

# Energy strategies for the urban poor

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## Executive Summary

### OVERVIEW

This document brings together research work undertaken by the Energy and Development Research Centre (EDRC) over the last three years. It synthesises strategies proposed in individual research reports produced during this period, places them in a present day context, prioritises them, and presents a way forward. The document is divided into three Parts. In Part I, the EDRC research project is described: project objectives and foci are identified, and the development of the research outlined. Part II, entitled "The factors influencing energy-efficiency strategy development" comprises two sections. The first section details current *opportunities* supporting energy efficiency, while the second examines the *barriers* inhibiting energy efficiency. In Part III, the strategies presented in the second part are prioritised.

### BACKGROUND

In 1995, EDRC embarked on a three-year policy project entitled *Energy efficiency, equity and environment: Improving access to energy services for the urban poor of South Africa*. The primary aim of this project was to identify policies and strategy interventions which could improve the appropriateness and efficiency of energy services in a way that would address both the energy poverty and the energy-related environmental problems experienced by the urban poor.

During the first phase of the project, a background study, determining the international and local experience in energy efficiency as well as the energy-efficiency potential across all sectors of the South African economy. The second phase of the project aimed at determining the current energy end-use patterns in low-income households with a view to establishing the energy needs of these households and to identifying potential areas for intervention. Four areas were then identified for more detailed analysis and strategy development: fuel switching, thermally-efficient housing, energy-efficient appliances and energy-efficient lighting. In the third phase of the project, these four areas were focused on in more detail. This paper draws together this research to present a package of strategies which target low-income urban households for energy-efficiency improvements. The economic analysis of the impact of the various energy efficiency interventions for the urban poor are presented in another research report, 'The real cost of conserving energy: energy efficiency for low-income urban households'.

### APPROACH

As noted, this report seeks to synthesise research undertaken during 1995 to 1997 for this project. All outputs from this research process have been carefully scrutinised and integrated into a broader energy strategy for the urban poor. The methodology used to develop the actions which make up the programme of energy efficiency presented in this report was to identify the opportunities for and constraints to energy efficiency in the low-income urban sector. Recommendations were then put forward to overcome the barriers, while at the same time make the most of the opportunities currently available. These recommendations were then prioritised according to a set of criteria, namely that:

- (i) the strategy is realistic;
- (ii) the opportunity to implement the strategy is currently available;
- (iii) the strategy could be linked to existing initiatives;

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- (iv) the strategy catalyses other improvements;
  - (v) the strategy addresses a barrier requiring immediate attention; and
  - (vi) the strategy supports local economic development.

## OBJECTIVES

The primary objective of this report is to develop a programme of energy-efficiency strategies for specific application to urban poor households, including both actions which could be undertaken by electricity utilities and those (for non-electrified households or other energy sources) which could be undertaken by government and/or other energy distributors.

## RESULTS

Cross-cutting as well as sectoral strategy interventions have been proposed. Though these strategies should be read in the context in which they have been developed, they are briefly as follows:

### *Crosscutting strategy interventions:*

- (i) Establishment of and support for a national Energy-efficiency Agency
- (ii) DME restructuring
- (iii) Development and dissemination of information materials about energy- and thermal efficiency and best fuel mixes
- (iv) Establishment of and support for local energy advice centres
- (v) Distribution of 'packages of goods and services'
- (vi) Support for Energy and Environment Advisors

### *Fuel-switching interventions*

- (i) Integration of all fuels into strategic planning frameworks and information materials
- (ii) Development and dissemination of information materials
- (iii) De-marketing of electricity

### *Thermally-efficient housing interventions*

- (i) Establishment of and support for the Inter-departmental committee
- (ii) Government lobbying
- (iii) Regulation for no-cost energy-efficiency measures
- (iv) Construction of demonstration houses
- (v) Development and dissemination of information materials

### *Appliance efficiency interventions*

- (i) Capacity building in government
- (ii) Development and dissemination of information materials
- (iii) Establishment/review of structures to test, certify appliances as well as monitor adherence to standards
- (iv) Research and development undertakings

### *Energy-efficient lighting interventions*

- (i) Strengthening of Eskom's energy-efficient lighting working group
- (ii) Development and dissemination of information materials
- (iii) Social analysis
- (iv) Door-to-door distribution, and encouragement of community participation
- (v) Lamp subsidisation

### **INDUSTRY PERSPECTIVE**

The strategy recommendations suggested in this document do not rely too heavily on any one institution for successful implementation. As there are already a diverse range of organisations involved in the development, and to a lesser extent, delivery of energy-efficiency strategies to the low-income sector in South Africa, it makes sense that an energy-efficiency strategy plan build on the activities of these existing institutions. These organisations include the DME, Eskom, energy research organisations and universities, implementation agencies energy and environmental NGOs and private sector companies. There is however, a need to ensure that these activities are co-ordinated to prevent duplication of activities and resources, as well as to ensure that interventions are made where there is a clear need for it. While different intervention areas – fuel switching, thermal efficiency, energy-efficient appliances and energy-efficient lighting – may require different co-ordinating bodies, for the most part this function could be fulfilled by the DME or Eskom. Beside the need for this top-down co-ordinating function, there is also a need for small-scale initiatives to influence policy from the bottom-up. This is particularly important in South Africa where the development of a comprehensive and innovative energy efficiency programme for the urban poor is threatened by a lack of institutional capacity. Recognising the need, the strategies presented are a combination of top-down planning and bottom-up innovation, demonstration and lobbying.

Within the above context, Eskom's roles in the strategies presented in this document are as follows:

#### *General*

- (i) Eskom, through the Electrowise campaign, should assist DME wherever possible in developing and disseminating information materials about energy- and thermal efficiency, and best household fuel mixes.
- (ii) Eskom should have representation on the proposed national Energy-efficiency Agency.
- (iii) Eskom should support the establishment and operation of local energy advice centres, as well as help to promote the concept in South Africa.
- (iv) Eskom should develop and promote the 'packages of energy, goods and services' proposed where possible.
- (v) Eskom should support the Energy and Environment Advisors whenever possible.

#### *Fuel-switching*

- (i) Eskom should pursue a de-marketing strategy for electricity in urban areas.

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*Thermally-efficient housing*

- (i) Eskom should become actively involved in lobbying government to change policy.
- (ii) Eskom should investigate the costs and benefits of thermal efficiency by constructing demonstration houses where appropriate.
- (iii) Eskom, through the Electrowise campaign, should develop and/or disseminate information materials on thermal efficiency.

*Appliance efficiency*

- (i) Eskom should foster the development of capacity in government through participation in the proposed appliance working group in the DME.
- (ii) Eskom should assist the working group (in collaboration with the proposed national Energy-efficiency Agency) to develop and disseminate information on appliance efficiency.
- (iii) Eskom should support research and development around appliances and their efficiencies.

*Energy-efficient lighting*

- (i) Eskom should take lead responsibility for energy-efficient lighting in the low-income sector.
- (ii) Eskom should bolster the energy-efficient lighting working group primarily by extending its reference group to include a wide range of stakeholders.
- (iii) Eskom, through the Electrowise campaign, should refine and disseminate information materials about energy efficiency.
- (iv) Eskom should co-ordinate door-to-door distribution of energy-saving lamps, as well as encourage, and actively seek the participation of the communities living in the target areas.
- (v) Eskom should subsidise lamps distributed to the low-income sector.

