDs when they are established. In many cases, these staff are the only individuals within the municipality with any knowledge or expertise on broader energy issues. Their departure to the REDs will thus leave municipalities with virtually no capacity to address non-electrical energy issues. Furthermore, there is an assumption that any budgets for implementing energy efficiency will be handled by the REDs, exacerbating still further the widespread assumption that 'energy efficiency' equates to 'electricity efficiency'.

If municipalities are to meet the needs of low-income communities with regard to comfortable, energy efficient homes, and clean and affordable energy sources, they will require considerable assistance. This project has demonstrated that many of the ESCOs currently established in South Africa are well-positioned to provide this assistance. Municipalities must be encouraged to make use of the valuable resource that these ESCOs constitute, enabling them more effectively to meet their responsibilities towards their more vulnerable populations.

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ATTACHMENT 1 – 'FEE FOR SERVICE' MODEL FOR PROVISION OF LPG

OVERVIEW

For many low to middle income households who are currently using coal and / or paraffin to meet their thermal energy needs, liquified petroleum gas (LPG) presents an attractive alternative. There are several significant advantages of LPG over coal and paraffin:

- it produces much lower levels of indoor air pollution than either coal or paraffin
- it is safer than paraffin, which is responsible for tens of thousands of house fires every year, as well as about 14,000 cases of poisoning in children
- the flame is much more easily controlled, providing greater versatility and convenience
- a cylinder of LPG will last several weeks in normal use, reducing the amount of time spent buying fuel

Despite these obvious advantages, take-up of LPG in South African households has been poor, due to a number of barriers. The most significant of these are:

- despite LPG's much better safety record than paraffin, householders remain frightened of it, fearing that explosions are a significant possibility
- there is a high up-front cost associated with adopting LPG, as it requires the purchase of a relatively expensive stove and associated equipment, and the acquisition of a cylinder (through either outright purchase or the payment of a significant deposit)
- LPG is significantly less accessible than coal or paraffin; it is available from far fewer retail outlets than paraffin, and there is no delivery system in place as there is with coal.

IIEC's experience in implementing its project "Switching from Coal and Paraffin to LPG in Low-Income Households" suggests that there is a high willingness to pay the slightly higher fuel costs of the LPG itself, because of the significant benefits that LPG brings – the higher fuel cost is not, in itself, a significant barrier.

The fear that many households have of LPG is already being addressed in the IIEC project mentioned above, and in a number of other initiatives currently in progress in South Africa. These initiatives all aim to build familiarity and awareness of LPG among households, by providing practical demonstrations and giving householders hands-on experience with using it. To complement these activities, a business model has been developed under this project to address the barriers of up-front cost and lack of accessibility.

THE 'FEE FOR SERVICE' BUSINESS MODEL

Summary description

Under this business model, an energy services company (ESCo) provides the client household with the thermal services derived from LPG without the household having to make the expensive purchases, which constitute one of the main barriers to the adoption of LPG. The ESCo effectively leases the LPG-using equipment to the household for a fixed fee, and charges the household for the gas used.

This business model addresses another significant barrier to LPG adoption, that retail outlets are relatively thin on the ground requiring householders to travel significant distances with a heavy cylinder to obtain a refill. Under this business model, the ESCo would deliver replacement cylinders

to its customers on a regular basis, at the same time collecting any payments due. The cost of operating this delivery round is included in the fee that the household pays to the ESCo.

The household has the option of exiting from the agreement at any stage, upon which the ESCo would take back any cylinders, cookers and other equipment that it had supplied to the household (with a refund paid for any gas remaining in the cylinder). Since repossessed LPG cylinders and stoves will retain a very high proportion of their original value, the cost to the ESCo of customer cancellations need not be very high.

After a period of two years has elapsed, ownership of the LPG cooker (including hose and regulator) passes to the household, as does ownership of the R 75 deposits on the two gas cylinders. The household then has the option of continuing the relationship with the ESCo at reduced payments (which cover only the cost of the gas used and the cost of home delivery of gas supplies) or exiting from the agreement altogether.

Cylinder options

To understand the options available for operating this business model, it is necessary to examine the way in which LPG is currently retailed. Smaller cylinders (up to, but not including 9 kg) are owned by the customer and, when they are empty, are taken to an LPG retailer, who refills them using their own equipment. The retailer usually keeps a number of 48 kg cylinders at its premises from which it fills the smaller cylinders.

Larger cylinders (9 kg and above) remian the property of the gas company, with the customer paying a deposit for their use. When empty, they are taken to the retailer, who simply swaps the empty cylinder for a full one, charging only for the gas it contains. These larger cylinders are all filled centrally at the gas company depot and distributed full (and sealed) to the retailer. The table below lists the costs of various cylinder sizes charged at a retail outlet in Fine Town, Gauteng Region 11, in November 2004.

Size	Price for fill	Price of cylinder
1.4kg (#3)	R 15.80	(buy) R 185.00
3.0kg (#7)	R 35.80	(buy) R 285.00
4.5kg (#10)	R 54.30	(buy) R 345.00
9kg	R 74.20	(deposit) R 75.00
19kg	R 156.00	(deposit) R 75.00
48kg	R370.50	(deposit) R 75.00
Source: Springbok Hardware, Fine Town		

The relatively high purchase price of the smaller cylinders acts as a significant deterrent to the adoption of LPG by households. An empty 4.5 kg cylinder costs about R 345 to buy, compared with a deposit of only R 75 for the larger cylinders. However, the larger cylinders are not feasible for lower income households because of the difficulty in budgeting for the large lump sum that must be paid for a full cylinder (cylinders cannot be partially filled). A notable feature of coal and paraffin usage is that households are able to purchase a single day's worth at a time, whereas a 9 kg LPG cylinder may represent up to a month's worth of fuel.

Anecdotal experience from IIEC's project "Switching from Coal and Paraffin to LPG in Low-Income Households" points to the significance of cylinder cost as a barrier to the adoption of LPG. Cases

were encountered of households who had already adopted LPG being forced to abandon it because they were unable to afford the cost of a replacement cylinder when the one they owned reached the end of its useful life. The LPG industry itself would prefer not to have to deal with the smaller refillable cylinders because, with the cylinder being customer-owned, the industry has almost no control over its correct maintenance.

The business model proposed here provides a solution to the first-cost barrier, because the ESCo allows the household to spread out the initial costs of adopting LPG. The preferred model is to provide each customer household with two 9 kg cylinders, ensuring that a spare is always available in the event that one runs out. The empty cylinder is then swapped for a full one the next time that the ESCo visits that household on its rounds. This model thus overcomes another of the potential barriers to the adoption of LPG, identified in IIEC's project "Switching from Coal and Paraffin to LPG in Low-Income Households" – namely that, because it is difficult to gauge the amount of gas remaining in a cylinder, householders were concerned that the gas might run out at an inconvenient time, leaving them without fuel.

Payment frequency

A feature of energy usage in low-income households is the need to purchase small amounts of fuel at frequent intervals, because of the difficulty in budgeting for large payments. This is one reason why fuels such as coal and paraffin remain popular – they can easily be purchased locally, in amounts corresponding to only one or two days' consumption. Many households use pre-payment meters to purchase electricity in the same manner. For the LPG business model proposed here to succeed, it must take account of this factor. Although it would be desirable from the point of view of minimising transport and administration costs to have the ESCo making monthly rounds to its customers, many of the potential customers would probably prefer to make smaller, more frequent payments.

The business model proposed here therefore assumes that individual households choose a payment frequency that best suits their needs, which may be weekly, twice monthly or monthly. The fee component of the payment to the ESCO would be a fixed sum, while the gas usage component of the payment would initially be based on an estimate made by the ESCO (based on household size etc.). Over time, periodic corrections would then be made to this component, based on the actual amount of gas supplied.

Customer base

For the purposes of the analysis conducted here, an ESCo operating according to this business model is assumed to consist of one or more 'basic units', a basic unit being defined as the number of customers that could feasibly be serviced with one vehicle. A business size smaller than this basic unit is possible, but is likely to be uneconomic unless the ESCo engages in other activities to make use of the vehicle when it is not being used for servicing LPG customers. To simplfy the analysis, it is assumed that the ESCo is engaged exclusively and full-time in the supply of LPG services. Under this assumption, it is reasonable to assume that 180 households could be serviced with a single vehicle.

FINANCIAL ANALYSIS

The first financial analysis described here is intended to establish the overall feasibility of the business model. It aims to show the circumstances under which such a business would remain sustainable, assuming it had already passed through its start-up phase. The second analysis examines the issues surrounding the start-up of such a business, paying particular attention to the

financing requirements. The third analysis introduces some assumptions about customer cancellations and defaults, and aims to test the robustness of the business model against such events.

Basic analysis

This basic analysis does not take into account the start-up costs of the ESCo business, but instead aims to show only that such a business is viable once it has passed through the start-up phase. This assumptions upon which this analysis is based are outlined in the following sections:

Number of customers. As described above, the business model is based on a customer base of 180 households.

Average monthly LPG usage per customer. Anecdotal evidence from IIEC's field work on promoting LPG suggests that monthly usage among existing low-income users varies over a very wide range, from about 8 kg up to 20 kg. Taking data on paraffin usage for cooking and water heating among low-income households, and translating this to its LPG equivalent according to delivered energy, suggests that a monthly usage of about 10.5 kg would be sufficient to meet these needs. For this analysis, a figure of 12 kg per month has been assumed.

LPG price per kg paid by ESCo. A figure of R 6.50 per kg is assumed for the price that the ESCo pays for its LPG supplies.

ESCo's monthly cost of hardware. This analysis is based on an equipment cost of R 450 per household, comprising a stove with associated regulator and hose. Assuming that this cost is financed over three years at an annual interest rate of 15%, the monthly cost to the ESCo of this equipment is about R 23 per household. This estimate is probably somewhat high, since a stove can be expected to last longer than three years. Note that, for the purposes of this simple analysis, the cylinder deposits are not included, as they are not a recurrent expenditure. This simple analysis looks only at the ESCo business after it has reached a stable and constant customer base, at which time cylinder deposits are not being paid.

ESCo's monthly transportation costs. Using a similar approach, the monthly cost of operating a vehicle is estimated by amortizing its purchase price (assumed to be R 35,000) over five years at an interest rate of 15%. This gives a monthly cost of R 870, to which must be added the monthly fuel and maintenance cost, assumed here to be R 360. This estimate is based on a monthly mileage of 300 km, costing R 1.20 per km. The total cost of operating the vehicle to service the customers is therefore R 1,230 per month

ESCo's monthly salary and administration costs. A monthly cost of R 5,600 is assumed for salaries and administrative costs.

LPG price per kg charged to customers. The analysis is based on a figure of R 8.24 per kg, which is the price charged at a typical retail outlet for a 9 kg refill.

Monthly fee per household for service provision. This analysis assumes that the ESCo charges each household a fee of R 60 per month for the provision of the LPG service.

Using these assumptions, the total monthly costs of the ESCo are R 25,010 and the monthly income is R 28,598.40. Hence such a business would show a profit margin of approximately 14%. Although only a very crude estimate, this profit margin is nevertheless sufficiently high to suggest that a 'fee for service' model for providing LPG to households could prove viable.

Start-up analysis

This anaysis examines the start-up costs of the ESCo business described above, and takes into account the cost of financing such a start-up. Since the analysis is somewhat more complex than that in the previous section, it is conducted using a spreadsheet (see sheet 'Start-up analysis' in the file 'LPG Business Model.xls') which should be referred in conjunction with this document.

Customer recruitment. The same final customer base of 180 is assumed as before, but an assumption now has to be made about the time period over which these customers are recruited. This analysis assumes the full customer base is reached after 24 months.

Behaviour of 'mature' customers. A mature customer is defined as one who has reached the end of the initial two-year period, and they have therefore taken ownership of the equipment provided. Under this analysis, a conservative assumption is made that every mature customer decides to exit from their agreement with the ESCo and seek their gas supplies elsewhere. The spreadsheet model assumes that every departing mature customer is replaced immediately by a newly recruited customer.

Cost per customer recruited. In the previous analysis, the cost of the equipment per customer was calculated on the basis of amortizing the value of the equipment over three years at 15%. In this analysis, the same cost of equipment of R 450 is used, but this full cost is now incurred by the ESCo for every new customer it recruits. Because we are now looking at the business start-up, it is necessary to take into account the need to pay a deposit of R 75 on every cylinder acquired by the ESCo. With two cylinders being supplied to each customer, the full cost per customer recruited is therefore R 600.

Customer deposit. In order to ensure that the customer households have at least some financial stake in the agreement, they are charged a deposit amounting to 10% of the total cost of equipping them. In the event that the the agreement is cancelled, this deposit is returned to the customer, subject to the equipment being returned to the ESCo in good order.

Vehicle cost. In the previous analysis, the monthly ownership costs of the vehicle was calculated on the basis of its amortized purchase price plus the monthly operating cost. Since we are now examining start-up, the purchase price of the vehicle needs to be included in its entirety at the beginning, while the monthly operating costs of R 360 are a recurrent expenditure. A purchase price of R 35,000 is assumed.

Interest rate. This analysis assumes an interest rate of 14% (based on a typical small business loan interest rate of prime + 3%).

Loan terms. The model described here assumes that the ESCo finances 10% of the initial start-up cost from its own resources, and the bank finances the remaining 90% with a loan. It is also assumed that the bank provides the ESCo with a credit line that it can draw on for a period of 18 months to finance the recruitment of new customers. After 6 months, the proporion of the cost of new customers that the bank will finance falls to two-thirds, and beyond 18 months, the ESCo must finance new customer recruitment fully from retained profits / additional equity injections. The bank provides a grace period when only interest payments are payable during the customer recruitment phase. The full principal of the loan is then repaid over two years from the time when the full customer base has been reached.

Owner-equity cash injections. The spreadsheet model assumes that the ESCo owner injects additional equity at such times as necessary, to ensure that the debt-service coverage ratio (DSCR) remains above 1.5 at all times.

Under these assumptions, the internal rate of return (IRR) to the ESCo on its equity investment is a reasonably healthy 22% over three years. The ESCo turns cash-positive in Month 6, and shows a positive cash balance every month thereafter. The cumulative cash balance after three years is

R 31,289. Since the model is designed to ensure that the DSCR remains greater than 1.5 at all times, there are by definition no problems arising from inadequate debt-service coverage.

Sensitivity analysis

Figure A1-1 below shows how the three-year IRR is dependent on the values of various key parameters. This sensitivity analysis illustrates that the critical parameters are the price charged by the ESCo for the LPG it supplies to its customers, the wholesale price paid by the ESCo for its LPG suppliers, and the fee that it charges its customers for the service provided. Adverse changes of only 10-15% in any of these parameters would make the business model completely unviable. The profitability of the business is much less strongly dependent on the interest rate, the vehicle purchase price and the cost of equipping new customers. A 20% increase in any of these parameters could be tolerated without endangering the survival of the business.