## Glossary of terms

AIJ/JI	: Activities Implemented Jointly/Joint Implementation
AMEU	: Association of Municipal Electrical Undertakings
CBOs	: Community-based organisations
CDM	: Clean Development Mechanism
CFL	: Compact fluorescent lamp
DME	: Department of Minerals and Energy
DEAT	: Department of Environment Affairs and Tourism
DoH	: Department of Housing
DoHealth	: Department of Health
DoF	: Department of Finance
DSM	: Demand-side management
DTI	: Department of Trade and Industry
DWAF	: Department of Water Affairs and Forestry
EDG	: Energy and Development Group
EDRC	: Energy and Development Research Centre
EEA programme	: Energy and Environment Advisors programme
EEL programme	: Energy-efficient lighting programme
ESCO	: Energy service company
FINESSE	: Financing Energy Services for Small Scale Energy Users
GEF	: Global Environmental Facility
GEIS	: General Export Incentive Scheme
GHG	: Greenhouse Gas
HEAT programme	: Household Energy Action Training programme
IFC	: International Finance Corporation
IIEC	: International Institute for Energy Conservation
LPG	: Liquid Petroleum Gas
LPGSA	: Liquid Petroleum Gas Safety Association
NGO	: Non-governmental organisation
NHFC	: National Housing Finance Corporation
PASASA	: Paraffin Safety Association of Southern Africa
REDs	: Regional Electricity Distributors
RDSM	: Residential demand-side management
SABS	: South African Bureau of Standards
SEED programme	: Sustainable Energy, Environment and Development

# Introduction

## 1.1. The E4 project

In 1995, the Energy and Development Research Centre embarked on a three-year policy project entitled *Energy efficiency, equity and environment: Improving access to energy services for the urban poor of South Africa* (hereafter, referred to as the E4 project), which was jointly funded by Eskom and the International Development Research Centre (Canada). The primary aim of the E4 project was to identify policies and strategy interventions which could improve the appropriateness and efficiency of energy services in a way that would address both the energy poverty and the energy-related environmental problems experienced by the urban poor. The project thus had multiple aims – to improve social equity by redressing the huge disparities in South African society both in access to energy and in the level of energy services provided; to increase energy efficiency, by improving access to affordable, efficient end-use technologies; and to achieve environmental sustainability, by reducing both national and local environmental health risks and encouraging a more economically appropriate mix of fuels in low-income households.

### 1.1.1 Project focus

The rationale for the focus on the urban poor was primarily one of achieving social equity. Poor households in South Africa have been denied access to the benefits of affordable, versatile and safe energy sources. The range of fuels that low-income households have access to are constrained both structurally (for example, by not being connected to the grid) and financially (for example, by being unable to pay access costs, either in terms of appliances or infrastructure such as wiring or gas bottles). Low-income households tend, therefore, to rely on a range of relatively expensive, but inefficient and unsafe fuels to meet their energy needs. Energy is an essential good and energy demand is therefore relatively income inelastic. As a result, poor households spend a substantially higher proportion of their monthly household expenditure on meeting energy needs than do wealthier households: that is, 10 to 12% of total household expenditure versus the 4% spent by wealthier households. Furthermore, poor households using paraffin, coal, candles and wood are exposed to high health and safety risks, such as fires, burns, poisonings and respiratory ailments resulting from localised air pollution. Energy efficiency improvements are one way of providing poor households with better, more affordable and healthier energy services.

In addition to equity motivations, it makes sense to target energy efficiency programmes at low-income households because they generally contribute disproportionately to costs incurred by utilities for bad debts. These debts can be reduced if customers' bills are lowered as a result of conservation. Also, while the residential sector comprises only 15% of total national electricity consumption, it constitutes 75% of the variable load. Satisfying peak load demands requires large capital investment for increased generating capacity which is infrequently utilised. As more and more households are connected to the grid, this problem is exacerbated. Finally, low-income consumers are less likely to adopt energy efficiency measures than higher income consumers because the high initial financial and time costs preclude their participation. Focused programmes are thus required to overcome these barriers and encourage their involvement.

### 1.1.2 Project objectives

Specific objectives of the E4 project have been:

- To determine the current status of energy end-uses, energy sources, and the prospects for improved end-use efficiency in poor urban households, using both secondary and primary data sources.
- To assess the current availability of energy-efficient household technologies in South Africa, their affordability for the target population, and the barriers preventing wider distribution and lowering of costs.
- To develop a programme of energy efficiency strategies for specific application to urban poor households, including actions which could be undertaken both by electricity utilities and by government and/or other energy distributors (for non-electrified households or other energy sources).
- To assess the environmental impacts of improved household energy efficiency in the target population, including both micro-environmental effects (household and community levels) and macro-environmental effects (national, regional and global levels).
- To develop an improved capacity to develop, plan and analyse energy efficiency programmes and, in particular, demand-side management programmes, and to give special attention in doing this to disadvantaged and poor populations in South Africa.

### 1.1.3 Project evolution

The E4 project has followed a research methodology, which has moved from the broad to the specific. The project has been structured in four phases. The first phase of the project was a background or scoping exercise, which aimed at gauging the international and local experience in energy efficiency, as well as the energy efficiency potential across all sectors of the South African economy. The second phase of the project aimed at determining the current energy end-use patterns in low-income urban households with a view to establishing the energy needs of these households and to identifying potential areas for intervention. Out of these two phases emerged a direction for the project. Four areas were identified for more detailed analysis and strategy development. These were fuel switching, thermally efficient housing, energy-efficient appliances and energy-efficient lighting. In the third phase of the project, these four areas were focused on in more detail. Barriers to implementation were identified and recommendations were put forward to overcome these barriers. Numerous reports were produced out of this research. These reports are presented in Table 1 below. This paper draws together this research to present a package of strategies which target low-income urban households for energy efficiency improvements.

these barriers are presented. These strategies build on current energy-efficiency and development initiatives in South Africa and international funding and technical transfer opportunities. Part III of the report prioritises the strategies identified in Part II, providing a programme of action which should be undertaken in the short to medium term in order to ensure that opportunities afforded by the current international and national context are not lost.

Research components	Research outputs		
	Author	Date	Title
Background research	Mammon, N	1995	Energy efficiency in South Africa's low-income urban sector: A review
	Simmonds, G	1995	International energy efficiency experience: Lessons for South Africa
	Thorne, S	1995	Energy efficiency potential in the South African economy: A review
Household survey	Simmonds, G & Mammon, N	1996	Energy services in low-income urban South Africa: A quantitative assessment
Standards study	Mabuse, K	1996	Improving appliance efficiency: International experience, South African prospects
Energy efficiency strategies	Thorne, S	1996	Financial costs of household energy services in four South African cities
	Thorne, S	1997	Economic cost of energy services in South African cities
	Clark, A	1997	Compact fluorescent lamps in an international context
	Clark, A	1997	Energy-efficient lighting in an imperfect market: Preliminary thoughts for South Africa
	Clark, A	1997	Strategy for Eskom's energy-efficient lighting programme for low-income households
	Clark, A	1997	Economic analysis of Eskom's energy-efficient lighting programme for low-income households
	Simmonds, G	1997	Financial and economic implications of thermal improvements
	Simmonds, G	1997	Barriers to energy-efficient housing
	Borchers, M	1997	Strategies to promote economically sound energy use in low-income households
Environmental impacts	Marchal, I	1998	Environmental impacts of fuel switching
	Simmonds, G	1998	Environmental implications of energy efficiency
	Fecher, R	1998	GHG implications of energy efficiency

Table 1: E4 project reports

## 1.2. Regional energy-use profile of the urban poor

A wide range of fuels are used by low-income households, including paraffin, gas, coal, candles and electricity. The types and combinations of fuels used vary greatly between regions and within areas and are influenced by variations in cost and availability of fuels, household income, perceptions of the safety of fuels and social determinants of fuel use such as practices of fuel sharing and household structure.

Nationally, the most widely used fuel in low-income households is paraffin. The frequency of use of paraffin and other fuels is, however, regionally differentiated. The use of coal is almost entirely specific to Gauteng. Nationally, very low levels of

LPG use are experienced, with relatively higher levels found in Cape Town, Port Elizabeth and Durban. The use of candles is greater in Gauteng and Durban than in Cape Town and Port Elizabeth.

The range of household energy needs includes the following end-uses: cooking, space heating, water heating, lighting, refrigeration, entertainment, and ironing. In many cases in low-income households, some of these needs are not met. Specifically, refrigeration, space heating and entertainment services may be lacking. This is influenced predominantly by the types of fuels used in the households and the prohibitive cost of appliances. Furthermore, in the case of space heating, climate has been found to influence consumption patterns. In more moderate coastal climates there is less need for space heating than in cold interior climatic areas.

Typical scenarios of low-income household energy use are presented in the tables below and include the fuels used to meet each end-use and the breakdown of household energy consumption in terms of monthly delivered energy.