The strong sensitivity of the profitability of this business model to the price paid for LPG supplies suggests that interventions to simplify the supply chain (thereby reducing the price paid by the ESCo) could have a huge impact on the profitability of this type of business. At present, the price of LPG at the refinery gate is regulated at R 3.115 per kg (as of October 2004), whereas typical (unregulated) retail prices in Gauteng range from R 7.72 per kg for 48 kg cylinders up to R 12.00 per kg for the smaller refillable cylinders. While a significant proportion of the price difference is accounted for by the cost of transporting LPG to an inland location, much of it results from the fact that there are many links in the supply chain, each of which results in a supplier taking a profit margin.

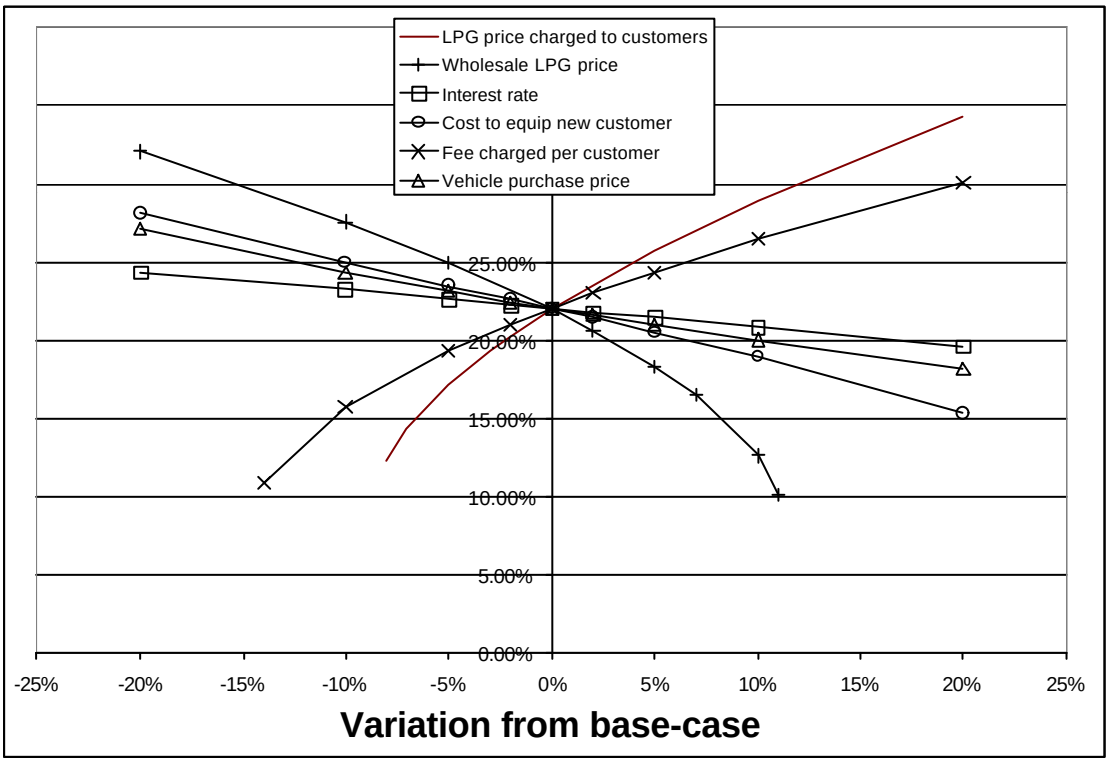


Figure A1-1 Impact on IRR (vertical axis) of variations of key parameters from base-case assumptions

The IRR of the business modelled is also strongly dependent on the price that the ESCo charges its customers for the LPG used. Although the retail price of LPG is not regulated at present, it is likely to become so at some stage in the future. A regulated retail price for LPG might damage the viability of the business, particularly if it is unable to secure suplies at a sufficiently low price.

Impact of customer cancellations

The analysis conducted above makes the somewhat unrealistic assumption of 100% utilisation of the cylinders and stoves held by the ESCo. In reality, in the event that a customer decides to cancel its agreement with the ESCo, it is unrealistic to expect a replacement customer to be recruited immediately. The ESCo will therefore inevitably find itself holding a certain number of cylinder-stove sets in the short-term that are not earning any revenues from customers.

The impact of this 'frictional' under-utilisation of capital can be determined by introducing a 'capacity utilisation factor' into the model described in the previous section (see sheet 'Capacity utilisation impact' in the file 'LPG Business Model.xls'). This factor represents the fraction of the cylinder-stove sets held by the ESCo that are actually in the hands of customers, and therefore earning revenues.

Figure A1-2 below shows the impact on the three-year IRR of a sub-optimal capacity utilisation factor. Under the same set of assumptions used previously, the viability of the business is threatened by capacity utilisation factors of less than about 92%. This means that, for a total potential customer base of 180, the ESCo must have no more than about 15 cylinder-stove sets lying idle at any time.

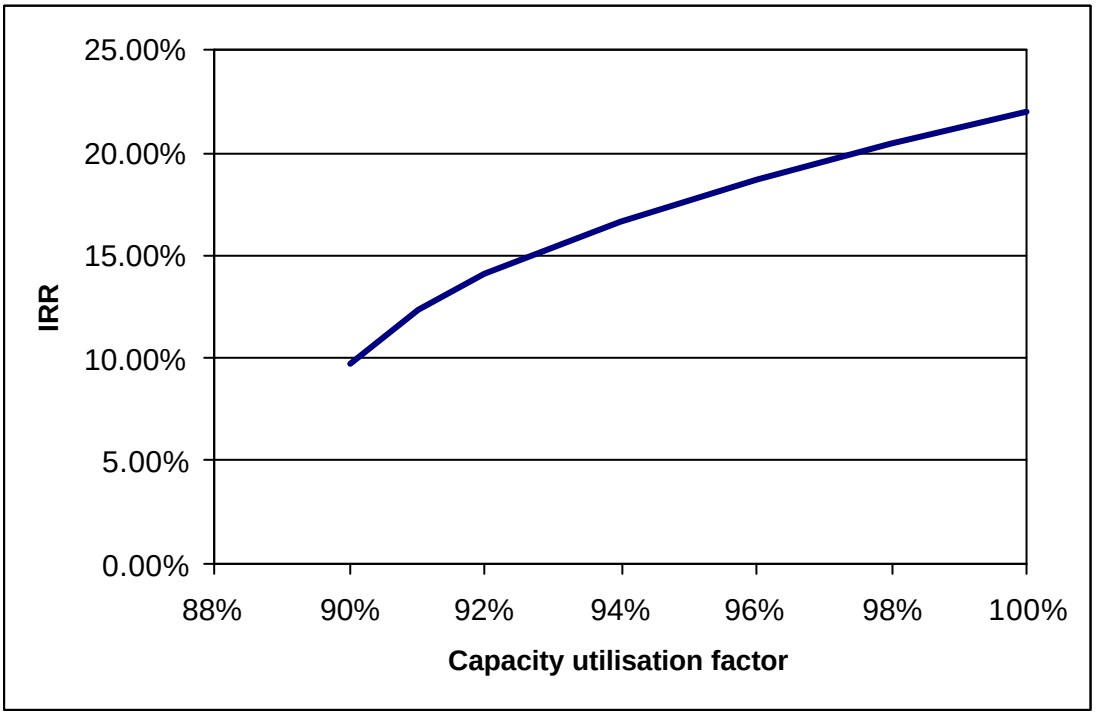


Figure A1-2 Impact on IRR of sub-optimal capacity utilisation factor arising, for example, from customer cancellations

Impact of customer defaults

Another risk to the viability of a business operating according to this model is that of customers defaulting on the agreement. This may range from the occasional late payment at one end of the spectrum to the outright theft of the installed equipment at the other. The legal remedies that are available to the ESCo to recover equipment (or its monetary equivalent) from defaulting customers are discussed below. However, this process may at best take several months, and at worst may fail completely. The impacts of this worst-case scenario – the complete loss of equipment to defaulting customers – are examined in the spreadsheet model. A 'customer default rate' parameter is incorporated into the model (see sheet 'Customer default impact' in the file 'LPG Business Model.xls'), representing the fraction of customers per year that default to the extent that the ESCo suffers a complete loss of the installed equipment.

To simplify the analysis, it is assumed that, when such a default occurs, the ESCo acquires an additional cylinder-stove set to replace the lost set and immediately recruits a new customer to replace the one that has defaulted. The impact of a defaulting customer is therefore to increase the monthly expenditure on gas using equipment. There will also be an additional income representing the deposit that is paid by the new customer recruited to replace the defaulting customer (who, of course, forfeits their deposit). A further simplification in the analysis is the assumption that the cost of customer defaults is spread evenly throughout the year. Although this sometimes results in a non-integer number of customers defaulting in a month, the simplification has the advantage of providing a smooth relationship between IRR and default rate.

Figure A1-3 below indicates that the viability of the business model is surprisingly insensitive to customer defaults. Even a rate as high as 20% annually does not endanger the survival of the

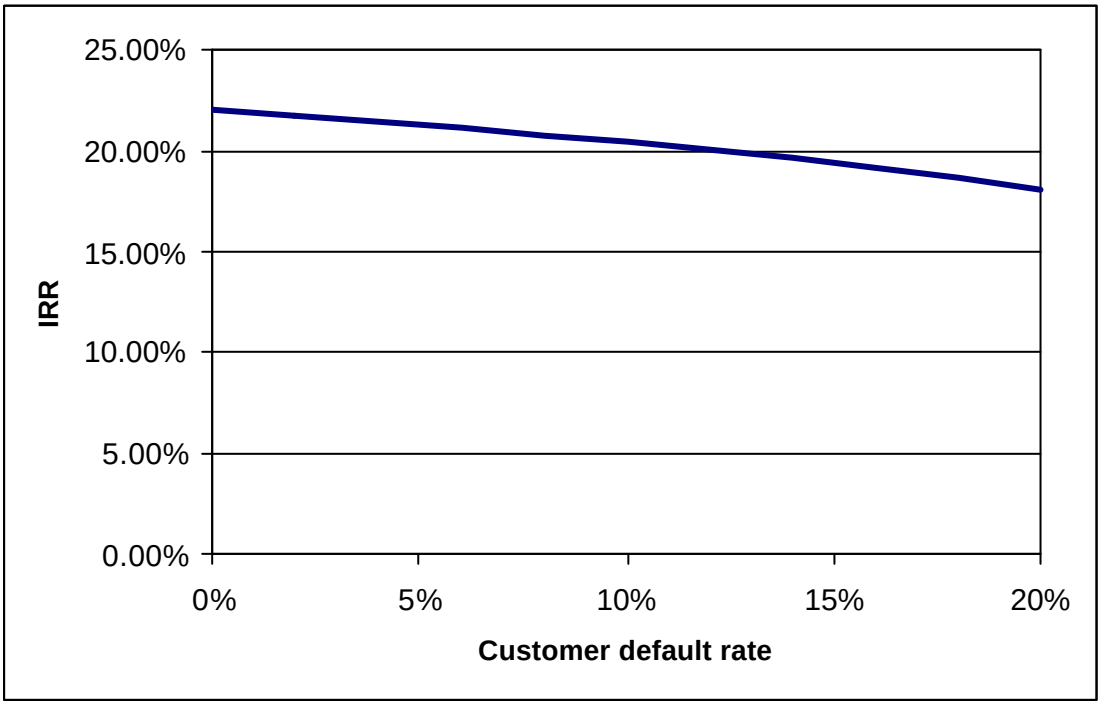


Figure A1-3 Impact on IRR of customer defaults.The customer default rate is the fraction of current customers defaulting per year.

business. For the customer base of 180 assumed here, a default rate of 20% annually represents three customers each month defaulting on the agreement (where a default is defined as a complete loss of the equipment provided to the defaulting customer). In practice, the ESCo would almost certainly succeed in recovering the equipment from at least a portion of customers who default.

LEGAL AND REGULATORY ISSUES

Payments made to the ESCo

Under the business model described here, the regular payments made by the customer to the ESCo can be separated into three components: a lease payment for the equipment provided; a fee to cover the cost of providing the LPG home delivery service; a payment for the gas actually consumed by the customer. Under the business model described here, the first two of these payments are combined into the monthly fee charged by the ESCo, while the third component is separated out.

The regulatory issues surrounding these three components of the payments received by the ESCo are examined in more detail in the sections below.

Lease payments

Two pieces of South African legislation are particularly relevant to lease payments that form part of the business model described here:

- Credit Agreements Act 75 of 1980
- Usury Act 73 of 1968

Credit Agreements Act 75 of 1980

This act covers both 'Instalment Sale Transactions', where ownership of the goods passes to the customer at the end of the agreement, and 'Leasing Transactions', where ownership of the goods does not pass to the customer (it must be remembered that, in the case of LPG cylinders of 9 kg and above, ownership remains with the gas company regardless of the nature of the agreement between the ESCo and the customer). The following sections of the Credit Agreements Act are of particular importance:

- Section 11, which specifies the procedures that must be followed in the event of a default to repossess goods that have been acquired under a credit agreement. From the date that a customer defaults on the agreement, a letter must be delivered either by hand or by registered post informing the customer that they are in default and giving 30 days to respond. Once this period has elapsed, the ESCo must send a further letter of demand giving 14 days to pay. Only after this period has elapsed can the ESCo seek a court order to repossess the goods. Execution of this court order may then take several weeks and, if the household has disposed of the equipment in the meantime, recovery of the equivalent monetary value may prove virtually impossible.
- Annexure A, which sets minimum levels for deposits and maximum repayment periods, in order to protect consumers from entering into credit agreements that are unaffordable For household appliances, which includes the LPG equipment considered here, the minimum deposit is 10% of the cash value of the equipment and the maximum repayment period is 24 months. Under the business model presented here, the deposit charged is 10% of the full cost of equipping the customer. But this cost consists in part of the returnable deposits on the cylinders, which remain the property of the gas company. The cash value of the

equipment actually being leased to the household is much lower, hence the deposit charged is well over 10%.

Usury Act 73 of 1968

The Usury Act concerns itself with the proper disclosure of interest and other charges, and the limitation of interest rates. Were this legislation to apply to the business model explored here, it would be necessary to explicitly separate the leasing part of the ESCo-customer agreement from the other parts. Only then could the customer be provided with transparent information regarding the interest rate they are being charged. However, certain types of leasing transaction are exempt from the Usury Act, including those that may be terminated by the lessee at any time without penalty. Providing these conditions are applied to the agreement that forms the basis of this business model, it would probably not be necessary for the ESCo to enter into separate leasing agreements with its customers.

Fee for service provision

The second component of the payment to the ESCo from the customer, the fee that the ESCo charges for providing the service, does not appear to be constrained by any current legislation. Furthermore, if the lease payments were exempted under the Usury Act as described above, it would not be necessary for the ESCo to make explicit the distinction between the service fee and the lease payments.

LPG pricing

The retail price of LPG is currently not regulated, but there is a high probability that price regulation will be introduced at some stage in the future. The danger for the ESCo is that a regulated retail price for LPG would be set at such a level that the business model becomes non-viable. It is not clear whether existing agreements between the ESCo and its customers for the sale of LPG at a particular rate would remain valid if a regulated price for LPG was subsequently introduced at below that rate. It is also uncertain whether, post price regulation, there would be a sufficient margin between the wholesale and retail prices of LPG for the ESCo business to remain viable.

Liability issues

The only significant liability issue is whether the ESCo would be liable for any injury caused by misuse of the equipment by the household. Provided adequate instructions are provided to the customer, there is no reason to believe that the provider of the equipment is any more liable for injury through misuse than in the case of any other item of household equipment. However, it would be prudent to conduct additional research into the question of liability before implementing the business model.

Training Requirements

Businesses wishing to engage in the supply of LPG and cylinders are already required to undergo training in the safe handling of LPG. Assuming the ESCo was an already established supplier of LPG and cylinders, there need not be any additional training requirement in this respect. However, this business model also envisages the ESCo delivering LPG cylinders to customer households. There would therefore need to be some specialist driver training. Before implementing this business model, it is recommended that Simon Moahloli of LPGSASA be consulted to determine the training requirement in this area.

ATTACHMENT 2 – MINUTES OF WORKSHOP ON BEE OPPORTUNITIES IN ENERGY EFFICIENCY

Project Overview:
Black Economic Empowerment Energy Efficient Enterprises

This project, undertaken through a grant from the US Agency for International Development (USAID) and the British High Commission Global Opportunities Fund, seeks to support Black Economic Empowerment (BEE) Energy Services Companies (ESCo) in the Electricity Supply Industry (ESI) and the residential sector. It intends to assist them to gain access to and participate in the various aspects of Demand-Side Management (DSM) and residential thermal improvement, and to capacitate, train and develop black-empowered enterprises in the implementation of the South African DSM programme which is steadily gathering momentum.

The project will define BEE opportunities within IIEC's market facilitation experience and expertise. IIEC will build on previous IIEC successes and core business in energy-efficient market facilitation, focusing on capacitating, training and developing BEE entrepreneurs to participate in demand-side management, South Africa's BEE initiatives and residential energy efficiency.

Year 1 of the BEE project implementation focused on positioning the project within the ESI and establishing relationships with key stakeholders who also promote BEE ESCo access to DSM activities. IIEC expanded on these activities by assessing the asset management implications relevant to BEE ESCos and linking to government and other local initiatives supporting this project, as well as other aspects of BEE capacitation and promotion. In the process of developing a manual for BEE ESCos, IIEC drew together a number of key stakeholders and solicited agreement for use of existing materials. This interaction allows IIEC to pilot this manual and promote it for uptake in the formal training sector of South Africa. Specific activities to be undertaken in the current grant programme include:

1) Continued discussion with, facilitation amongst and capacitation of key stakeholders and decision-makers in the field

2) Identification and formulation of a business model that BEE ESCOs can use to successfully enter the energy services and residential energy-efficiency markets

3) Development of capacity amongst BEE ESCos to respond to Eskom DSM Requests for Proposal (RFP), and

4) Raising public awareness around the project and its impacts.

Workshop Objective:
Opportunities for Black Economic Empowerment in the Renewable Energy and Energy Efficiency Sectors

South Africa has set a target of 10 000 GWh of electricity to be produced from renewable energy sources by 2013. South Africa currently produces 200 000 GWh of electricity annually, of which less than 1% comes from renewable energy sources. South Africa is a country which has significant renewable energy potential through resources such as biomass, wind, solar, hydro, and human and animal waste. Based on this availability of resources and the Department of Minerals and Energy's commitment to renewable energy, independent power generation from renewable energy represents a promising and untapped business opportunity.

In addition to energy being generated from new and renewable sources, significant opportunities also exist to improve the efficiency with which energy is consumed.

E+Co Africa and IIEC-Africa have invited interested parties to this workshop to discuss these opportunities.

The main objectives of the workshop are:

- To introduce the renewable energy and energy efficiency sectors as possible investment opportunities
- To present business models, through which a potential financier provides assistance in taking advantage of these opportunities
- To identify suitable potential entrepreneurs, project developers and potential co-financiers
- To spread the word about E+Co's commitment to investing in South African SME's in the modern energy sector, and
- To pursue IIEC's objective of promoting growth in the market for renewable energy and energy efficiency.

Workshop Introduction

Vusi Sithole, E+Co Africa Regional Manager, welcomed participants to South Africa's first BEE Renewable Energy Workshop. He asked participants to introduce themselves and identify the organisations that they represent. He said that it was pleasing to have major role players from the modern energy and financial world attend the workshop.

He introduced the two host organisations, International Institute for Energy Conservation (IIEC), represented by Jason Schäffler and Ian Househam (London, UK), and E+Co, represented by himself, Gavin Watson and Kofi Nketsia-Tabiri.

E+Co is a 10-year old public purpose investment company focusing on energy enterprise development in developing countries. It provides business development services and catalytic finance to establish enterprises that provide sustainable energy to the energy consumer, both domestic and business/industry.

There are fewer and fewer trees in the rural areas of South Africa, mainly because of the cooking and space heating energy needs of the rural poor. Their only sources of energy are trees and cow dung. In the townships, especially the shanty-towns, children's growth is stunted and they die suddenly and early because they inhale the kerosene fumes and the cow dung smoke and are burned by the fires.

This is the backdrop to E+Co starting in New Jersey, USA, in 1994, and later, establishing its offices in Centurion in April 2004. Prior to this, its work in Africa was undertaken by proxy but it is considered vital to have a local presence. All E+Co's Africa work is conducted from its Centurion office.

E+Co's task is to create energy entrepreneurs, who will have a telling impact on the energy poor of Africa, and also to stop the ongoing decimation of the continent's trees and forests. In order to create energy entrepreneurs, people from the financial and modern energy world, as well as government departments, especially the Department of Trade and Industry and the CEF, are needed for their expertise and services – people such as those attending this workshop.

The E+Co philosophy is a people-centred approach. This includes the acceptance of project risk, with no more "belts and suspenders" support. E+Co will provide support services both before and after the investment is made in the entrepreneur company. It will help grow the entrepreneur. Role players are therefore invited, with due diligence and people in mind, to help create the energy entrepreneurs.

Vusi concluded by thanking the organisations and their representatives whose contributions made the workshop possible: USAID, British High Commission and Mintek.

Opportunities for Black Economic Empowerment Enterprises in Renewable Energy and Energy Efficiency

Jason Schäffler explained that IIEC is an international non-profit organisation, with its headquarters in Washington and representation throughout the world, including London, Rio de Janeiro, Johannesburg, Mumbai, Bankok and Manila.

Renewable energy resources

His presentation on renewable energy resources, power production and potential are reported from his Powerpoint presentation.

Africa objectives

Two IIEC-Africa projects:

- Black Economic Empowerment Energy Efficiency Enterprises (BE5) funded as part of the REEE Partnership (REEEP) through the British High Comission's Global Opportunities Fund
- Black Entrepreneurship Empowerment funded by the USAID.

Project and workshop objectives

- Interactive feedback on business models and perception of opportunities
- Interaction with E+Co
    - Financiers
- Next steps
    - Business model refinement
    - Survey
        - Opportunity perceptions
        - Barriers
        - Incentives.

Renewable energy

- Energy that is consumed at a slower rate than the rate at which it is replenished (sustainable energy).

Renewable energy resources

- Landfill gas
- Micro-hydro

- Biomass, including pulp and paper, bagasse
- Wind
- Solar, including thermal and PV.

Landfill gas

- Comprises managing a landfill site, capping it and tapping off the gas produced
- One of the closest to economic viability
- Attracting significant carbon financing attention.

Wind

- Wind resources
- Stand-alone systems (e.g. water pumping)
- Non-utility electricity generation and ESI structure (mini-grid)
- Distributed generation (grid-connected)
- Examples:
    - o Eastern Cape, driving emissions reduction, rich economic growth
    - o Lubisi Dam, Eastern Cape.

Solar water heating

- 19% of national electricity demand is domestic
- 30% of this is heating
- RE technology is closest to commercial viability
- There is great opportunity in this sector.

Biomass

- Bagasse from sugar mills
- Paper and pulp mills
- New technologies using existing feedstock
- Excess beyond process steam requirements to grid.

Micro-hydro

- Eight licensed less than 8MW

- Three municipal and one private
- Some of best existing examples of South African IPPs
- 3 500 to 5 000 potential sites along the escarpment (and close to local communities).

Electricity sector private participation

- Graph showing private investment (as a % of ESI total) in the generation, transmission, distribution and non-core sectors
- Total value is R160 billion
- Entrepreneurs' share is 10%, in peripheral activities.

Independent power production

- Definition
    - o Municipal
    - o Private
- Policy framework
    - o Renewable energy white paper
    - o Supply contractual criteria
    - o Green electricity market developments (CT, set-asides)
- Grid connection
- "Full avoided costs"
- Power purchase agreements
- Legal aspects.

Production costs and required sale prices

- Graph.

Technically feasible production

RE Technology	Potential GWh contribution	Percent
Biomass pulp and paper	110	0.1
Sugar bagasse	5 848	6.9
Landfill gas	598	0.7

Hydro	9 245	10.3
Solar water heating, commercial	2 026	2.0
Solar water heating, residential	4 914	6.0
Wind	64 102	74.0
TOTAL	86 843	-

Current South African consumption/production is some 40% of the total of 86 000 GWh.

Opportunities

- Number, size, technology order "least cost" – economic or financial
- Models
    - o Sourcing of finance
        - Banks
        - Private
        - Concession finance (soft loans, grants, guarantee funds)
        - "Green financing" CDM, Green Premiums, TRECs (tradable renewable energy costs)
- Viability
- The adopted model will aspire to bridge the financial gaps.

Energy efficiency

Ian Household's presentation on energy efficiency is reported from his Powerpoint presentation.

Energy efficiency

- What is it?
    - o Doing more with less, but not "freezing in the dark"
- Why and who?
    - o To save money (energy end-users)
    - o Demand-side management (Utilities)
    - o Environmental (wider society)

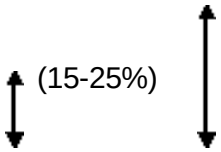
- Sources of finance
    - o End-users own resources
    - o Eskom DSM fund
    - o Grants, soft loans and CDM
- Efficiency improvement opportunities mean business opportunities.

International comparison of energy efficiency

- Graph
- Energy efficiency does not mean just energy saving.

End-user sectors

- Industrial (15-50%)
    - o Process-specific (beyond the scope of this workshop)
    - o Generic
- Institutional / public
- Commercial



Many common characteristics

- Residential and micro-enterprises (10%)

Where do inefficiencies exist?

- Industrial / commercial / institutional / public
    - o Motive power (electric motors)
    - o Space heating
    - o Hot water
    - o Lighting
- Residential
    - o Space heating
    - o Lighting
    - o Water heating
    - o Cooking

Energy efficient solutions

- Industrial, commercial, institutional, and public sectors

- o Motive power
  - Energy efficient motors (value of the electricity that a motor uses is many times more than the value of the motor itself)
  - Variable speed drives (tailor the speed to the job the motor is doing)
  - Power factor correction
- o Lighting
  - Appropriate lighting levels
  - Compact fluorescent lamps (CFL)
  - Lighting controls
  - Use of daylight
- o Space heating
  - Building insulation
  - Heating controls
  - Passive solar design
- o Hot water
  - (Solar water heaters)
  - Insulation of pipes and boilers

- Residential sector
  - o Space heating
    - Building insulation
    - Passive solar design
  - o Lighting
    - Use of CFLs
  - o Hot water
    - Insulation of pipes and tanks
    - More efficient water heaters (LPG geyser is more efficient than an LPG stove)
    - Fuel switching (LPG is efficient but is expensive and some user resistance)
    - (Solar water heaters) (Residential solar water heaters are now attractive and viable, but there is an upfront cost)
  - o Cooking
    - Fuel switching
    - (Solar cookers).

Energy management services

(Pertaining to the commercial and industrial sectors)

- Audits (identifying and quantifying inefficiencies)
- Energy management (minor investments in hardware, e.g. heating controls)
- Energy saving projects (major investments in hardware, e.g. retrofit with energy-efficient motors)
    - o Design
    - o Implementation
    - o Operation and/or maintenance
- Finance
    - o Facilitating
    - o Third-party financing
- Monitoring and evaluation of savings.

Business models

- Simple contractor-client model
    - o The simple starting reference point
- Lease financing
    - o A bank may or may not be involved
- Energy Services Company (ESCo) model
    - o Provides an integrated solution (“one stop shop”)
    - o Operates under a performance-based contract, whereby its fee is linked to the level of energy savings achieved.

Workshop participants (and other stakeholders) were asked for their feedback on the business models.

Performance contracts

- Guaranteed savings model
    - o The client pays the ESCo a fee for its services
- Shared savings model
    - o The client pays the ESCo a share of the savings made

  - The client and the bank have no direct relationship
- Chauffage model
  - Not linked to a particular energy saving intervention
  - ESCo takes over all aspects of energy management from the client, including paying the energy bills
  - ESCO's fee is equal to the client's current energy bills minus 5-10% (usually).

Addressing the needs of the residential sector

- Thermal rather than electrical needs dominate (e.g. cooking, space heating, water heating)
- Difficult sector for ESCOs to access because:
  - Large numbers of very small clients
    - Where they exist, operate through housing associations
    - Use standardised "cookie cutter" contracts
  - Difficult to monitor and verify energy savings
    - Performance contracting is therefore impractical
    - Lease financing is the best approach where outright cash-purchase is not possible
- The Thermal ESCO concept (TESCo).

Thermal ESCo (TESCo) concept

- Integration of solar water heating with LPG (or other fuels) for meeting residential needs
- Market transformation within low-income communities to promote:
  - Cleaner fuels
  - Cleaner combustion technologies
- Market for BEE entrepreneurs
- Possibility of carbon financing.

Conclusions

- Highlighting ways of turning **renewable energy** and **economic empowerment opportunities** into **business opportunities**
- Business model refinement (to suit the South African situation)
- Seeking feedback on:
  - Perception of opportunities

o Barriers (and ways to overcome them)

o Incentives.

Questions

- Belinda Hoffman (One World Sustainable Investments): How is the long range energy cost of 25 c/KWh made up?

  Jason Schäffler: This cost is taken from the strategic electricity plans for coal-based power and would include a range of options including the cost of de-mothballing power stations. 19c/KWh is often used but this does not include the de-sulphuring of coal. These are production costs before transmission and distribution.

- Rolf Papsdorf (AEDC): When mentioning ??? gas and carbon, is this the Kyoto Protocol?

  Jason Schäffler: Yes, but there are also mechanisms outside the Kyoto protocol, including regional trade, private companies etc.

- Trevor van der Vyver (Maxlite/SESSA): The domestic residential rate is 78c/KWh, making it more financially viable.

  Jason Schäffler: It depends how the service is provided down to the residential level. Individual clients cannot be accessed because they are serviced by a municipality or Eskom. There is no retail competition.

- Trevor van der Vyver: Solar water heating on roofs makes much sense and, with little wind in Gauteng, the figures given for solar (lower) and wind (higher) power generation may be misleading.

  Jason Schäffler: The figures indicate total technically feasible power production throughout the country. The potential for wind power is vast but, right now, solar water heating is both feasible and viable. There is great scope for entrepreneurial job opportunities in solar heating.