	Scenario 1 (Electricity)		Scenario 2 (Electricity & paraffin)		Scenario 3 (Electricity, paraffin & gas)		Scenario 4 (Electricity & coal)	
	Fuel	MJ	Fuel	MJ	Fuel	MJ	Fuel	MJ
Cooking	Elec	797	Para	777	Gas	1176	Coal	4455
Space heating	Elec	468	Para	603	Para	603	Coal	5589
Water heating	Elec	112	Para	344	Gas	294	Coal	1107
Lighting	Elec	151	Elec	174	Elec	174	Elec	174
Entertainment	Elec	79	Elec	52	Elec	52	Elec	52
Monthly h/h energy consumption (delivered MJ)	1 607		1 950		2 299		11 377	

Table 2: Typical fuel scenarios for low-income electrified households in South Africa

While households using electricity alone are found throughout South Africa, the frequency of occurrence varies between metropolitan areas and is linked to provincial levels of electrification. The lowest levels of households using electricity only are found in Port Elizabeth. The use of other fuels in combination with electricity varies substantially between regions. The use of paraffin and electricity is most commonly found in Port Elizabeth and Cape Town. Candles are often used in combination with electricity for lighting needs in Durban and Gauteng. The combination of electricity, paraffin and candles is most prevalent in Durban and, to a lesser degree, Gauteng.

	Scenario 5 (Paraffin)		Scenario 6 (Paraffin & candles)		Scenario 7 (Paraffin & gas)		Scenario 8 (Coal & candles)	
	Fuel	MJ	Fuel	MJ	Fuel	MJ	Fuel	MJ
Cooking	Para	777	Para	777	Gas	1176	Coal	4455
Space heating	Para	603	Para	603	Para	603	Coal	5589
Water heating	Para	344	Para	344	Gas	294	Coal	1107
Lighting	Para	311	Para & cand.	185 52	Para	311	Cand.	124
Monthly h/h energy consumption (delivered MJ)	2 035		1 961		2 384		11 275	

Table 3: Typical fuel scenarios for low-income non-electrified households in South Africa

Households using paraffin only (scenario 5) are found predominantly in Port Elizabeth and Cape Town, with 77% and 57% of non-electrified households fitting into this scenario respectively. The combination of paraffin and candles (scenario 6) is found in Durban (70% of non-electrified households) and, to a lesser degree, Gauteng (45% of non-electrified households). The combination of paraffin and gas (scenario 7) is found predominantly in Port Elizabeth (11%) and Cape Town (16%), while in Durban, this scenario, combined with the use of candles for lighting, is also commonly found (9%). In Gauteng, the combination of coal and candles is prevalent; this may be combined with the use of paraffin in summer. Car batteries may be used for entertainment services in combination with any of the above scenarios in non-electrified households.

The efficiency of these fuels in performing different tasks varies substantially and they are often not the most efficient fuels for a specific end-use. Furthermore, there are significant health and safety implications associated with the use of coal, paraffin and candles, the most commonly used fuels in non-electrified low-income households. The welfare of low-income households can be substantially improved by promoting the use of the most efficient fuels for each specific household energy need.

### 1.3. Rationale for energy conservation interventions

As mentioned previously, four broad areas for intervention were identified out of the analysis of household need and research on possible programme strategies. These are appropriate fuel-mix, energy-efficient housing, energy-efficient appliances and energy-efficient lighting. The following section provides the rationale for focusing on these four areas.

#### 1.3.1 Sectoral interventions

##### 1.3.1.1 *Appropriate fuel-mix*

From an economic perspective, the most cost-effective appliance/fuel combinations are coal stoves, gas rings and electric hotplates for cooking; coal braziers and stoves and gas heaters for space-heating; solar water heaters (integral and with electric back-up), coal stoves with jackets and gas geysers (in-line and storage) for water heating; and electricity for lighting and refrigeration.

Comparison of this theoretical best-mix with actual energy-use practice reveals substantial differences between the optimal scenario and practice. While paraffin primus and wick stoves are, for all applications, the poorest choices from an economic perspective (and in many cases from a financial perspective as well) they are very widely used in low-income households for cooking, space- and water-heating, and lighting. This widespread use of paraffin can be attributed to a number of factors: the low costs associated with its use (there is no access cost and appliance costs are relatively low); it is widely available, is easily transportable and can be purchased in small amounts; it can be used to meet a number of needs; and people are familiar with it.

Although most newly-electrified households use electric lights to meet some of their lighting needs, CFLs are not common due to their high capital cost, limited availability and a lack of information on their potential benefits. High costs also limit the penetration of electric refrigerators.

Coal is not widely used beyond Gauteng. This can be attributed to the fact that coal appliances (excluding braziers) are relatively expensive compared with paraffin appliances; coal is considered to be dirty and polluting by many households; and coal is not as readily available as paraffin in many parts of the country.

While gas is very well suited to cooking and water-heating, it is not widely used in South Africa. This can be attributed to the high cost of gas appliances, the access cost in the form of deposits on bottles, the fact that it is perceived as a dangerous

fuel, and the fact that it is not as widely distributed as paraffin and is more difficult to transport.

Candles are a very costly light source. They are widely used in low-income households, however, because they are well suited to the periodicity of income in low-income households. They require no capital outlay and they are universally available.

Finally, although solar water heaters are the most cost-effective option for water-heating, their penetration in the low-income residential sector is close to zero. The main constraints on the adoption of solar water heaters are the high capital costs and the lack of knowledge and familiarity with the systems.

National energy policy should aim to meet consumers' energy needs with least economic cost. This opens the way to some form of support for non-electric fuels such as solar, coal and gas, if these can be shown to be more cost-effective than electricity for certain uses among poor populations. It also provides a framework in which energy efficiency activities (such as those pertaining to housing, appliances and lighting) can be co-ordinated as part of a strategy to obtain an optimal fuel-mix.

### **1.3.1.2** *Thermally-efficient housing*

The existing low-cost housing stock in South Africa exhibits very low levels of energy efficiency. Formal houses are generally constructed of brick or cement, with iron or asbestos roofs; few have ceilings and almost none are insulated.

Research has shown the benefits of thermally-efficient housing to be increased comfort, lower space heating requirements and improved health at the household level; deferred capital costs of building the next power station and reduced greenhouse gas emissions at the national level. Despite the obvious benefits of thermal efficiency, low-cost housing continues to be built for poor thermal performance. Reasons for this include raiding of the subsidy by developers and local service providers, competing subsidy demands, and inadequate information (these are discussed in more detail in Part II).

Given the large number of homes to be built in South Africa and the fact that those gaining access to housing are poor and are spending up to 10-12% of their monthly household budgets on energy, the introduction of energy efficiency measures in these homes will produce significant positive benefits for those families. Furthermore, a strategy of energy-efficient housing provides benefits to all households using space-heating and is not specific to one fuel. New low-cost housing should be correctly oriented on the plot, should include ceilings and ceiling insulation, should provide adequate ventilation, and windows should be designed to maximise solar penetration in winter.

### **1.3.1.3** *Energy-efficient appliances*

The efficiency of the appliance stock in South Africa is relatively low. This is because there are no energy performance standards applicable to appliances in South Africa; there is no information available to consumers with regard to the relative efficiency of appliances leaving consumers to rely on brand recognition alone; maintenance networks for existing appliances are poor; and finally, consumers are ill-informed with regard to how to select quality second-hand appliances. International experience has shown that substantial improvements in appliance efficiency can be achieved through a range of complementary strategies which include general information programmes to encourage consumer awareness, appliance labelling programmes, minimum efficiency standards, testing and certification of appliances, and technology procurement or 'golden carrot' award programmes. Owing to the wide range of fuels used by the majority of South Africa's population, it is important that appliance efficiency programmes are not narrowly defined to include only electrical appliances, but encompass gas, coal and solar appliances as well. Of particular importance is the need to link the appliance

efficiency programme into a broader framework of promoting appropriate fuel-mixes.