- Rolf Papsdorf: Studies undertaken by students for low-cost housing (e.g. Diepsloot) have shown that, with a 4KW consumption per day, household Eskom electricity costs are some R350/month or R2/KW. There is also an administrative service charge. This is a very expensive form of energy and, in any event, the levying of a service charge should be questioned.

  Jason Schäffler: Off-grid supplies are more expensive and the cost can rise to R3-4/KWh. In the rural areas, however, even a basic supply has great impact on a household's living conditions and provision of this service must be balanced against the cost of supply.

Opportunities for Black Economic Empowerment in the Renewable Energy and Energy Efficiency Sectors

Gavin Watson's presentation on E+Co, business opportunities and the Enterprise-Centred Model is reported from his Powerpoint presentation.

E+Co

- E+Co is a 10-year old, public purpose investment company
- It focuses on local small and medium enterprises that supply or use modern energy to deliver services to households, businesses and communities in developing countries
- It has offices and operates around the world, in Africa, Asia, Europe, Latin America and the USA
- Its offices in Centurion opened in April 2004.

E+Co Africa

- Has made $2 335 000 in 26 investments in 11 African countries
- It has served 126 800 people (some 26 800 households)
- Local partnerships in Ghana, Mali, Senegal, Tanzania and Zambia (incl. NGOs)
- Multi-technology approach, including PV, LPG, solar drying, fuel-efficient stoves, solar cooking, energy efficiency, solar thermal
- E+Co operates using the Enterprise-Centred Model for investing.

Enterprise-Centred Model

A chart was presented illustrating the Enterprise-Centred Model. The key to the process is the energy entrepreneur him/herself.

Questions

- Mandisa Nkamba-Kadalie (ABSA): When a company moves from the E+Co umbrella to a financial institution, is it the company's size or its turn-over or some other measure that determines whether the company is ready to move on?

  Gavin Watson: Each company is evaluated on its own performance. In the case of Suntank, it has grown over four years and has met its financial commitment with E+Co. It is therefore in a position whereby it can approach a commercial financial institution. E+Co could also co-finance a company's growth stage, thereby reducing the risk exposure of the financial institution.

- Belinda Hoffman: In respect to building skills in the enterprise development model, is there any focus on what skills are required to be developed?

  Gavin Watson: There is an energy handbook for reference. The required business skills would include business plan development, planning, financial modelling, implementation plans, organisational structure etc. E+Co has a pool of international expertise that can be drawn on to assist potential entrepreneurs to become "financeable". It should be remembered that, when an entrepreneur is taken on, s/he is part of the E-Co system for at least three years.

- Rolf Papsdorf: Does E+Co investment support the development of business plans and intellectual development rather than the provision of hard equipment and implementation?

  Vusi Sithole: Funding provided by E+Co is not specific to either skills development or equipment and can be across the board. Partnering stakeholders can also provide co-finance. Funding provision is based on the individual entrepreneur and his/her particular needs.

- Judy Weboz (Women Development Bank): What is the minimum entry level loan size?

  Gavin Watson: The range of investment is US$25 000 to US$250 000.

- Vusi Nhlapo (NAFCOC): What role could NAFCOC play to mobilise youngsters to enter the energy business?

  Gavin Watson: This is of interest to E+Co, but possibly something that should be discussed at a later stage.

- Question: What is the cost of the finances provided?

  Gavin Watson: Market-related interest rates are charged. There are no soft loans available to E+Co and the provision of funding is shared across financiers to help reduce the high risk of these investments.

- Judy Weboz: Are you looking at longer-term investments?

  Gavin Watson: The investment term will fit the type of business. The period will be typically 3-5 years, or longer if a business requires longer-term investment.

  Vusi Sithole: E+Co does not walk away from its money.

- Sven Kreher (One World Sustainable Investments): In comparison with commercial institutions, what security does E+Co require?

  Gavin Watson: This is entrepreneur specific and will differ with the individual's circumstances.

  Vusi Sithole: E+Co will not encourage a "cap in hand" approach to business. It wants to help start energy businesses, but it is a business itself, will not walk away from its money and will require that all funding be repaid.

- Rolf Papsdorf: This approach will be difficult in respect to those poor entrepreneurs who have nothing, but possibly ideas. Social responsibility and a degree of reality need to be considered. Innovation takes risk and the higher the risk, the higher the rewards and the

losses. This may require slightly higher finance charges. However, risks must be taken and it is more than likely that the successful enterprises will cover the failed ones.

Vusi Sithole: E+Co will help the entrepreneur develop his/her business until it is bankable and it is growing. The funds may be provided without security. However, it must be assured that the funds are used to develop the business and that they are paid back.

- Mandisa Nkamba-Kadalie: Does the planning and business development support form part of the interest-bearing loan or is this provided as a grant?

  Gavin Watson: The entrepreneur is only responsible for the financial loan that s/he receives, and not the business planning and development services provided by E+Co. These are provided free-of-charge to the entrepreneur. However, E+Co does not consider that it "owns" the entrepreneur and that s/he cannot seek alternative financing. One of the goals is, in fact, to involve more and more financial institutions.

- Belinda Hoffman: 1) One of E+Co's goals must be to ensure that the entrepreneurial businesses reach long-term financial sustainability. 2) To what extent is a potential business assessed in respect to the particular country's overall energy objectives and what is appropriate to that country? Would E+Co's energy business investments focus on those businesses that would help achieve national objectives? Note that renewable energy in Africa is new and, as a new technology, will take time to get of the ground.

  Gavin Watson: Similar to any financial institution, E+Co will research and identify opportunities through liaison with appropriate organisations. E+Co is technology-neutral and will link its investments with sectors that are appropriate and are expected to perform well.

Examples of current E+Co entrepreneur projects in Africa

Kofi Nketsia-Tabiri's presentation on E+Co's current enterprises in Africa is reported from his Powerpoint presentation.

Landfill gas to electricity

- Pre-investment example, large project requiring substantial funding even at the pre-feasibility study phase
- Feasibility study
- 4 MW LFGTE business
- Capitalisation of US$6 million
- 70:30 debt equity ration
- Targeted IRR 15% to 30%.

Suntank

- Manufacture and sale of domestic and institutional solar water heating systems
- Pretoria, South Africa
- US$28 000
- 2000
- Working capital, plant and equipment, finalise business plan.

Chavuma

- Importation, sales and installation of energy-saving motor devices
- Lusaka, Zambia
- Two working capital loans, totalling US$63 000
- Entrepreneur's contribution, US$10 000
- 2002 and 2003
- For the purchase of energy-saving devices; also technical training in UK.

ABM Management

- An existing energy efficiency company that sells power factor correction equipment to reduce the energy bills of the end consumer
- Ghana
- US$120 000
- 2001
- Working capital to purchase power factor correction units
- Firm orders from 27 companies; support for installation and operational training; ABM now turning over US$250 000 per year.

BETL

- Collection and supply of biomass waste (1 000 t/month) to a cement plant to replace 20% of heavy fuel consumption
- Tanga, Tanzania
- US$50 000 investment
- Entrepreneur invested US$10 000
- 2003

- Working capital loan
- Biomass trials now being conducted.

Energy Systems Ltd

- Importation, sales and installation of solar PV systems to households and institutions
- Uganda
- US$50 000
- 2001
- Working capital to purchase inventory
- Partnered with a micro-finance company; 473 systems installed in rural areas.

ANASSET

- Distribution of liquid petroleum gas (LPG)
- Ghana
- US$38 000
- 2002
- Purchase of LPG storage tank and dispenser for vehicles
- Entrepreneur had a business plan but no finance.

Questions

- Mandisa Nkamba-Kadalie: Having a financial institutional background and not very conversant with the energy sector, information is required on those opportunities that are best suited to rural, peri-urban and urban situations in South Africa.

  Gavin Watson: The IIEC has a thorough knowledge of the breakdown of the South African energy sector. In the rural areas, one attempts to select the technology that is best suited to a particular area. However, rather than identifying an opportunity and finding an entrepreneur, it is preferable to have a potential entrepreneur identify the opportunity. A champion is needed to drive the adoption of the process.

- Mandisa Nkamba-Kadalie: It is unlikely that rural people are familiar with the energy sector and would probably not be able to identify the opportunities. They are hungry and want to earn money. It is more likely to work if the experts match the identified opportunities with likely entrepreneurs.
- Trevor van der Vyver: Where does the white male fit into this BEE initiative?

Vusi Sithole: Two objectives of this workshop are to tell participants about the energy sector that exists and to help draw BEE parties into the energy industry. We also want to see a marriage of skills between BEEs and WEEs (white economic empowerment). While the thrust in South Africa is BEE, there is no BEE in the rest of Africa. Serving Africa as a whole, black and white is not an issue for E+Co.

Jason Schäffler: It is difficult to obtain true demographic representation at a workshop such as this. However, through the ongoing process, the potential BEE entrepreneurs will be found, even though they do not attend meetings such as this. For example, skills development in a business and procurement from BEE companies provide opportunities for entrepreneurial development.

- Trevor van der Vyver: If someone has an idea, how does s/he take it further? It cannot be discussed in a forum such as this workshop.

  Jason Schäffler: The workshop itself is just the start of the process. There is a need to take some of the high-tech out of the approach. For example, think "hot boxes" as well as "super wind turbines" and "power factor correction".

- Jackie Williams (Women in Oil and Energy South Africa): What type of biomass is used in the cement plant in Tanzania?

  Kofi Nketsia-Tabiri: The biomass is wood waste from sawmills and ????. The cement plant is located 20 to 100 km from the sources of these materials.

- Jackie Williams: Financiers normally want entrepreneurs to be ready. However, the reason why there is a need for BEE and Women's Economic Empowerment in South Africa is because they have been kept back for centuries. In the rural areas, people are not even able to understand the possibility of energy uses and opportunities. Prior to the financiers' task, organisations like mine must ensure that the people are empowered to understand the energy opportunities. Without working with such organisations, it will be difficult for E+Co to get people (on board as entrepreneurs) if they don't have that prior knowledge. Entrepreneurs do not just happen.

  Vusi Sithole: This is the very purpose of this workshop and it will be repeated throughout the country in both larger and smaller centres. In clarification, E+Co does not make grants.

- Dudu Zwane (Shell Solar): Clarity is needed on the definition of BEE. As women, we have nothing in energy and oil. Would you go down to the people who have nothing in the rural areas and get them started?

  Jason Schäffler: Access and getting ideas can be provided through women networking and getting involved (e.g. Jackie Williams' Renewable Energy Workshop in August). In respect to the definition of BEE, it is not the IIEC or E+Co definition but rather that provided by national legislation and related regulatory matters such as the draft empowerment charter for the electricity supply industry and setting of minimum levels. For this particular process, it would be preferable to concentrate on a more practical level involving people, skills transfer and implementation.

Yes, we would go to the rural areas and assist the people. It is, however, difficult – and a challenge - to get involved and to identify potential entrepreneurs.

- Judy Weboz: We have 16 years experience of finding women entrepreneurs and, although there are opportunities, the constraint is their unbankability. Micro-credit is too expensive.

  Jason Schäffler: Cooperatives and women's groups are a possibility for business models.

- Rolf Papsdorf: In the rural areas, the developing economic environment should possibly be towards the making of hand-made products (e.g. hand crafts) which do not need to be energy related. In the rural areas where the women have nothing, there is a need to create a base which will provide them with an income, will teach them to read and write and then to empower them further to become entrepreneurs. Before all this, however, they need to eat. We therefore couple our basic projects of alternate energy electrification to a social responsibility programme in order to create sustainable permanent employment for the women. The women work shifts and are paid piece work. The poorest are selected for work by the indunas.

  Vusi Sithole: This discussion is all about networking

  Workshop participants declared that such processes are already in place.

- Mandisa Nkamba-Kadalie: There is an ABSA unit called ??????; this unit looks after the unbankable.

- Dudu Zwane: Would E+Co take the risk of the unbankable?

  Vusi Sithole: E+Co does not do micro-financing, but the "unbankable" approach is not expressed quite right. If a potential entrepreneur from a rural area has an idea that we think we can grow, then we will help grow it without security from that person.

  Dudu Zwane: Then the Apex funding that starts in September would take the women from one level to another?

  Vusi Sithole: Yes.

- Keith Sanderson (Laserscript, Scribe): For an understanding and clarity on BEE, he recommended Mr Lionel October, Deputy Director General, Black Economic Empowerment, Department of Trade and Industry.

- Asagan Moodalay (Sasol Technology Engineering): If an entrepreneur is applying for finance from a commercial bank but the person does not have the technical expertise to draw up a business plan, would E+Co assist in the development of such plans and would the US$25 000 minimum still apply?

  Gavin Watson and others: If an entrepreneur requires a business plan and also wants funds, then he should approach E+Co. Because he is seeking finance from a bank does not rule him out from approaching E+Co as we are also aiming to finance commercial deals. While we may assist the entrepreneur to draw up business plans, we would not finance this phase as such.

  Vusi Sithole: There are also other organisations that would help develop business plans.

Way Forward and Closure

On behalf of IIEC, Jason Schäffler said that this workshop represents the starting point of this project. Workshop proceedings and business plan models will be distributed and he invited feedback and comment on both opportunities for and barriers to the project. A survey of identified role players, especially workshop participants as core players, will facilitate model refinement and project development. He thanked participants for their attendance at and participation in the workshop.

Vusi Sithole explained that E+Co is in a joint venture with another international company, E+Co Securities. This company is involved with carbon emission reduction and asked workshop participants to urge companies involved in carbon reduction and associated compensation to contact E+Co, which represents E+Co Securities in Africa.

Rolf Papsdorf queried if this refund process was arranged through the government under the Kyoto Protocol. During discussion, it was explained that E+Co Securities has nothing to do with green certificates but dealt with carbon emission reduction. Both the DBSA and the Department of Minerals and Energy have roles to play in carbon emissions and carbon credits. E+Co Securities is a USA-registered company and cannot have anything to do with the Kyoto Protocol. E+Co Securities acts as a broker.

On behalf of E+Co Securities, Vusi Sithole thanked participants for attending the workshop and looked forward to working together in developing the energy industry.

The workshop closed at 12:40.