#### **1.3.1.4 Energy-efficient lighting**

Energy-efficient lighting was selected as a target programme for low-income households because lighting is generally the first electricity service that poor households acquire on gaining access to electricity and because utilisation of compact fluorescent lamps (CFLs) can yield widespread benefit. A 18W CFL, for example, provides the same light output as a 75W incandescent light bulb and can last eight to ten times as long. Because CFLs do not have to be replaced as often, and use less energy, they offer significant savings in terms of reduced electricity bills to electricity users. Depending on its rate of usage, the high first cost of a CFL could be paid back in energy savings in less than two years. CFLs can also be beneficial to utilities. If Eskom were to install lamps into low-income households it could receive substantial benefits in terms of avoiding expenditure associated with generation, as well as installing new capacity. Finally, energy-efficient lighting programmes can also have significant positive impact on the natural environment. Replacing a 75W incandescent with an 18W CFL would also avoid emissions into the atmosphere of over 250 kilograms of carbon and seven kilograms of sulphur dioxide over the life of the lamp (assuming it conserves electricity that would have been produced in a coal-fired power plant).

#### **1.3.2 Economic rationale**

The magnitude of the benefits of the above-mentioned interventions to low-income urban households and to the nation are presented in the second volume of this synthesis report entitled, 'The real cost of conserving energy: Energy efficiency in low-income urban households' by Fecher (1998). The report presents 'cost of conserved energy curves' and 'cost of avoided installed peak capacity curves' for the following interventions:

- Energy-efficient lighting: switching from incandescent to compact fluorescent lamps.
- Thermal improvements to low-cost housing: ceilings and passive solar orientation.
- Fuel switching: switching from one fuel/appliance combination to another, such as:
  - paraffin to gas for cooking, water- and space-heating;
  - electricity to gas for cooking and space-heating;
  - paraffin to solar hot water heater with electric backup; and
  - paraffin and candles to electricity for lighting.

The results of this analysis show that significant economic benefits can be achieved while saving energy and avoiding generation capacity investments. The interventions presented in Figures 1 and 2 below save energy for low-income households at negative costs, yielding net economic benefits for society. All of the interventions presented in Figure 1 have costs lower than the long run marginal costs of supplying energy and all measures to reduce peak capacity (see Figure 2) are less expensive than building new peak capacity. Not only is it cheaper for the user to save energy than buy it, it is more profitable for society to save energy than to supply it.

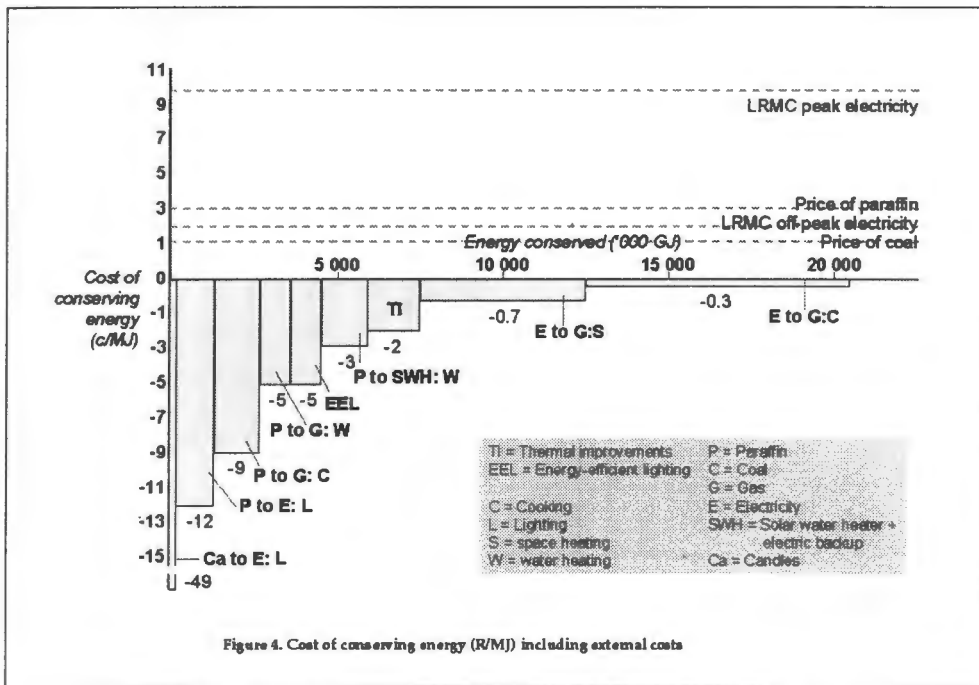


Figure 1: Cost of conserving energy (R/MJ) (including external costs)  
Source: Fecher (1998)

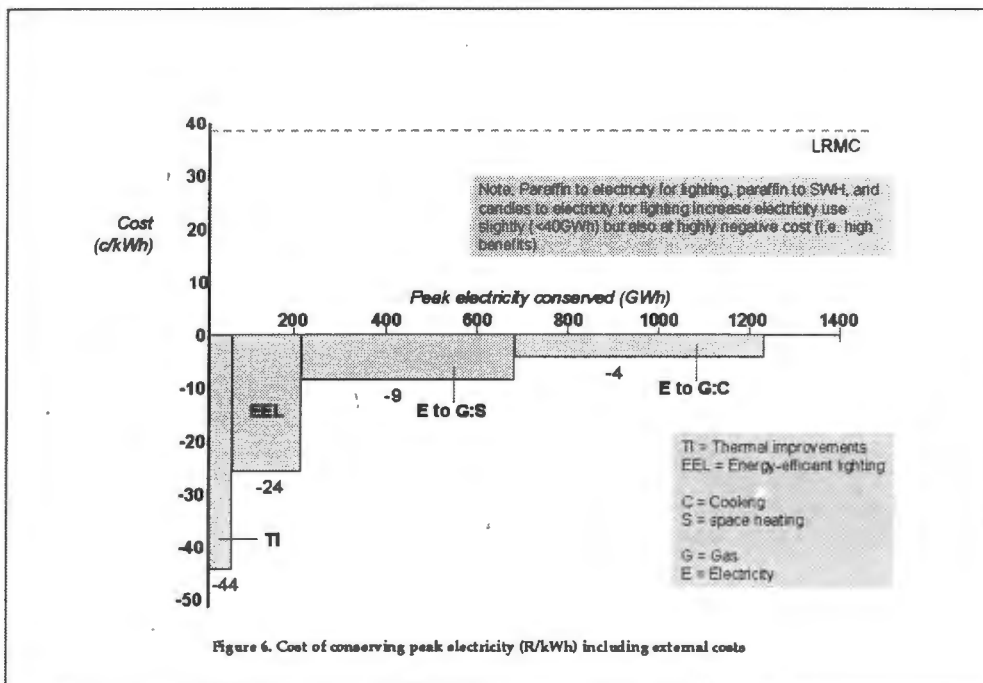


Figure 2: Cost of conserving peak electricity (R/kWh) (including external costs)  
Source: Fecher (1998)

### 1.4. Structure of paper

The paper is divided into three parts – Introduction, Synthesis and Way forward. Section I of Part II highlights the opportunities afforded by national and international priorities and initiatives for inserting energy efficiency into low-income urban households. Section II of Part II details the current barriers to the adoption of energy efficiency measures by the urban poor. Strategies to overcome

## **Factors influencing energy efficiency strategy development**

The methodology used to develop and prioritise the actions which make up the programme of energy efficiency presented in this report was to identify the opportunities for and constraints to energy efficiency in the low-income urban sector. The strategies presented in Parts II and III of this report are responses to the barriers to energy efficiency experienced by the urban poor in South Africa and build on the opportunities afforded by national development initiatives, existing national efficiency programmes and local energy efficiency initiatives, international treaties and agreements, and international experience in the realm of energy efficiency. Section I of Part II highlights the national and international opportunities to promote energy efficiency in poor urban households. Section II of Part II presents the barriers to energy efficiency and suggests strategies to overcome these barriers, drawing on the opportunities presented in Section I.

# Opportunities supporting energy efficiency

A sound programme of energy efficiency for low-income urban households should consist of elements which are well proven abroad, fit the needs of low-income consumers, take advantage of national development initiatives and international funding and information exchange opportunities, and link into other efficiency programmes and initiatives by local role players. This section highlights the opportunities supporting energy efficiency in South Africa. These opportunities include:

- the national political environment;
- national development priorities, specifically the mass housing and electrification programmes;
- electricity industry restructuring;
- local energy efficiency initiatives;
- international funding opportunities; and
- bi-national agreements.