ATTACHMENT 3 – DATABASE OF SMME / BEE ESCOS

Company	Status	Telephone	Contact	E-mail	Description
Palace Engineering Services	(BE)	011 883 4347	M Dlamini	pesmid@icon.co.za	Electrical, mechanical ,control and instrumentation engineers focusing on all fields of engineering , but including energy and power management.
Lohuis SA	(BEE)	011 444 3359	G Pillay	noleen@lohuis.co.za	Suppliers of electric light bulbs and fluorescent tubes.
Voltex	(BEE)	011 622 4910	Drew Donald	ddonald@voltex.co.za	Specialising in the design, supply and installation of commercial and industrial lighting systems.
Dejaymci Technical Energy Services	(BWO)	082 879 0067	M Jacobs	jacobsm@webmail.co.za	Experienced in the telecommunications field linked to the energy field. Also some experience in substation planning, network reticulation and ptrepayment equipment.
F&S Enterprise	(BWO)	011 443 3554	Shela Moyo	mokalefm@tiscali.co.za	Involved in basic electrical installations and auditing.
FML Construction	(BWO)	015 633 6699	S Moerane	moerane@lantic.net	Experience in maintenance and HV and LV cable work as well as small commercial projects, such as schools.
Molathi Manufacturing	(BWO)	011 477 0537	O Nyathi		Suppliers of lights and fittings for the commercial , industrial and outdoor environment.
Nationwide Electrical	(BWO)	031 206 2544	Shamla Chetty	nepi@mweb.co.za	Electrical contracting company with experience in maintenance and line work. Have previous experience in commercial lighting installations.
Ponego Electrical Services	(BWO)	082 908 0676	Abigail Morulane	ponego@webmail.co.za	Involved in power line construction, meter audits and meter readings.
Umbane Solutions	(BWO)	021 979 0685			
Palace Engineering Group	(LBS)	011 883 4347	M Dlamini	pesmid@icon.co.za	Company with wide experience in energy management including energy efficiency and load management.
Supaheat Geysers	(LBS)	012 661 9510	EM Keyser	emo@supaheat.co.za	Large company specialising in the manufacture of geysers.
Cebisa Tshezi	(SMME)	043 742 1110	Mzimkhulu Mafanya	dlvec@iafrica.com	Consulting engineers involved in energy management, quality of supply, large scale electrification etc.
DLV Phambili	(SMME)	043 742 1110	Kobus Morgan	dlvec@iafrica.com	Consulting engineers involved in reticulation, distribution, rural electrification, energy management and metering.
Emzansi	(SMME)	012 345 3383	Aubrey Mackenzie	Aubrey@emzansi.com	A company with experience in the setting up of software systems in the energy efficiency field.
Energy Solutions Africa	(SMME)	011 803 7548	M Thobela	mthobela@mweb.co.za	A company focusing on tariff analysis, valuations, software development, as well as DSM needs analysis.

Eternity Star	(SMME)	073 443 2585	CJ Mabuela		A company intending to supply and install energy efficient lamps in the residential sector.
Fortune V investments	(SMME)	011 468 4830	G Mathabathe	godfrey@trisano-executives.co.za	Involved in facilities management,street lighting and electrical installations
George Mzamani Electrical	(SMME)	011 393 2309	T Monyai		Small electrical installation company with experience in domestic and commercial projects.
HSC Technologies	(SMME)	011 803 4928	A Sekabe	Alex.Sekabe@Webmail.co.za	Involved in the development of a time of use controller.
Ingoma Communications	(SMME)	011 315 3396	Mpho Mphake	ingoma@ingoma.co.za	Communications equipment supplier associated with energy savings and power audits.
Iskhus Power	(SMME)	011 392 4838	Anton Potgieter	antonp@iskhus.co.za	Providing energy outsourcing services such as metering and information analysis, identification of value focus areas, feasibility studies, benchmarking and reporting functions to large energy consumers in the commercial and industrial sector.
Karebo Systems	(SMME)	083 400 3416	P Kgame		DSM consultancy operating in the fields of electricity trading, data analysis, modelling and control.
Khawuleza Technologies	(SMME)	057 352 9736	MSK Maseka	s.maseka@khawuleza.co.za	A company with experience in meter reading, meter auditing and data collection.
Lebone Engineering	(SMME)	011 802 6370	Tlaleng Moabi	tlalengm@lebone.com	Electrical consultants with a wide field of exp ertise including energy consulting in the commercial and industrial load management fields.
Lyo Emfuleni Engineers	(SMME)	016 981 6270	M Lyon	mlyon@lyon.co.za	Consulting engineers with experience in commercial and industrial facilities as well as residential geyser control systems.
Mandla Lighting	(SMME)	082 416 5347	Jerry Mpofu		Experienced in general lighting installations in the commercial field.
Meganewton	(SMME)	083 297 3122	Shalen Bechoo	meganewton@mweb.co.za	Research and development of sustainable technologies, project management and electrical installations.
MIS Projects	(SMME)	031 209 2235	TC Madikane	tcmadikane@misprojects.co.za	Consulting engineers focusing on power distribution, commercial and industrial lighting, air-conditioning and data management.
Modikeng Electrical	(SMME)	013 690 3203	S Dolamo	modikeng@mweb.co.za	Electrical contracting company involved in electrical installations, repairs and maintenance.
Mveledziso	(SMME)	083 278 0246	B Madula	bethuel.madula@webmail.co.za	Experience in residential load management and street lighting projects
Neppa	(SMME)	012 807 6915	BP Nappai	neppa@mweb.co.za	Experience in lighting installations and electrification of schools as well as rural and township reticulation.
Nyathi	(SMME)	011 233 7834	Luntu Matsiliza	lm@wspgroup.co.za	Concentrating on commercial and industrial energy efficiency projects.

Palenque	(SMME)	012 653 8693	Esme Bluff	esme@palenque.co.za	Involved in load management and energy efficiency in the commercial, industrial and residential fields.
Quintem	(SMME)	011 786 4284	M Ramollo	quintem@iafrica.com	Experience in commercial energy audits and marketing of Ozonewash kitchen energy efficiency products.
RPS Engineering	(SMME)	043 722 1973	P Sibanda	rpsengbisho@telkomsa.net	Consulting engineers involved in electrical distribution systems, tariff investigations and electrical reticulation projects.
Sinotho Electrical & Civil	(SMME)	035 772 6323	S Sibiya		Involved in smaller installation and maintenance projects such as schools and halls etc.
Siyadingana Consulting	(SMME)	011 802 5389	MJ Ellman	siyadingana@yahoo.com	Provides specialist advise in energy related matters including energy efficiency, distributed generation, electricity accounts and project management.
Thamela Technologies	(SMME)	011 714 7331	Sibusiso Shangase	sibusiso@thamela.co.za	Involved in Industrial and Commercial energy efficiency and load management projects.
Tsebo Resources	(SMME)	083 260 6055	Mollo Ramollo	quintem@iafrica.com	Experienced in project management, rural electrification, energy efficiency and renewable energies.
Tshepo Thato Consulting	(SMME)	011 606 2390	S Mabalayo	sydney@spmsa.co.za	Small company with experience in maintenance and energy management.
Umbutho Civil and Electrical	(SMME)	014 594 0111	AD Mokoena		Electrical contracting company involved in electrical installations, repairs and maintenance.
Usizo Engineering	(SMME)	011 609 7560	S Dumakude	info@usizoeng.co.za	Consulting engineers specialising in electrical reticulation schemes, substations, building electrical services and plant process equipment.
Vhukhani Electrical	(SMME)	015 307 2845	Martinhus Barnard	mc.barnard@netgroup.co.za	Involved in electronic data capturing, meter auditing, and pole inspectiopns.

ATTACHMENT 4 – ESCO SURVEY QUESTIONNAIRE

SECTION 1: Details of the Energy Service Company (ESCo)

1.1	**Name of ESCo:**	
1.2	**Contact Details of ESCo:** **Postal Address:** **Phycical Address:** **Tel:** **Fax:** **E-mail:** **Website:**	
1.3	**Year of Establishment/ Company Registration Number:**	
1.4	**Name of Contact Person:**	
1.5	**Designation:**	
1.6	**Contact Details:** **Mobile:** **E-mail Address:**	

SECTION 2: Area of Focus of ESCo

2.1 What is the core business of your company?

2.1.1	Research and Development	
2.1.2	Manufacture	
2.1.3	Product sale (wholesaler,	

	distributor or retailer)	
2.1.4	Energy service delivery	
2.1.5	Technical assistance	
2.1.6	Project design and implementation	
2.1.7	Other *(specify)*	

2.2 **In which sector of energy market is your company active?**

2.2.1	Residentail	
2.2.2	Commercial/public	
2.2.3	Industry	
2.2.4	Other *(specify)*	

2.3 In which geographical area is your company operating?

2.2.1	Local	
2.2.2	Provincial	
2.2.3	National	
2.2.4	Regional (SADC)	
2.2.5	Pan-African	
2.2.6	Other *(specify)*	

2.4 Is your ESCo involved in the provision of thermal energy service delivery?

YES / NO

2.5 If yes, which service delivery ?

2.5.1	Cooking	
2.5.2	Water heating	

2.5.3	Housing insulation	
2.5.4	Solar passive housing design	
2.5.5	Other *(specify)*	

2.6 If not, would your Esco be interested in the provision of such energy service delivery in future? YES / NO

SECTION 3: Corporate Profile & Skills

3.1 Give a brief profile of your company.

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

3.2 **Give an indication of your company's (staff) management and professional levels.**

	Position	**#**	**Full-Time #**	**Part-time #**
3.2.1	Senior management			
3.2.2	Middle management			
3.2.3	Technical/professional			
3.2.4	Support/administrative			

3.3 Give an indication of your company's staff profile by qualification criteria:

	Position	#	Full-Time #	Part-time #
3.3.1	PhD and above			
3.3.2	Post-graduate qualification(s)			
3.3.3	Graduate/basic degree			
3.3.4	Under-graduate			
3.3.5	High School (Matric)			
3.3.6	Under Matric			

SECTION 4: Selected energy efficiency projects/work carried out by the company in the last five years.

	Project description and scope	Client	Year, Duration	Approx. Budget
4.1				
4.2				
4.3				
4.4				
4.5				

SECTION 5: Needs Assessment

5.1 **What are the critical needs for your company to explore opportunities in the energy efficiency sub-sector?**

_____
_____
_____
_____
_____
_____
_____

5.2 What are the challenges your company is facing to meet those needs?

_____
_____
_____
_____
_____

5.3 What levels of skills are required to function successfully in the energy efficiency sub-sector?

5.3.1	Expert	
5.3.2	Semi-skilled	
5.4.3	Un-skilled	
5.3.4	Other *(specify)*	

5.4 Have your company experienced challenges in carrying out its work? YES/NO

5.5 If yes, what challenges?

5.5.1	Technical	
5.5.2	Financial	
5.5.3	Lack of skills development	
5.5.4	Lack of government support	
5.5.5	Other *(specify)*	

SECTION 6: Sources of, and access to, capital and/or funding:

6.1	What is your company's main source of income?	1. Consultancy fees	
		2. Service delivery fees	
		3. Grant funding	
		4. Government project funding	
		5. Product sales revenue	
		6. Other (specify)	

6.2 What has been your experience with regards to accessing finance?

6.2.1	Easy	
6.2.2	Difficult	
6.2.3	Impossible	
6.2.4	Not Applicable	

6.3 If you have been able to access finance, where did you find out about relevant financial institution?

6.3.1	Print *(journal, newspaper, specify*)	
6.3.2	Advertisement	
6.3.3	Internet	
6.3.4	Department of Minerals and Energy	
6.3.5	Department of Trade and Industry	
6.3.6	Other *(specify)*	

6.4 If you have been able to access finance, what type of financial institution was it?

6.4.1	Commercial Bank	
6.4.2	Financial Trust	

6.4.3	Development Bank	
6.4.4	Other *(specify)*	

SECTION 7: Perception of BEE opportunities:

7.1 Are you aware of opportunities for BEE in the provision of energy efficient service delivery?

YES / NO

7.2 If yes, in which specific energy efficiency sub-sectors?

7.2.1	Lighting	
7.2.2	Thermal (cooking, water heating, and thermal housing design: insulation or retrofitting)	
7.2.3	Electrical	
7.2.4	Other *(specify)*	

7.3 Where do you access information about the opportunities available in your sector/sub-sector?

7.3.1	Print *(journal, newspaper, specify*)	
7.3.2	Advertisement	
7.3.3	Internet	
7.3.4	Department of Minerals and Energy	
7.3.5	Department of Trade and Industry	
7.3.6	Other *(specify)*	

7.4 Have you considered exploring these opportunities in the energy efficiency sub-sector? YES / NO

Please elaborate:

_____
_____
_____
_____
_____
_____

7.5 What is your company's perception and/or experience with exploring such opportunities?

_____
_____
_____
_____
_____
_____
_____
_____
_____

7.6 Do you think there has been effective transformation in the energy sector for overall BEE participation? YES / NO

7.7 If a business model was presented to you by IIEC, would your company be interested to develop, adapt and test the model ? YES / NO

7.8 If yes, what will be possible thermal areas of interest to develop a model within:

	Thermal application	Tick
7.8.1	Cooking	
7.8.2	Solar water heating	
7.8.3	Energy efficienct (solar passive)housing design for new buildings	
7.8.4	Retrofitting (insulation) of old buildings	

7.8.5	Other *(specify)*	

SECTION 8: Way Forward

8.1 IIEC is developing business models for LP Gas (for cooking and water heating); Solar Water Heating and thermal insulation of houses. Would you want to learn more about these models and want to explore opportunities in these sub-sectors?` YES / NO

8.2 Would your company welcome a visit to talk more about these opportunities and the models? YES / NO

8.3 Do you have any other general comments?

_____
_____
_____
_____
_____
_____
_____
_____
_____

THANK YOU FOR YOUR TIME

ATTACHMENT 5 – DRAFT REPORT ON THE ESCO SURVEY FINDINGS

INTRODUCTION

> ***"…economic growth, development and black economic empowerment are complementary and related processes. The empowerment we speak is an inclusive process and not an exclusive one. No economy can meet its potential if any part of its citizens is not fully integrated into all aspects of that economy. Equally it follows that any economy that is not growing cannot integrate all its citizens into that economy in a meaningful way."***
>
> - **President Thabo Mbeki**

In retrospect, South Africa's political liberation was the easy part. Now the country is faced with the hard part: freedom from the cycle of poverty and underdevelopment, freedom from mindsets and fear! It is now more than ten years since the new dispensation, yet the country is still faced with great challenges in terms of alleviating poverty and remedying the imbalances and the skewed distribution of wealth inherited from the past.

Empowerment is a vital component to the success or failure of any venture in South Africa. For BEE to succeed,

ESKOM has established and run a programme on Demand Side management since 1994. Since inception, the company as well as its clients on the programme were grappling with conceptual, legal and management issues. In the recent year, particularly since 2004, the programme has gathered momentum and is running at full capacity. However, many players in the demand side management are big players with a bit of financial muscle; small black economic empowerment companies are struggling to see project to finish as revenue and returns are only realized after certain financial investment and time.

The prevailing challenges, however, as presented by Mr Tsholo Matlala, manager of ESKOM DSM on the DSM implementation in South Africa are, among others:-

- Inadequate representation of previously disadvantaged people in the ESCo businesses;
- Educational awareness
- Availability of EE and load management technologies in SA market and
- Lack of ESCos with required energy management expertise.

These and other challenges allude to the very purpose of this project.

ESCOS IDENTIFICATION, SOURCES AND LISTS – METHODOLOGY

The starting point for this research was the two databases of energy service companies (ESCos) as registered with ESKOM within the Demand Side Management programme (see www.eskom.co.za); and the IIEC green professional database available under the IIEC Sustainable Homes Network, as part of the Eco Home Advisor Programme (1999). The next level of identification of ESCos was through own networks and association. The other source really was the participants list within the residential and transport sectors of the monitoring and evaluation of renewable energy targets project at DME (**April 2005;** ***ref. to Ian Household project report/list of participants to the residential sectors workshop on Monitoring of the EE target, CABEERI/DME – e-mail: ihouseham@iiec.org).***

The ESCos list – ESKOM DSM

This list is available o the ESKOM website, and is updated regularly (by-annually, see www.eskomdsm.co.za). The up-to-date list, dated 21 December 2004 has about one hundred and six companies registered, of which almost half are SMMEs. Most of the SMMEs are reasonably established and are not necessarily BEE.