## 2.1. National opportunities

### 2.1.1 Policy environment

Since the 1994 elections, South Africa has been in transition. This period of change represents a window of opportunity to place innovative concepts on the policy agenda. In the past decade, South African energy efficiency experts have been working tirelessly to get energy efficiency onto the national agenda. With national policy currently under review, a greater degree of flexibility exists, and it is possible, therefore, to influence national and local policy and practice through lobbying and exposure to existing energy efficiency research and demonstration.

### 2.1.2 National development priorities

The two major development initiatives which are shaping the national context are the mass housing programme and the national electrification programme.

South Africa has inherited a severe housing shortage – estimated to be as high as three million units in 1993 and growing at a rate of 200 000 units per annum – from the apartheid era. To alleviate the pressures of this housing crisis, the Department of Housing aims to provide one million housing opportunities by the end of 1999. These housing opportunities take the form of subsidies which operate on a sliding scale linked to monthly household income. The capital subsidy provides housing assistance to first-time home buyers who are married or have dependants, have an income of less than R3 500 per month, have not derived benefits from any current or previous housing subsidy scheme, and where the product price does not exceed R65 000. While housing delivery got off to a slow start, with only 30 000 houses being built in the first two years, 93 139 houses are presently under construction and 380 000 subsidies have been reserved.

In 1991, Eskom embarked on a national electrification campaign, adopting the slogan 'electricity for all'. This programme was formalised as a national initiative when the National Electrification Forum's mid-range scenario for the implementation of a national household electrification programme (the electrification of 2,5 million households by the year 1999) was adopted as a set of targets by the RDP and endorsed by Eskom and other distributors. The proposed annual targets for the programme are presented in Table 4 below. Eskom has committed itself to achieving 1.75 million connections by 1999, with municipal

distributors responsible for the remainder. Because of licensing arrangements, Eskom has been largely excluded from supplying electricity in urban areas. Consequently, most urban connections are the responsibility of local authority distributors.

<i>National electrification targets: Household connections (1994-1999)</i>						
	1994	1995	1996	1997	1998	1999
Eskom	250 000	300 000	300 000	300 000	300 000	300 000
Other	100 000	100 000	150 000	150 000	150 000	150 000
Total	350 000	400 000	450 000	450 000	450 000	450 000

Table 4: National electrification targets

Since 1991 just over 2 million electricity connections have been made. During 1996, 183 623 urban connections were made, but 21% of urban households remain without electricity (NER 1997).

The national housing and electrification programmes have often been cited as opportunities to insert energy efficiency into the low-income sector. It is well recognised that it is not only less expensive, but also less complex to introduce energy efficiency measures at the time of access to new housing and to electricity. Furthermore, the infrastructural support costs associated with energy efficiency programmes and strategies can be reduced by twinning these programmes and strategies with the housing and electrification process delivery mechanisms. While this window of opportunity afforded by the national housing and electrification programmes has not yet closed, people have been slow to take advantage of it. Eskom's residential demand side management programme (RDSM) and DME energy efficiency initiatives for the low-income sector are yet to get off the ground and few of the new houses have been constructed using principles of thermal design. Thus, for the most part, these low-cost houses are thermally inefficient, providing uncomfortable living environments which are highly energy consumptive. Furthermore, there are currently no standards to ensure that no-cost energy efficiency measures are incorporated into new, subsidised low-cost housing. As the 1999 elections approach, it is likely that the impetus to increase the number of homes being built for South Africa's poor will result in a major increase in the number of subsidies being approved and homes being built. These opportunities to introduce energy-efficient and environmentally appropriate measures into the low-income residential sector must be seized, before they are lost.

### 2.1.3 Electricity industry restructuring

The electricity industry in South Africa is dominated by Eskom, a vertically integrated and state-owned utility. Over the last four years, the industry has been carefully scrutinised with a view to its potential reform. High level agreement has been reached that the industry will be restructured, though precisely how this will occur is still under debate. Consensus has, however, been reached that the electricity distribution industry (EDI) will be targeted first for reform and competition in the wholesale market will precede competition in the retail sector. Strategy interventions proposed in this document are done so in the light of this context.

The EDI is highly fragmented – over 400 separate distributors are currently responsible for distributing electricity to customers around the country – with Eskom being by far the largest player in terms of energy sales for final consumption and numbers of customers. Moreover, roughly one third of the municipalities acting as electricity distributors currently cannot consistently provide an adequate, reliable and acceptable quality of service. The restructuring of the EDI is expected to entail the rationalisation of these distributors. It has been recommended that the EDI be consolidated into between five and seventeen regional electricity distributors (REDS), to be formed by merging the electricity distribution functions of Eskom and local authorities in specific areas. In doing so, Eskom's distribution functions will be separated from generation.

Following international trends, recognition of the need to introduce competition into the South African electricity industry is also beginning to emerge. While it is undecided as to how and when this will occur, recent actions and stipulations of the National Electricity Regulator (NER) lean toward preparing the electricity industry for more competition in generation. While transmission is set to be separated from generation and distribution, it is unlikely that the organisational structure of transmission will be altered: it continues to make economic and organisational sense for this service to be operated and managed by one firm. Currently, retail sales of electricity fall within the activities of the EDI. It is likely that a retail industry will emerge out of the distribution structures, but it is unlikely that this will occur for some years to come.

The precise role and nature of DSM in newly-created competitive electricity markets in South Africa is unclear. While there is little doubt that reform will have an impact on Eskom's DSM initiatives in their current form, restructuring does not have to be seen as the demise of DSM. In fact, the restructuring of the electricity industry could be viewed as an opportunity to strengthen DSM initiatives in South Africa. The changing policy environment provides an opportunity for interested parties to contribute to the regulatory and policy frameworks which will shape the future of the electricity industry and DSM. If DSM is a factor influencing the design of the proposed REDs and appropriate policy and governance systems are put in place, sustainable DSM activities will occur.

#### **2.1.4 Energy efficiency initiatives**

The following planned or existing policies and strategies aim to improve energy efficiency or fuel safety in South Africa. To ensure that the efforts of these initiatives are not duplicated, it is important to identify the synergies between the programme package which is being promoted in this report and those strategies which already exist. The strategies presented in Parts II and III of this report aim to build on and guide these initiatives.

**Energy Efficiency Agency** The DME commissioned consultants to develop a business plan for a proposed Energy Efficiency Agency (EEA) which will provide an implementation vehicle for current DME energy efficiency activities and provide a home for all further energy efficiency related activities. To-date, a draft business plan has been produced, but the time-scale for the establishment of the EEA is unclear.

**Appliance labelling programme** This DME funded project aims to develop an appliance labelling programme to enable consumers to make informed choices concerning the energy efficiency of their purchases and to encourage manufacturers to improve appliance efficiencies. The programme will initially apply to refrigerators and freezers only, but will, in future, be extended to other appliances which demonstrate significant potential savings. Phase I of the programme, which included background research and stakeholder consultation, has been completed. Phase II which involves the implementation of the appliance labelling strategy has not yet been approved by the DME.

**Enerwise** The Enerwise programme is a DME run information dissemination programme aimed at wealthier, electrified households. The Enerwise programme promotes the use of solar water heaters, in-line water heaters or heat pumps as an alternative to electric geysers; fluorescent

lighting; and the use of microwaves, kettles, frying pans, toasters and pressure cookers rather than electric stoves, in its information leaflets.

#### *HEAT Programme*

The Household Energy Action Training (HEAT) programme is a DME project which is being developed and implemented by the Energy and Development Group consultancy. The project is targeted at lower-income households and aims to build the capacity of these households to make safe, cost-effective, efficient and sustainable choices around energy use practices. The existing and planned activities of the HEAT programme include information dissemination through television and radio messages, an energy booklet, and an energy advisory service; and training through workshops and the development of adult education materials.

#### *Energy & Environment Advisors*

The International Institute for Energy Conservation (IIEC) and the Energy and Development Group (EDG) aim to set up an energy advisory service which will train and locate energy and environment advisors in appropriate organisations in pilot areas. The aim of these energy and environment advisors is to build capacity in housing delivery and support agencies to incorporate energy efficiency and other environmental issues into their activities, as well as to provide education and training and expertise and advice to communities and to generate energy activism within communities. Funding has been secured by the IIEC from the UK National Lotteries Commission for the salaries of six advisors. Funding is being sought by EDG from DANCED for a further four advisors.

#### *FINESSE programme*

The FINESSE (Financing Energy Services for Small Scale Energy Users) programme is run by the United Nations Development Programme (UNDP) and the SADC energy sector in collaboration with national Energy Departments and Ministries. The aim of the programme is to promote renewable energy and energy efficiency technologies in the SADC region. This is achieved through the development of sound business plans, the central element of which is to establish a loan mechanism which small energy users can readily access. The idea is to link small energy initiatives and opportunities with large financial institutions by grouping smaller projects together into large projects which are more attractive to multilateral funding organisations. In South Africa, business plans have been developed around the following technologies – solar water heaters for low-income houses, thermal efficiency improvements in low-income houses, and efficient lights, refrigerators and other appliances.

- Low-smoke fuel programme** The low-smoke coal programme is a DME-led initiative which aims to reduce indoor and outdoor air pollution by substituting coal with low-smoke fuels. These low-smoke fuels have been piloted to test whether they reduce air pollution in practice and to test fuel marketability and social acceptance. Provisional results of the field test are inconclusive.
- Electrowise** Eskom's Electrowise programme aims to promote the safe, wise and economic use of electricity. Electrowise provides 'welcome packs' of information on the safe use of electricity and on the use of prepayment meters to newly electrified households and meets with communities before electrification.
- Eskom's RDSM programme** It is estimated that Eskom's DSM programme will save more than 5 000 MW of generation capacity by the year 2015. The focus areas of the RDSM programme are on water heating, thermal efficiency and energy-efficient appliances. Specific activities include supporting the DME appliance labelling programme and promoting the use of CFLs through a merchandising programme.
- Energisation** The Energisation programme aims to provide households which will not be electrified in the medium term with high quality energy sources for lighting, media and cooking at an affordable price. The broad strategy is to supply a 1-panel PV system with two lights and an outlet for radio and TV and two 5.5kg LPG cylinders and a two-plate gas stove with the necessary connections. These systems will be installed and maintained by local 'energy agents' that will be established at each site. The energy agent will also receive bulk financing, will on lend to end-users and collect repayments.
- SEED programme** The Sustainable Energy, Environment Development Support (SEED) programme, set to be launched in mid-1998, will comprise two broad projects for urban and rural areas. The urban project will aim to support sustainable, safe and affordable energy use in the context of housing development projects, as well as improvements to a range of other household services. The rural section will aim to achieve improved co-ordination between different rural energy initiatives which are taking place and to demonstrate the potential for adding value to these initiatives.
- PASASA** The Paraffin Safety Association of Southern Africa (PASASA) is funded by all major oil companies in South Africa, bar Sasol. In 1996, it received approximately R5 million in revenue from the participating oil companies. This revenue was raised through the dedication of 0.5 cents of every litre of paraffin sold in the southern African region. These funds are used to

promote paraffin safety through the production and distribution of child-resistant safety caps for cooldrink bottles used to store paraffin, warning labels which can be stuck on paraffin storage bottles, and display board information to be placed at retail outlets and health clinics. PASASA also operates an information dissemination programme through the media and runs regional training workshops targeted at NGOs, CBOs and community health advisors.

#### LPGSA

The Liquid Petroleum Gas Safety Association (LPGSA) is concerned with improving the safety of gas use and combating the perception that gas is dangerous. The main aims of the LPGSA are to ensure that gas appliance quality is upheld and to ensure that dealers and installers adhere to safe standards. These are achieved by ensuring SABS approval of gas appliances and providing mandatory courses and certification for gas dealers and installers.

## 2.2. International opportunities

### 2.2.1 Funding opportunities

#### *Global Environmental Facility*

The Global Environmental Facility (GEF) is an intergovernmental organisation which acts as the financing mechanism for the implementation of the United Nations Framework Convention on Climate Change (UNFCCC) and other global environmental agreements. It is financed by donor grants, primarily from the USA, Japan, Germany and France. The GEF provides dedicated grants and low-interest loans to so-called developing countries to cover the additional costs of investments which have global environmental benefits, but are more expensive than the cheapest alternatives. The operational strategy of the GEF puts emphasis on three Operational Programmes that address long-term priorities of the UNFCCC. The most appropriate of these programmes to the content of this report is that which deals with the removal of barriers to energy conservation and energy efficiency. Funding can be accessed to remove institutional, economic and social barriers which delay or inhibit the realisation of energy savings from targeted strategies. These strategies must be country-driven and must be in line with national development priorities. The financing modalities of the GEF are:

- *grants*, which come in the form, either of an initial lump sum, paid upfront, or in instalments as and when incremental costs occur;
- *concessional finance*, in the form of either a once-off repayable loan at a below-market interest rate or a revolving fund for activities of a specified type. Such finance is awarded to economically unattractive projects that would protect the global environment and to measures that are financially constrained even after a grant has been made for incremental cost; and
- *contingent finance*, that is a loan which is normally repayable, but all or part may be excused (that is, turned into a grant) under specified contingencies. Such contingencies include technical and institutional risks which may make the project unsuccessful. Part of the loan would, therefore, be converted into a grant for the incremental costs actually incurred.

Since ratifying the UNFCCC in August 1997, South Africa has become eligible for GEF funding.

### *Activities Implemented Jointly/Joint Implementation*

Other climate change linked investment opportunities exist in the form of Activities Implemented Jointly or Joint Implementation (AIJ/JI). Joint Implementation refers to the process where the government of an Annex I country or a private enterprise in that country invests in measures, projects or programmes which result in greenhouse gas (GHG) emissions reduction or GHG sink enhancement in a Non-Annex country.<sup>1</sup> In return for their investment, the government of the investor country receives credit for a proportion of the emissions reductions achieved in the host country. Activities Implemented Jointly refers to the pilot phase of JI – no credits accrue during this pilot phase. The Kyoto Protocol to the UNFCCC establishes a new mechanism, the Clean Development Mechanism (CDM), to channel investment between the Annex I and Non-Annex I countries. If the Kyoto Protocol is accepted by the Parties to the UNFCCC, the CDM will come into effect in the year 2000. Investor countries will receive credit for their investments through the CDM.

### *Multilateral banks*

Multilateral Development Banks (MDBs) are international lending institutions owned by member countries. The objective of the MDBs is to promote economic and social progress in developing nations by providing loans, technical assistance and help with economic development plans. South Africa can obtain development assistance from the African Development Bank (ADB) and the World Bank. The World Bank consists of four institutions: the International Bank for Reconstruction and Development, the International Development Agency, the International Finance Corporation and the Multilateral Investment Guarantee Agency.

While the MDBs represent an opportunity for assistance, their investment in energy efficiency has been low, representing approximately 1% of the banks' energy lending. This can be attributed to the following:

- there is pressure within the MDBs to meet annual lending targets and this militates against small loans like those generally involved in energy efficiency projects, and
- developing countries who are uncertain of the benefits of energy efficiency are reluctant to borrow for the purpose of energy conservation.

### **2.2.2 Binational agreements**

Opportunities for technical and informational exchange exist through the US-South Africa Sustainable Energy Committee (part of the Gore – Mbeki Binational Commission) and through other binational agreements.

Energy efficiency programmes have been well developed in other countries such as the USA, Netherlands, Australia and Brazil. South Africa can learn from the energy efficiency experience in these and other countries. Knowledge can be obtained through research, exchanges of information and technical expertise, and research fellowship exchanges. Small funding opportunities exist for such endeavours.

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<sup>1</sup> Annex I Parties are countries and regional economic integration organisations included in Annex I of the UNFCCC (all OECD member countries, except for Mexico, the European Economic Community and 11 countries that are undergoing the transition to a market economy) that have ratified the convention. These Parties have commitments to adopt national policies and take measures to mitigate climate change, by limiting emissions and protecting and enhancing sinks and reservoirs. Non-Annex I countries have no commitments under the UNFCCC.