Undoubtedly, there are a number of energy services companies out there in South Africa, big or small; which are not yet registered with ESKOM's DSM for one reason of the other. For smaller, un-established companies, some of the reasons for not having registered with ESKOM might be lack of capacity (financial, human resources and skills) and hence not being able to meet the ESKOM criteria and registration processes and requirements, while earning some income.

The Green Professional List: ref IIEC's Sustainable Homes Network Initiative

The green professionals list dated as far back as 1999, and most of the institutions and companies were not appropriate for the survey. Most of the partners in the green professionals' database were categorized under different and not applicable categories such as water conservation, government departments, projects, trusts, commercial housing developers, leaving only a few energy services companies which were appropriate to the BEE ESCo survey.

When focusing on this small fraction of the database, only ten out of fifty institutions were prospective ESCos, of which only two were BEE to which the questionnaires were sent to. So this list provided a very small base of prospective thermal energy ESCos.

Own Networks

Being one of the un-registered ESCos with ESKOM DSM; the company used its own networks to extend the research to other energy service companies which are also not registered with ESKOM DSM. Five of the fifteen such companies contacted provided responses to the survey.

Hence of the entire lists, the ESKOM DSM list provided a huge resource base in terms of valid contact details, appropriateness of the companies to the survey, and the up-to-date contact details. This then directed the survey to focus more on the ESKOM EEDSM programme, as a base for analysis of results.

The ESCo Concept and Model

The ESCo concept and model in SA is implemented in a rather different way to the rest of the developing counterparts (eg. Thailand, Philippines, Sri Lanka, Brazil and India). In all of these countries, the DSM funding mechanism is through government sponsored EE initiatives, while the assets ownership stays with the customer. In the South African Case, the funding mechanism is through the ESKOM DSM funding through tariff; while the asset ownership stays with the utility. *This somewhat poses a threat to the overall programme and the real empowerment ability*.

THE RESEARCH PROCESS, STRENGTHS AND LIMITATIONS

The research process entailed the screening of the databases to select appropriate BEE/SMME companies, and to locate their contact details. A coping survey questionnaire was designed, and finalized with the input of IIEC, together with the accompanying introductory letter. These then were sent (by e-mail and/or fax) to the prospective thermal energy service companies (TESCos). Follow-ups were done by phone and the responses were collated to identify the respondents who are most appropriate and have interest in exploring the opportunities in the thermal energy service delivery.

The strengths…

- Though the questionnaire seemed a bit long, it was very easy to fill, and it took around 30 minutes to be completed.
- Numerous follow-ups were done by IIEC consultant to make sure that inputs and responses from the BEE and BWO companies in particular, though some, to no avail
- This research was undertaken at the time when ESKOM DSM is supposed and reported to be at its peak, especially during the energy efficiency month championed by the DME, and NER and ESKOM itself, soothe results and responses were informed on the current status and activates in the sector, in line with the opportunities (if any) and activities of the month thereof.
- The research somewhat presented hope and opportunities to the ESCos, and hence the enthusiasm to learn a bit more about the organization (IIEC), BEE and BE5 projects and the thermal energy sector.

The limitations…..

- The research coincided with the IIEC move of office and hence lack of e-mail and telephone facilities over a period of two months, which impacted on the communication side of the project.
- The other limitation is that people generally do not 'take time' to fill in the questionnaire and it takes several phone calls and follow-ups by e-mail to finally get the responses. People also fear a multiple-page numbered questionnaire of form, even if it takes half an hour to fill.
- Generally on the contacts lists, the e-mail addresses (and/or telephone numbers) are either faulty (lack of updating in case of change of address and contact details by ESCos), or not operational on the receiving side maybe due to long company move/close up; and one never gets to know about the undelivered until one follows up.
- Most of the ESCos under consideration are somewhat disorganized for one reason or another, hence that impacts on the number and quality of responses received.

THE ESCOS SURVEY

Results from survey

Of the hundred and ten ESCo on the ESKOM's list, the questionnaires were sent to at least 45 of the SMME and BWO; and to fifteen more BEE/ energy service companies that are not registered under as ESCos such as ENEGREEN, Energy Management Consultants, Dikepolana Resources, PDC and others. Out of the sixty questionnaires sent, twenty (a third) responses were received, with a lot of level of effort and follow-ups by telephone and setting up deadlines. The twenty responses were representative of the four categories: relatively established ESCos; the less established ESCos and the 'struggling' ESCos and the non-registers ESCos.

For the purposes of this report, the four categories mentioned above are defined as:

Relatively Establishes ESCo

Though categorized as SMMEs, some companies, mostly white owned and not necessarily BEE, are relatively established with established area of focus, products and services other than those within the ESKOM's EEDSM. Thus when they participate in the DMS, they often have capacity to conduct the necessary audits,

The Less Established ESCo

These are surviving companies anyhow, are engaged in a number of projects though they have not se any significant project to finish. They often have a number of DSM project ongoing, and are

focusing of other projects which generate income and cash-flow for the day-to day running of the company. Some, though not many of the BEE companies fall under this category, and are quite satisfied with the programme and continue to see opportunity for later profits.

The 'Struggling' ESCo

Some level of effort and investment has gone into the company's registration with ESKOM, but hardly any projects have come to approval stage by ESKOM. Most of these are BEE and either they keep waiting for ESKOM to come to their aid with other prospects; or they look for surviving opportunities and strategies elsewhere. Some of these companies were established with hope of using the DSM programme to establish themselves, which is normally the killer mode of operation that bringing hope to the company's establishment and cash-flow!

The Non-registered Prospective ESCo

Though these are prospective ESCos in their own right, they are not registered with ESKOM for varied reasons. Some do not see the ESKOM DSM as their core area of focus, some have tried but could not meet the requirements , and are still working towards meeting the requirement to register; some are beginning to see the need once the DSM expand its focus and put attention to BEE and all the many other reasons.

Summary of survey responses

According to the specific sections/categories of the questionnaires, the responses to the ESCos (majority of which are registered with ESKOM under the EEDSM programme) survey were as follows, and ranges across all categories defined above:-

Areas of focus of ESCos

The ESCos focus mainly on energy service delivery; technical assistance, project design and implementation. Most focus on commercial / public and industrial sectors, with a few including the residential sector as well. Very few focus on residential sector alone. In term of geographical area coverage, all companies see themselves as national companies, even if currently operate provincially. None of the ESCos were involved in research and development; manufacture of products; of product sale at wholesale or distributor levels.

Corporate profile and skills

Most of the established registered ESCos are companies that have been providing services like meter reading and revenue management services; physical audits, general maintenance; supplies of electrical equipment such as light bulbs, cabling plugs, etc;

Needs assessments

Over and above the skills and capacity needs, the most pressing needs that was expressed by all ESCos was financial resources, and information. Given the time (and financial resources) needed to see project to fruition from development, approval to implementation levels; the ESCos expressed the need to re-look at the financing mechanisms and business models to support the DSM project processes.

The other need is human (particularly technical) and financial resources of course to have expertise in-house. The DSM processes involve hard-core processes that require technical skills and capabilities, and in cases where companies have to outsource these, they may not be able to afford, or even realize the desired projects/profits.

Sources of, and access to, capital and/or funding

This is a major barrier, as many if not all the ESCos found it difficult to accessing funding, and capital. In most cases, capital is injected by owners/share holders of a particular company, and might not be enough to sustain the company to fruition.

Perceptions of BEE opportunities

Interestingly, all the ESCos (black or white; big or small); expressed lack of transformation in the energy sector. However, with regard opportunities for BEE in the sector, ESCOs feel that such are not made widely available, and while they are bogged down in their everyday running of he companies and making ends meet, they do not have time and financial resources to explore such opportunities to the maximum. Initially they have to bear all the cots while establishing the companies; it is really lengthy and costly to reach a break-even point, let alone to start enjoying the benefits.

Further interest and openness to diversity

Notably all the ESCos registered under the ESKOM's EEDSM focus on electrical sub-sector of energy efficiency. Given such opportunity and awareness, all the ESCos would be open to include the thermal energy service delivery and products, such as LP Gas; Solar Water Heating, Insulation of the building envelope; and passive solar design advice.

The Overall Research Analysis

The Consultant views these to be the case with the DSM concept and implementation in South Africa:

- The programme offers business focus, growth of and hence business opportunities service providers in the energy sector. Companies have to be at the level of business capacity and capability to survive and thrive, while negotiating EEDSM projects.
- There is a noble course by all stakeholders: from National Department of Minerals and Energy; the National Electricity Regulator, ESKOM, Other Institutions and the ESCos in general to deliver energy efficiency products and services. The general public, however, are not aware and motivated to use energy efficiently, especially at household level.
- Through implementation by ESKOM, the focus and growth is mainly in the electrical sub-sector, as is the core business and competitive edge of ESKOM, and this pose as a limitation to project outside of electrical, such as LP Gas, Solar water heating, and passive solar design/thermal insulation of the building envelope. It is worth noting, however, that ESKOM is considering and engaging with other institutions to deliver thermal efficiency models; products and services towards a holistic EEDSM programme.
- There exist a huge disparity between SMME and big companies in terms of ability to participate effectively in the programme, whilst acquiring the necessary investment and maintaining the business cash flow
- Since inception NER /ESKOM have, and continue to improve the programme and the opportunities thereof, by building capacity and customizing the delivery programme to suit the clients – the ESCos. The recent years, particularly 2004 and 2005, are seeing more capacity building and media initiatives to operationalize the EEDSM programme (see www.enerficiency.org.za.
- There is a whole write-up of intend and commitment by ESKOM to support ESCos, to support the creation and transformation of the ESCos markets in South Africa, and to encourage the establishment of BEE ESCos in this year. Hence a budget of R100m set aside for BEE and the ongoing BEE ESCo seminars currently underway at ESKOM Megawatt Park.

- Last, but not least, much as the EEDSM present business opportunities for ESCos, the programme is not designed to boost the performance (and hence cash-flow) of a particular company, but to build steadily with time. This means that for ESCos focusing solely on the DSM project experience a lot of difficulty, particularly related to cash-flow as project required initial investment for a greater period before realizing the financial returns.

FINDINGS OF, AND ISSUES FROM THE SURVEY

ESKOM as the primary 'on the ground' implementer of the DSM has designed and channeled the programme to offer opportunities and business in the electrical with respect to the industrial and commercial sub-sectors. These somehow disadvantages (to a great extend) both the residential sub-sector, and thermal energy applications

The main issue with regards lack of capacity, inability to engage effectively and benefits for Small, Medium and Micro Enterprises (SMMEs), particularly the Black Economic Empowerment (BEE) ESCos, is lack of funding/financing options. Funding and cash-flow poses a huge threat/risk to emerging and growing SMMEs/BEEs. The institutional support offered by ESKOM DSM does not speak directly to, and/or address this critical issue.

ESKOM alludes to the need to restructure their financing options with regards the residential and thermal sectors.

The detailed analysis of the responses from the Prospective Thermal ESCos illustrate the following as problem areas:

- Lack of funding and financial support to explore and benefit from the business opportunities in the sector;
- Lack of transformation in the sector to enable BEE and SMME participants
- Inadequate dissemination of information and hence business opportunities to ESCos in the sector
- Inadequate skills (particularly technical – auditing) in-house, as a result these are outsourced at company's risk, which makes it too high.
- Inadequate awareness of energy efficiency concept and measures within the target markets (specifically the residential markets including the municipalities); leading to absolute demand for EE.
- Due to lack of information, the target markets do not always see EE as a priority, hence in most cases there is no provisional budget/incentive to implement EE measures, practices and projects
- The duration/magnitude of preliminary work prior to 'acceptance by ESKOM as a DSM project' often takes too long, at owners/ESCo's risk, and this pose as a challenge as some/many audits are done without resulting into a concrete project.

RECOMMENDATIONS

- Recommend that IIEC, ESKOM, NER should meet at high level to discuss the partnership(s) in delivering energy efficiency to the people, to get buy-in from the people (create the necessary awareness and demand); as well as alleviate such challenges as the financing options and/or mechanisms.
- That the with specific reference to the residential sector, the 'concept' of 'ESCo' be reviewed or relaxed to allow funding (100%) of such energy efficiency projects by

governments, and/or other funding bodies as opposed to the customers having to bear the costs.

- That IIEC should devise steady programme to work in partnership with, and fully understand the ESCos markets, as a strategy to delivery energy efficiency within the integrated approach.
- IIEC should co-operate with, and get support from the delivery stakeholders, mainly the DME, NER, ESKOM, ESCos and any partner institutions with energy efficiency drive, motivation and intend.
- IIEC should use the close-up of these project to forge pro-active partnerships for EE (particularly thermal) delivery models within the residential sector; through municipalities

PROPOSED WAY FORWARD

- Meeting with ESKOM DSM to fully understand and confirm their perception and implementation of the DSM
- Meeting with NER, ESKOM DSM and/or DME at the highest level to position the IIEC DSM /residential business model(s)
- Proposition of co-operation, project development and funding to address the two main challenges vis-a-viz funding/financing; and lack of business models in the residential sector; and secondary challenges such as:
    - Lack of educational awareness
    - Lack of ESCos with requirement energy management expertise
    - Inadequate representation of previously disadvantaged people in the ESCos business
    - Unavailability of EE and LM technologies in the SA market and
    - The bias exclusion of the thermal, residential markets as prescribed by the current business implementation models
- All of these (*except the last bullet*) as earmarked/observed/put forward by the Manager of the DSM programme at ESKOM, Mr Tsholo Matlala during the launch of the energy efficiency month May 2005 (*see www.eskom.co.za).*
- IIEC to further revisit the selected ESCos to deliberate further the possible business models that can be piloted at a small level with SEED funding from the REEEP programme.
- IIEC should propose to NER/DME/ESKOM an intervention that may carry the energy efficiency message to the people, as a starting point, and all the partners should work towards growing such a programme beyond awareness creation to education, and finally to implementation of projects possibly by BEE/BWOs in the residential sector.
- The partnership should be extended to renewable energy and energy efficiency funding programmes and financiers, such as CEF, USAID, HBS, GVEP/UNDP, E&Co etc, to facilitate broad-based financing mechanisms for EE project in the residential sector.

CONCLUSION

There is no doubt that the whole energy efficiency sub-sector is gaining the utmost energy, particularly at the residential sector, where people have to get into the practice of using resources sparingly. As a not-for-profit organization, IIEC is better positioned to promote energy efficiency

impartially at all levels: policy, liaison, development and community levels. The organization has to find partners in the development and promotion of energy efficiency programmes. The recent contacts, developments and partnerships with ESCOs and other role players in the energy efficiency directly relates to ways in which the Institute can deliver its intended programmes.

Integration, coordination and consultation play important steps in any venture. Hence IIEC EE programmes have to be seen within the holistic approach while advancing certain elements of the delivery processes that other institutions and models are not very strong at, thus complementing, and feeding back to the national coordinators and champions of the policies and strategies, in South Africa.

ATTACHMENT 6 – SCOPE OF WORK AND DELIVERABLES UNDER IIEC-ESCO CONTRACTS

Scope of Services:

The ultimate goal of this work is to arrive at a situation where partnerships between municipalities and local BEE ESCos are capacitated to develop and deliver a steady flow of high-quality energy efficiency projects in the residential sector. The purpose of your appointment is to achieve measurable progress towards this ultimate goal.

Activities:

1. Conduct research at municipal level to assess the status quo and needs analysis for residential energy service delivery in the localities. The research should look into:-
    - the current energy use patterns
    - the residential needs analysis
    - opportunities in delivery of thermal energy service delivery and energy efficiency
    - skills and skills gaps at municipal level to understand and deliver energy efficiency
    - current municipal activities and developments in this area
2. Engage in negotiations with the local government leadership, municipal leaders and other stakeholders[35] to make presentations, to deliberate and to provide input into the development of thermal energy efficiency delivery models. The meetings should be purposed to identify areas of collaboration between municipalities and ESCos in integrating the promotion and delivery of energy efficiency.
3. Liaise with local government / municipal structures and compile a report outlining the responsibilities, budgets, services and powers under different portfolios (e.g. water, health, energy, sanitation, etc) that pertain to delivery by municipalities of household energy efficiency services. This activity is closely linked to activity 1, and will provide a clear perspective of how the local government is structured in this regard.
4. Identify opportunities for partnerships between ESCos and other stakeholders (including municipalities and IIEC) in the area of information dissemination, promotion, education and training of personnel / staff to deliver energy efficiency, in line with the developments that are taking place in the localities.

Deliverables:

1. Baseline report on status quo, energy needs, skills analysis and gaps.
2. Meetings with signed documentation by at least two bodies (local DME, municipalities, projects or NGOs) working in the area
3. Report on local government municipal structures and delivery mechanisms
4. Report on opportunities and threats / challenges (obstacles) report

[35] Stakeholders in this instance may include the municipalities, Local DME offices, projects and NGOs working with various projects that can be interlinked to the provision/delivery of energy efficiency. This can be done through information dissemination, education and training.

5. An overall project report outlining the project activities and processes, outputs and way forward. This report should include a detailed description of how the activities undertaken under this contract have helped to achieve measurable progress towards achieving the ultimate goal described above.

ATTACHMENT 7 – INTERIM REPORT FROM ETERNITY STAR INVESTMENTS

FEEDBACK REPORT
ON A STUDY TOWARDS

DEVELOPING AND TESTING BUSINESS MODELS

TO INTEGRATE THERMAL ENERGY EFFICIENCY WITHIN THE RESIDENTIAL SECTOR

THROUGH ESCOS IN THE LIMPOPO PROVINCE

Compiled by : Eternity Star Investments 168 CC

DATE : 18 November 2005

A. DEDICATION

This report is dedicated to the enhancement of better collaborations of various key stakeholders in the energy efficiency environment in Limpopo. The provision of energy conservation is an essential service that needs to be provided in this sector not only to reduce the power consumption of households, but also to improve the livelihood of some of the poorest communities in the Province.

B. ACKNOWLEDGEMENTS

A research report, regardless of magnitude, requires acknowledgements and thanks to:

- To IIEC consultants for availing us the opportunity and resources of executing a survey of this nature
- To the three municipalities, namely Polokwane, Molele and Makhado and their respective key personnel , Danie Potgieter (Polokwane Technical Manager), Mr Delikisa (Molemole Technical Manager), Mr Maphodi (Makhado Technical Manager) Also to Limpopo DME Energy Efficiency Coordinator Mr Griel Ambani.

C. ORIGIN OF THE STUDY

IIEC initiated a project through which ESCOs such as Eternity Star Investments were deployed to identify and investigate delivery mechanisms/models for the integration and implementation of Energy Efficiency in the residential sector, as well as broadening the current DSM concept and delivery to include thermal energy service delivery. The purpose of this initiative/partnership was to provide support to ESCos to alleviate some of the challenges that emerged out of a survey that IIEC conducted prior to this project initiation. The ultimate purpose is to support and work in partnership with all regional stakeholders to promote energy efficiency, including thermal and focusing mainly on the residential sector.

D. DELIVARABLE

- Baseline report on status quo, energy needs, skills analysis and gaps.
- Meetings with signed documentation by at least two authorities
- Local government municipal structure and delivery report
- Activity, opportunities and threats/challenges (obstacles) report
- An overall project report outlining the project activities and processes, outputs and way forward.

E. SCOPE OF THE REPORT

This report has been compiled to provide feedback to IIEC on the progress that has been made to date on the key activities that Eternity Star was tasked to establish and investigate. The activities are as follows:

5. Conduct at municipal level (mini) research to establish the status quo and needs analysis for energy service delivery in the localities. The research should look into:-
    - the current energy use patterns
    - the residential needs analysis
    - opportunities in delivery of thermal energy service delivery and energy efficiency

- skills and skills gaps at municipal level to understand and deliver energy efficiency
- and the overall municipal activities and developments in their areas.

6. Engage in negotiations with the local government leadership and municipal leaders; and other stakeholders[i] to make presentations (IIEC and ESCos) to deliberate and have input into the thermal energy efficiency delivery models to the people. The meetings should be purposed to find synergies of working together with IIEC and ESCos in integrating the promotion and delivery of energy efficiency.

7. Liaise with local government/municipal structures and compile a report outlining the responsibilities, budgets, services and power; as well as different portfolios e.g water, health, energy, sanitation, etc) that pertains to municipalities. This activity is closely linked to activity 1, and gives one a clear perspective of how the local government is structure.

8. .Identify opportunities for ESCos; IIEC, other stakeholders for partnerships in information dissemination, promotion, education and training of personnel/staff to deliver energy efficiency, in line with the developments that are taking place in the localities

F. EXECUTIVE SUMMARY

To be summed at completion of the report.

G. IMPLEMENTATION APPROACH (METHODOLOGY)

We have divided the key areas of our research into three facets namely:

G.1. End user Facet

Low cost dwellings constituting of Rural community and RDP community. We are to execute a mini survey on households energy usage. To date we have engaged a professional who is busy designing a questionnaire to use when carry out the survey. This would be the last leg of the tasks we are assigned with. We have also acquired a disk for recent censors that were established provincially. This will come in handy when we analyze affordability of energy sources for the targeted market. Some of the issues that the survey will establish are:

- Source of income
- Primary Expenses
- Sources of Energy Used
- Costs of Energy Units
- Motivation for usage of a particular energy source
- Usage of Energy source/day
- Motivation of Energy Preference
- Views on affordability of various energy sources
- Perception on gas

G.2 Engagement of key energy personnel at DME and Municipalities

In this leg of the of the research we are engaging key personnel of the above mentioned institutions by collating information via

- Primary documents used for planning purposes
- Interviews of these key matters personnel
- And also interviewing community stakeholders such as councilors whom are primarily involved in energy related matters

To date three local municipalities and DME have been engaged;

DME has advised us on which Municipalities to pursue regarding thermal energy research. The following Municipalities have been engaged for interfacing with us on this research:

Polokwane Munic – has substial numbers of RDP houses

Molemole Munic(Dendron Area) – Mainly constituted by villages

Makhado Munic (formerly Louis Trichardt) – Mainly constituted by villages

We have acquired all of the above mentioned Municipalities Intergrated Development Plans (IDP), which we hoped will aid us in future plans that the municipalities have put in place for the development of their respective areas. This should have included at least a survey on various households energy options profile. We further expected an Intergrated Energy Plan to be included in the respective IDPs. This was not the case. Only Molemole Munic had a brief survey on their households energy options/usage profile. The other two Munics plans are only on prospects of future electricity household connections, these plans are undertaken by Eskom.

The interview questions and answers that were raised with the key municipal representatives will be furnished in our next report.

G.3 Engagement of Local Government and housing department

Collate strategic planning documents that steers deliverables, projects at hand, project prioritization, implementation processes and procedures. The funds allocation protocol and authorization processes will also be established. The major issue of concern is the mandate that this department has regarding energy requirements modeling in terms of new low cost housing projects and also the role that this department has in promoting energy savings.

H. IMPLEMANTATION SCHEDULE

Identification of Municipalities we will engaging 100%	29 Sept 2005 to 14 Oct 2005
Engagement & Interviews of Key Municipalities energy personnel 100%	29 Sept 2005 to 14 Oct 2005
Collation of IDPs 100%	29 Sept 2005 to 14 Oct 2005
Engagement of community liaison persons 40%	20 Oct 2005 to 24 Oct 2005
Engagement of Local government and housing department	0% No commitment as yet
Design of Survey questionnaires 2005…85%	04 Oct 2005 to 19 Oct
Execution of the survey 0%	23 Oct 2005 to 15 Nov 2005

I. DISCUSSIONS

I.1. Municipalities Identification/Selection

DME aided us in identifying Municipalities to approach regarding the thermal energy research. The following Municipalities have been engaged for interfacing with us on this research:

Polokwane Munic – has substantial numbers of RDP houses

Molemole Munic (Dendron Area) – Mainly constituted by villages

Makhado Munic (formerly Louis Trichardt) – Mainly constituted by villages

The municipalities were selected mainly due to the following reasons:

- Availability and concentration of targeted households that are potential candidates of utilizing alternative sources of energy other than electricity.
- The proximity of the municipalities, Polokwane is just at our doorstep, Molemole is 60km out of Polokwane and Makhado is 100km north of Polokwane.
- The other factor that was considered was the willingness and support of key personnel dealing with energy issues in divulging the information we requested.

I.2. Primary objectives for Interacting with Municipalities

- Engage & Interviews of Key Municipalities energy personnel.
- Source documents that are used for planning purposes and the operations of municipalities.
- Establishing channels for liaising with communities.

All of the three objectives were successfully accomplished.

I.3. Key Questions Posed

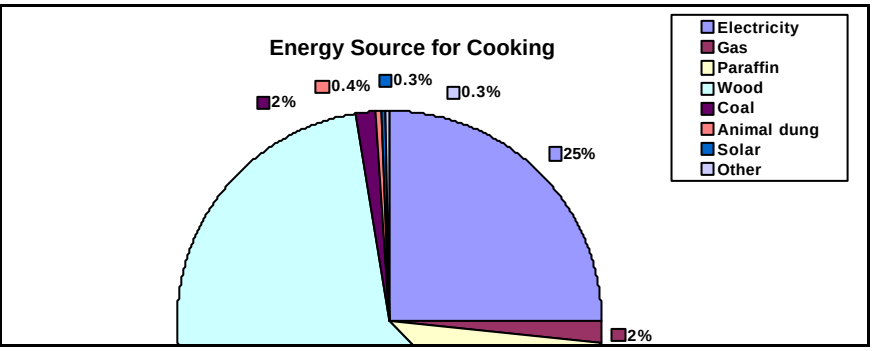
- Which Documents steers the municipalities planning, implementations and operations?
- What are the primary sections of this document?
- What are municipalities' mandates?
- How are Municipal operations and projects budgeted for and how are funds allocated?
- How are their projects prioritized?
- Does this document outline the approach of Energy planning?
- What are their core objectives especially in the energy facet of development?
- Are requirements plans compiled regularly?
- Are municipalities compiling Integrated Energy plans, which incorporate other sources of Energy?
- What are municipalities views regarding future energy requirements?
- Are they pursuing Energy Efficiency and or load shifting/shedding projects?
- Would they consider gas as an alternative energy source for cooking and heating applications
- How best can DME, Municipalities, Eskom, ESCOs, Communities and other stakeholders work together to promote a comprehensive options of energy sources?

The above questions will be discussed in subsequent sections as per municipality. Most of the information was found in sections of the documents (IDPs) that we were able to attain from these Munics. It must be however stated that the quality of the compilations varied from one Municipality to the other. The underlying factors that could have led to having variations in the quality of the compilations of these IDPs might be the budgets allocated for developing these documents, the competency of the personnel that compiled the documents and also possibly lack of skilled consultants that were collating information for the IDPs. To set the scene we will briefly energy usage profile of Limpopo province households. This info is Courtesy of statistics SA, Census 2001.

I.4. Limpopo Province Household Energy Use Profile

- **Energy Source for cooking in Limpopo households**

Energy Source	Number of houses
Electricity	295512
Gas	19625
Paraffin	131633
Wood	702428
Coal	18651



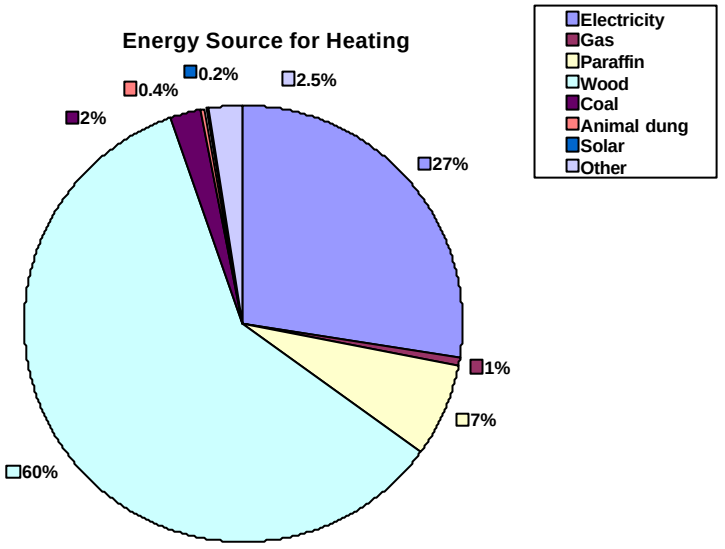
Animal dung	5272
Solar	2981
Other	3864
Total	**1179965**

Wood and Paraffin are still extensively used.

- **Energy Source for heating in Limpopo households**

Energy Source	**Number of houses**
Electricity	322904
Gas	7441
Paraffin	82363
Wood	703416
Coal	26831
Animal dung	4384
Solar	2909
Other	29717
Total	**1179965**

Wood and Paraffin are still extensively used.



This was just to depict the extent to which gas is under utilized. Whilst other energy sources that are hazardous in terms of health are excessively utilized. Some of the wood that is used as a source of energy is obtained by chopping trees and this aggravates deforestation. The next section presents feedback on interactions with Municipalities. The feedback address the key questions that were posed in the prior section of the report and it will be presented as per municipality as we have already indicated.

I.5. Polokwane Local Municiplity

I.5.1 Background

Polokwane Municipality is a local Municipality that fall under the Capricorn District Municipality. The Municipality is clustered into four areas; viz, Molepo/Maja/Chuene, Moletjie, Mankweng Dikgale and City/Seshego. According to census that were done in 2001/2002 the population of this local municipality was 508 27, which constitutes 9.4% of the province.