## Section II

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# Synthesis

### 3.1. Introduction

This section is a synthesis of the strategies emerging from the research undertaken for the E4 project. Most of the strategies presented here originate in the reports written over the last three years.<sup>1</sup>

The three principle objectives of the research work undertaken by the EDRC have been to enhance *energy efficiency*, *economic efficiency* and *environmental sustainability* in the urban low-income residential sector. It is important to note that in the strategies, the emphasis placed on these themes differs, and sometimes quite considerably. With regard to fuel switching, for example, most of the strategies, if implemented would promote the *economically-efficient* use of fuels and appliances, whereas the strategies for the housing, appliance and lighting sectors, focus on enhancing *energy efficiency* in the urban low-income residential sector.

The strategies presented below emerged from a series of in-depth analyses of the market barriers inhibiting poor people from investing in energy efficiency improvements in their households, or in the case of fuel switching, the barriers that inhibit these people from investing in an economically efficient 'package' of services. The principle barriers identified are:

- Affordability;
- information and awareness;
- access; and
- risk.

For each of these the context is described and the challenge that the barrier presents is noted. Strategies aimed at removing these barriers are then suggested.<sup>2</sup> It should be noted that while the main aim of the research has been to suggest strategies which will remove barriers faced by low-income households, care has been taken to ensure that the strategies suggested are 'reasonably' within the scope and mandate of the institutions that would be driving and/or implementing them, and will benefit the national economy.

In 3.6 of this Section II, these strategies are summarised in terms of the following four categories:

- fuel switching;
- thermally-efficient housing;
- appliance efficiency; and
- energy-efficient lighting.

Interestingly, when the strategies are seen from this different perspective, instances where strategies could be innovatively combined with others, emerge quite clearly.

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<sup>1</sup> In general, reports and their authors are *not* specifically referred to in the section to follow. Reference is only made where research material *not* emanating directly from the 'Energy, efficiency, equity and the environment: Improving access to energy services for the urban poor in South Africa' project is made.

<sup>2</sup> Where barriers have not been identified for any of fuel switching, thermally-efficient housing, appliance efficiency and energy-efficient lighting, it is because they have not been regarded as a concerning problem for that particular area.

For instance, a community energy advice centre could undertake many of the activities required in order for an energy-efficient lighting programme to be effective, as well as provide information and support to households wanting to invest in thermal efficiency or purchase energy-efficient appliances. In addition, the centre could handle financing transactions, and lobby for additional funding for energy efficiency improvements.

In the discussion below, the terminology used to describe the different types of energy efficiency technology, is broad. For the sake of clarity, the term 'appliance' is used to include *large appliances* (for example, stoves, refrigerators), *small appliances* (for example, irons, kettles, hot plates), *consumer electronics* (for example, radios and television sets). Thermal improvements in households include the installation of *ceilings* and *insulation* and also refer to the *orientation* of the building and windows. Lastly, the technology used to introduce energy-efficient lighting to low-income households would be the *compact fluorescent lamp*, or CFL.

## 3.2. Affordability

### 3.2.1 Barriers

Generally, energy efficiency is a relatively new concept for low-income households, so improvements in this regard tend to necessitate a re-evaluation of the household fuel mix. Energy efficiency improvements usually also entail the purchase of different or additional appliances (for instance, compact fluorescent lamps in the case of energy-efficient lighting) and/or the installation of home improvements (for instance, ceilings in the case of thermal efficiency). Many, if not most low-income households are barred from investing in these kinds of energy efficiency improvements because they cannot afford to do so. This affordability barrier is perhaps the most troubling of all obstacles faced by the low-income sector particularly because of the considerable spin-off impacts it also has on these households. Not only are low-income households unable to invest in energy efficiency improvements on their own, but by virtue of their financial standing, experience considerable difficulties in accessing additional finance. In fact, because of this same affordability barrier, poor households sometimes end up investing in fuels and appliances which, ironically, are both energy and economically *inefficient*.

#### 3.2.1.1 Fuel switching

Mindful that the efficiency of fuels used to perform different household tasks varies substantially, the fuels that low-income households ultimately choose to meet specific end-uses are often neither the most efficient, nor the most cost-effective. One of the main reasons for this is that households are frequently unable to afford the most cost- and energy-efficient 'package' of energy services. This is generally because the appliance purchase costs, the cost of access, the appliance operation and/or replacement costs are out of these households' reach.

The 'package of fuels' that households in South Africa sometimes use varies between regions, and so it is difficult to make generalisations on improving this mix. Nevertheless, the following trends (which in essence distort the options available to low-income households) appear to be quite common country-wide.

Energy sources are generally not priced according to their true *economic* costs. Paraffin, for example, is used widely for cooking, water heating, space heating, and lighting when in fact this fuel is economically a poor choice: it is polluting, inconvenient, and dangerous. It is used partially because it entails no associated access costs, appliances are relatively cheap, and because users do not look at life-cycle costs and compare energy options on this basis.

Electricity, on the other hand, is clearly an economically and financially cost-effective energy source particularly for lighting and refrigeration. Appliance costs are often high, though, so for newly-connected households which already have non-electric appliances, the cost of conversion to electricity can be prohibitive.

Coal is cost-effective for space heating, for water heating and for cooking but this fuel is not used widely partially because coal appliances are relatively expensive (compared with others, that is). Likewise, gas would probably be good for cooking and water heating. But, gas appliances are expensive, and deposits are required on bottles, and so its use is limited. In addition, solar energy appears to be an economically sensible energy source for heating water. Solar water heaters are expensive though, and so, again, low-income households' investment in them is generally low.

Finally, while candles are well suited to low-income household's budgets and periodicity of income, and they require no capital to purchase appliances, they are dangerous, thus increasing their economic costs to society.

### 3.2.1.2 *Thermally-efficient housing*

This document focuses on the thermal performance of the formal low-cost houses typically being provided under the government's housing initiative. Few of these houses are constructed using materials or design strategies that enhance the thermal efficiency of the buildings. This is because priority has always been given to the construction of houses requiring the smallest capital investment: in fact most of the barriers that the low-income sector faces regarding the acquisition of housing are the same as those they face regarding thermal efficiency. In addition, a significant proportion of the capital subsidy for first-time low-income home buyers goes towards paying for service infrastructure in particular, but also for professional fees, and for labour. What is left often does not allow for the purchase of building materials that would enhance thermal efficiency in the structure. Construction materials, therefore, and building practices that would enhance thermal efficiency are sacrificed.<sup>3</sup>

In addition to not being able, in the first place, to invest in construction materials and building designs that enhance thermal efficiency, low-income households have considerable difficulties in securing additional finance over and above the capital subsidy to do so.

### 3.2.1.3 *Appliances efficiency*

As is the case with housing, many people in South Africa cannot afford to purchase household appliances, let alone energy-efficient household appliances. As such, a relatively small proportion of black, low-income households own electrical appliances. Because of the cost of these appliances, some households purchase second-hand appliances, or share non-electrical or small electrical appliances.

Appliances specifically manufactured to use energy efficiently are generally more expensive than others found on the market. Because poor people generally tend to value future savings less than current consumption, they tend not to invest in these appliances. This trend is reinforced because the price of electricity is low (and the capital recovery rate is significantly reduced).

### 3.2.1.4 *Energy-efficient lighting*

Even though, over their lifetimes, energy-efficient lamps offer considerable energy savings, and thus reductions in the energy bills of those who use them, low-income households are generally unable to afford the high initial capital cost required. Indeed, the cost of an incandescent lamp is roughly R2.50, while that of an energy-saving lamp is around R50.00. In addition, even if the initial investment were achievable, the low electricity price discourages low-income households from

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<sup>3</sup> Construction materials used in *informal* housing vary substantially in terms of thermal performance. Out of necessity, poor urban households use materials that are low in cost, and readily available. These materials provide shelter but rarely contribute significantly to thermal efficiency.

making the investment because the payback or capital recovery period of the investment is considered too long.