- **Population per cluster was as follows**:

Cluster	Persons	% of Municipality Population
Molepo/Maja/Chuene	57 792	11.37%
Moletjie	103 755	20.41%
Mankweng/Dikgale	194 631	38.30%
City/Seshego	152 096	29.92%

- **Types of Dwellings% per cluster were as follows:**

Cluster	Formal	Informal	Traditional	Other
Molepo/Maja/Chuene	83.62%	3.59%	12.59%	0.22%
Moletjie	80.79%	12.72%	6.41%	0.08%
Mankweng/Dikgale	84.25%	11.14%	5.52%	0.29%
City/Seshego	81.66%	16.67%	1.24%	0.33%

- **Breakdown of Polokwane Annual Household Income**

Annual Household Income	Number	Percent
ZAR 1 – 18 000	45 855	53.63%
ZAR 30 001 – 72 000	8 268	7.56%
ZAR 72 001 – 132 000	3 738	4.37%
ZAR 132 001 – 192 000	1 182	1.38%
+ ZAR 192 001	1 042	1.22%
Other	8 617	10.08%

Labour Force and Unemployment

The total labour in the municipality constitutes about 31.25% of the the population. Approximately 58.5% of the total labour force is employed. A staggering 41.5% of the labour is unemployed. Unemployment is obviously higher in rural areas than in urban areas. In Molepo/Maja/Chuene cluster for example, the unemployment level stands at approximately 63% while in Moletjie cluster the percentage of the labour force that is unemployed stands at 54 %. Unemploymenyt in the City/ Seshego cluster is at 27%. This is in brief the background of Polokwane Local Municipality.

The ensuing section presents the mandate, objectives and priorities of Municipalities. These sections will not be presented for each an every Municipality since they are generic.

I.5.2 Mandate

Municipalities have the constitutional mandate to create and sustain humane, equitable and viable settlements, and to promote social and economic development. This is in line with the strategic objectives of building a prosperous, united, non racial, non sexiest and democratic society.

Section 152 of the constitution stipulates the objective s of the local governments (Munics) as:

- To provide democratic and accountable government for local communities
- To ensure the provision of services to communities in a sustainable manner
- To promote social and economic development
- To promote safe and healthy environment and
- To encourage the involvement of communities and community organization in matters of local government

Furthermore, section 153 stipulates that a municipality must structure and manage its administration, budgeting and planning processes to give **priority to the basic needs of the community** and to promote the social and economic development of the community. (Page 67 of the IDP)

I.5.3 Core objectives of Polokwane Municipality

According to the Executive Mayoral Budget Speech in May 2003, the objectives and priorities of of this Municipality were outlined as follows:

- Give priority to the eradication of poverty by continuing to address the basic needs of our people especially water and sanitation in rural area.
- Reduce vulnerability and strengthen our people s livelihood strategies by extending free basic services throughout the municipality.
- Strengthen our people s livelihood strategies by creating economic opportunities through the promotion of Local Economic Development.
- Play our part in the fight against HIV-AIDS
- Accelerate the transformation of our municipal structure
- Work towards the normalization of distorted spatial settlement patterns and building of safe, and sustainable communities.

These priorities are further asserted by the prevalent demand of basic services such as provision of water, electricity and housing across all clusters. The issue of job creation and the support of sustainable livelihoods are also emerging as critical priorities from communal forums.

Projects Prioritization

The are numerous role players when developing an IDP. The main role players being: The executive Mayor, Municipal Manager, IDP Manager, IDP Steering Committee, IDP Representative forum, IDP Cluster Meetings, Community based organizations and NGOs, District Municipality, Government Dept and parastatals, research and educational institutions. The The role and responsibilities of the main role players are clearly summarized in page 58 to 60 of the IDP document. Consultative feedbacks from clusters and wards in clusters seem to be amongst the top drivers of prioritizing projects. The consultative process was split into two phases. The first phase was between September –October 2003 while the second phase was between March and April 2004. The first phase focused on identification of priorities and needs. The second phase was to allow communities to make inputs on the proposed strategic priorities and resources allocation. Another factor that steers the prioritizations of projects is obviously availability of funds and sources of funding the initiated projects, however everything must also be in line with the grand objectives and priorities or focus areas of the political mandate of the government at large. Page 61 to page 66 of Polokwane's IDP document table issues that were raised as priorities as per cluster.

The next section discusses the meeting that was held between Polokwane Munic key energy Stakeholders and Eternitystar.

I.6 Meeting

A meeting was held the on 4th of October 2005 between Polokwane Municipality key energy patrons (Mr C.J Pienaar and Mr Danie Potgieter) and EternityStar (Mr Oupa Mabuela) with the objective of discussing the following regarding the Municipality:

- Primary documents used for planning and documentation of Municipal plans
- Baseline studies that they've undertaken to date
- Incorporation of an Integrated Energy Plan In the planning documents
- Current initiatives on energy efficiency and load shedding
- Energy sources in communities
- Utilization of gas in communities
- Personal perceptions regarding the promotion of gas as an alternate energy source for thermal applications

The two representatives' contact numbers are as follows:

Danie Potgieter	(Technical Services Section)	(015) 290 2275
C.J. Pienaar	(Technical Services Section)	(015) 290 2275 or 083 827 8854

- **Outcome Of The Meeting**

It was established that the sections that are accountable for energy matters in municipalities are the Technical Services Sections. The primary document that directs the planning and implementation of municipal roles, projects and programmes is the Integrated development Plan (IDP) documents. These documents are compiled on a three year cycle. The current IDPs were developed in May 2004 to cater for plans and implementations that are from 2004 to 2007. It is however reviewed on a yearly basis. The Municipality provided us with their IDP document and a disc of census that were executed in 2002.

- **Baseline Studies**

Polokwane Municipality have entered into a partnership with the University of the North and Tlhavhama Training Institute to implement the study. Sections of the study are presented in depth in the IDP document they've provided. The baseline study was intiated with the following objectives in mind:

- To provide baseline data on the socio-economic, demographic and institutional dynamics at the municipal level.
- To provide information that enhances development of concrete strategies and programme for the implementation of sustainable livelihood s initiatives.
- To factor in the findings of the baseline study into the 2004/05 review and budget process.

The baseline study has been useful as one of the key instruments that are utilized to advise key planners and decision makes identifying the needs at grass roots and prioritizing the implementation of remedial actions according to specific communal cluster requirements. The baseline study that was undertaken did not however critically assess the energy requirements of people at the ground. The IDP document that was develop does not incorporate the energy planning in the true sense; The only trace of energy issues that are highlighted in the Polokwane IDP document is under the socio economic profile ,in page 23: Sources of energy for lighting are depicted. Source of energy used for lighting per sector are summarized as follows:

Clusters	Electricity	Gas	Paraffin	Candles	Solar	Other
Molepo/Maja/Chuene	50.67%	0.15%	7.91%	40.66%	0.22%	0.44%
Moletjie	71.35%	0.14%	2.87%	25.11%	0.26%	0.32%
Mankweng/Dikgale	61.49%	0.15%	3.57%	34.05%	0.25%	0.93%
City/Seshego	75.30%	0.2%	4.75%	19.41%	0.25%	0.13%

▪ Perceptions on energy efficiency and thermal heating options

Mr Potgieter and Pienaar indicated that their primary focus in terms of energy issue primarily was occupied by the drive towards the provision of electricity especially in non electrified areas. Lately the provision of free basic electricity has even intensified the drive to connect as many houses as possible. Backlogs of electrification projects are giving municipal personnel and politicians difficulties. Most electrification plans that are compiled are also governed by the availability of funds from DME and tedious project planning and implementation red tapes from Eskom. Availability of capital and manpower to fast track this seems to be the problem.

Alternative sources of energy such as solar for lighting are rolled out to schools and residential areas that will not in a long term be financially viable to take Eskom's grid to them. In recent months a company called Eskotek has been engaging various Municipalities including Polokwane Municipality to execute energy audits to the buildings and also to evaluate the prospects of introducing systems of remotely switching geysers on and off, with the aim of assisting the Munics to shed some of their load as per need during certain time intervals.

The two personnel feel that paraffin and wood are still extensively utilized for heating applications mainly in rural areas. They are aware of the benefits of gas such cost effectiveness, ease of use

and less health risks as the other two widely used energy sources. They however stated that gas seems to be an expensive options for communities because

- It is not provided to them at premises that are accessible and close to these communities.
- It has not been promoted as an alternative viable thermal energy option
- Some of the communities view it as being unsafe
- It is presumed to be expensive
- Subsidies are not offered for it
- Gas bottles are also heavy and most people that are targeted cannot afford high transport to carry them
- And the masses view electricity to be prestigious as opposed to other sources of energy (including gas)

- Energy issues

They both agreed that baseline studies to access the views from communities regarding energy types, and source used need to be undertaken. They also indicated that numerous interventions of enlightening communities regarding energy issues need to be undertaken, however resource are always the problem, as a municipality they are faced with extensive challenges and other issues normally take the backseat especially if funds are not available.

Energy forums were identified as appropriate platforms of introducing talks regarding energy issues however to have buying of the people at the ground a lot of campaigns by companies which stands to benefit form increased sales of their products need to intensify their campaigns in proving information about their products and also services, eventually get support from government to consider the product as a product that has positive merit attributes that the government must support in the provision thereof.

Two wards in Polokwane municipality boundaries were then identified to carry out a mini survey of energy sources preferences, current energy sources choices and costs

Seshego Hospital View. (The are RDP dwellings all electrified). Sixty houses were interviewed.

Makanye Unit E Mankweng. (This section is constituted by shacks and village dwellings – mostly non electrified). Sixty houses were interviewed as well.

Results of the these findings will be presented in the findings sections, Details of ward councilors that Eternitystar dealt with when organizing access into these communities will be presented in the finds section as well.

- Restructuring Dynamics

It is not yet confirmed as to whom will be moving into the REDs at Municipalities. If certain Key Municipal sections such as those that are to provide electricity were to move in to the REDs , remaining bodies will just provide administration services of other non-energy related services and the competency and platform will be eroded even further. Basically electricity will be monopolized as the only viable source of energy. The budgets for implementing energy efficiency programmes might be channeled into the hands of the REDs and this can be a major problem than what it is already.

I.6. Molemole Local Municipality

I.5.1 Background

Molemole Municipality is a local Municipality that fall under the Capricorn District Municipality. The Municipality is consist of many villages however major nodes that these villages are around:

Dendron, Botlokwa, and Soekmekaar. According to census that were done in 2001/2002 the population of this local municipality was 109 441. .

Dwelling Type

	Formal	Informal	Traditional	Other	Total
Molemole Munic	**25 710**	**1 120**	**1 012**	**46**	**27 888**

Income Distribution

R1 – R400	R401 – R800	R801 – R1600	R1601 – R3200	R3201 – R6400	R6401 – R12800	R12801 – R25600	R25601 – R51200	R51201 – R102400
15 024	**134 141**	**2 128**	**1 658**	**1 429**	**429**	**55**	**48**	**31**

8.1.1 Unemployment

Employed Persons	Unemployed Persons	Not economically Active	Not applicable	Total
16 227	**10371**	**33 443**	**49 400**	**109 441**

I.6.1 Priorities of Molemole Municipality

- Access to clean water and sanitation
- Access to Energy
- Access to Educational Services
- Access to health Services
- Accessible Roads infrastructure
- Access to Sports, Arts Culture and Recreational Facilities
- Access to housing
- Economic Development
- Financial Sustainability
- Community Stakeholders participation
- Safety & Security
- Access to emergency services

Processes undertaken for identifying project and prioritization work are similar to those of Polokwane Municipality. Similar structures and personnel are engaged to eventually compile an IDP which required by law to be compiled by each an every Municipality. The objectives are long however the one that relates to energy issues is the one which states that the Munic will strive to provide electricity to 99% of the unelectrified villages by 2007.

I.6.2 Meeting

A meeting was held the on 7th of October 2005 between Molemole Municipality key energy patrons (Mr H.N.Kataka- Technical Services Councilor, Technical Services Manager Mr Delikisa and Technical Services Officer Mr Sepota) and EternityStar (Mr Oupa Mabuela) with the objective of discussing the following regarding the Municipality:

- Primary documents used for planning and documentation of Municipal plans
- Baseline studies that they've undertaken to date
- Incorporation of an Integrated Energy Plan In the planning documents
- Current initiatives on energy efficiency and load shedding
- Energy sources in communities
- Utilization of gas in communities
- Personal perceptions regarding the promotion of gas as an alternate energy source for thermal applications

The two representatives' contact numbers are as follows:

Mr H.N.Kataka (Technical Services Councilor) 082 334 8374

- **Outcome Of The Meeting**

It was gathered that the municipality services some of the poorest communities in the province with minimal financial resources to afford even some of the most basic needs. Most villages have been electrified in the Municipalities however people are mainly utilizing it for lighting, fridges, TVs and radios. Wood, and paraffin are mainly utilized fro cooking and heating applications. The following energy usage figures were provided as a rough guideline of the energy source utilized in the Municipal area. (See Tables below)

The table illustrates the energy sources of lighting in the municipality

Electricity	**20 859**
Gas	**32**
Paraffin	**656**
Candles	**6 195**
Solar	**44**
Others	**103**
Totals	**27889**

The table indicates the source of cooking within the municipal area

Electricity	**8 836**

Gas	**636**
Paraffin	**4 895**
Wood	**13 125**
Coal	**146**
Animal Dung	**120**
Solar	**70**
Other	**60**
Totals	**27 889**

- **Baseline Studies**

No proper baseline study was undertaken independently from the last Census that was conducted in 2002. The is a need of strategizing on energy issues since some of the wood that is utilized by various communities is cut from the surrounding vegetation. This is a concern to the forestry and environmental departments. It is clearly evident that communities cannot really afford electricity as a cost effective source for cooking and heating, other options will have to be offered to the communities, however at substantially subsidized prices.

Perceptions on energy efficiency and thermal heating options

At Molemole the drive as well is towards electrification and provision of free basic electricity. According to the technical Services people that were in the meeting Gas is perceived to be hazardous, costly and not accessible to communities. Serious efforts of ensuring that gas does take off needs to be done through consultative approach however they indicated that the financial implications of the choice of energy type strongly influences decisions prior to perceptions. None or whatsoever iniciatives are being pursued of energy efficiency or improvement in the provision of other alternative sources of energy. This is mainly due to the following, priorities of the municipality, funding, lack of knowledge and competency level of the staff involved in energy matters.

The following village was then identified to be used for carrying out a mini survey in the municipality:

Mogodi village (15 km from Dendron has a combination of RDP and Village house holds) A large portion of this village has been electrified. Results will be discussed under findings.

1.7 Makhado Municipality

The next section was supposed to discuss Makhado Municipality however due to the little information that was provided the section is summarized as follows. A meeting was held on the 14 October 2005 with following ppeople:

Mr Griel Ambani DME Provincial Energy Services Managers (082 0695727)

Mr Mapholi Technical Services Manager

Mr Jabu Shidzinga Technical Service Officer (082 344 2913)

An IDP document was provided however it was not up to scratch. It was just providing Electrification programmes. No baseline studies of focus areas etc. Most the communities settlements in Makhado are in rural areas. According to the official 60% of the households are not electrified. An alternative source of energy that is utilized for light applications is solar in a number of villages. Paraffin and Wood in these parts of the country are still utilized as an alternative source of energy. When asked about their views on gas for communities, they viewed it as being expensive, and not easily accessible. It was highlighted that significant training will also be required to raise awareness in various communities.

The following village was identified for surveying purposes:

Gogobole GaSenthumule Village (electrified and non electrified)