### 3.2.2 Challenges

The overall challenge for policymakers is to make a significant contribution to reducing the 'affordability' barriers that inhibit poor people from investing in household energy efficiency, and to do so in a manner that is reasonably within the capabilities of all stakeholders. By improving the affordability of energy efficiency for low-income households', as well as their access to additional finance, the burden placed on them by the high operating costs associated with energy- and economically-inefficient fuels, appliances and practices will be reduced.

#### 3.2.2.1 *Fuel switching*

The key challenge to government and other role-players in the energy sector and appliance industry is to remove the pricing distortions associated with the cost of fuels and appliances so that low-income households are better able to invest in a package of fuels that maximises their utility within financial constraints.

#### 3.2.2.2 *Thermally-efficient housing*

The two key challenges to government and other role-players in the housing finance, energy and housing sectors are:

- to reduce the associated costs of service infrastructure and the top-structure for poor people, thus freeing up scarce capital for thermal improvements, and
- to create an environment that is more conducive for poor people to seek and acquire additional sources of finance above and beyond the capital subsidy.

#### 3.2.2.3 *Appliance efficiency*

The challenge for role-players in the electricity, appliance and banking industries is to make appliances (including energy-efficient appliances) more affordable to the low-income residential sector.

#### 3.2.2.4 *Energy-efficient lighting*

The challenge to the electricity industry is to make energy-saving lamps more affordable to the low-income sector. Again, this will entail that the electricity industry introduce ways to reduce the capital cost of the lamps, as well as to improve the low-income sector's access to finance.

### 3.2.3 Strategies

In general, the strategies proposed for increasing the low-income sector's ability to make investments in energy efficiency improvements will focus on increasing poor households' capacity to invest in these improvements. Even though most energy efficiency improvements result in considerable energy saving benefits in the long run, low-income households are unable to afford the initial costs associated with the improvements.

#### 3.2.3.1 *Fuel switching*

In this section, strategies are presented which seek to:

- reduce the economic costs of energy services to low-income households, and
- promote fuel switching where economic and efficiency gains can clearly be made.

#### *Determining the true economic costs of energy sources*

Wherever possible, energy sources should be priced according to their true economic costs. Where full economic costs and benefits are not reflected in the end-user price, taxes or subsidies should be applied.

Economic costs can be reduced by reducing the negative externalities which partially make-up these costs. Examples of projects, which seek to reduce these externalities, include:<sup>4</sup>

- The PASASA 'safe cap' programme which attempts to reduce paraffin poisoning;
- The DME's (i) low-smoke fuel programme, and (ii) awareness programmes around the safe use of energy sources, for example Enerwise, Electrowise, the HEAT Programme.

\* Economic costs can also be reduced by improving the efficiency of appliances. Strategies to do this are addressed in 2.3.3 on energy-efficient appliances in this Section.

#### *Re-assessing paraffin*

At present, a great number of poor households are dependent on paraffin for many energy services. Paraffin is a costly source of energy, but any strategy to increase the price of paraffin to bring it more in line with its economic costs, could have serious negative social impacts, particularly on poor households. The focus firstly should be on reducing the externalities associated with paraffin which will help to render it less economically costly to use (such as the PASASA 'safe cap' programme noted above), and secondly on reducing the barriers to other energy sources currently faced by poor households.

#### *Promoting gas for cooking, water heating and space heating*

Gas is likely to be significantly more economically cost-effective than paraffin for most applications. To promote its use, the access cost of gas could be reduced by:

- Reducing the deposits currently required on the larger gas bottles;
- Making the smaller gas bottles and gas appliances more affordable; and
- Financing the establishment of small gas depots.

In terms of the above, it is suggested that the deposits on larger bottles should not be removed entirely, but rather reduced somewhat. Experience has shown that if households are required to purchase their own bottles, the bottles will not be maintained as they should be, and will, therefore, become hazardous, and inefficient. In addition, financing mechanisms would need to be developed to help poor people to make this investment. The provision of financing to poor communities that are not creditworthy by conventional standards may be problematic. Community savings schemes could operate as an alternative financing mechanism in for the urban poor.

As regards smaller bottles (which can currently be purchased), the strategy should be to make gas in small bottles more affordable. This could be done with a coupon or rebate scheme targeted at the end-users. Alternatively, the price at which gas retails could be reduced. The petroleum industry would clearly need to take the lead here. This price reduction could be cross-subsidised by other gas sales, or from the benefits emanating from bulk-purchasing. Financing mechanisms should be investigated, and evaluated through pilot studies. If the price at which gas retails can in fact be reduced, care should be taken to ensure that it takes account of regional gas policies and pricing structures: or opportunities to export these smaller gas bottles will considerably dampen the intended impact on the domestic market.

Finally, small depots in poor communities could be financed. This venture could be cross-subsidised by other sales, or from the benefits of bulk purchasing, at least initially. Again, it is important that the financing mechanisms are tested prior to full-scale implementation.

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<sup>4</sup> These programmes are described in more detail in section 2.1.4 of Section I.

If gas were to be seriously promoted amongst poor households, bold measures such as these will need to be explored more seriously. Perhaps the most pertinent issue for gas at present is the need to research the feasibility of proposed gas strategies and develop these strategies more fully.

#### *Promoting electricity primarily for lighting and refrigeration*

Not only is electricity generally one of the more economically cost-effective alternatives to paraffin use, it is also clearly the most financially and economically cost-effective option for lighting and refrigeration. It is probably also financially and economically cost-effective for cooking (as is gas). Strategies to promote the use of electricity for these particular purposes essentially entails making these appliances more affordable to low-income households. For detailed strategies on this, also see 3.2.3.3 of this Section. Users could be offered a range of 'packages' with different tariffs, which include different sets of appliances: for example, one package could include a set of CFLs; another would offer CFLs and a hotplate; and yet another, CFLs, a hotplate and a refrigerator. Eskom should develop a business plan around the implementation of a suitable financing package for these household goods.

#### *Keeping the real price of electricity low*

Reducing the cost of electricity is likely to have financial benefits for households, as well as being economically sound. Eskom's DSM programme aims to reduce real generation costs by reducing the national peak over the next 20 years via the adoption of various strategies including:

- controlling geysers via ripple control or intelligent thermostats;
- introducing domestic time-of-use tariffs;
- promoting CFLs; and
- supporting the DME appliance labelling initiative to promote refrigeration efficiency initially, and later that of other appliances.

#### *Reducing coal externalities*

Although coal appears to be a financially and economically competitive fuel, there are severe externalities associated with its use. With a view to reducing the economic costs associated with coal use, the DME has initiated a programme to monitor the acceptance and viability of the introduction of low-smoke coal in low-income households. Financial incentives used in the testing phase include a coupon scheme (to reduce future purchase costs of the product). Initial results of the pilot projects suggest that in addition to the coal not igniting well, households are generally not satisfied with paying the additional cost for low-smoke coal. This suggests that, if low-smoke coal is to become a viable and acceptable energy source, then for it to be *widely* utilised, it should be heavily subsidised.

#### *Financing solar water heaters*

Solar water heaters, integral units or with electricity back up, are financially and economically amongst the most cost-effective options for water heating. Integral units may be less acceptable to households than units with backup, due to their inability to store hot water effectively. The strategies should therefore focus on areas where electricity is, or will be, available.

Solar water heaters are presently not used by the majority of low-income households, partly because of the high cost of appliances. Making solar water heaters affordable essentially entails ensuring that financing for this technology is available. The financial savings that could be realised by many households who would otherwise use gas, electricity or paraffin to heat water suggests that financing solar water heaters can be viable. Probably the most appropriate vehicle to do so is by including them in housing bond repayments in new housing developments, and ensuring affordable repayments. The financing of retrofitted solar water heaters to existing households may not be as simple. One possible

mechanism is to finance these systems through the electricity tariff, as has been suggested for other electrical appliances.

Financing schemes could also include rebate or coupon programmes, low-interest loans, or free installations. These schemes should be piloted to assess applicability and effectiveness.

### 3.2.3.2 *Thermally-efficient housing*

Strategies which reduce the costs of service infrastructure and those associated with the top-structure of the house thus freeing up capital for investment in household thermal improvements are presented below, as are strategies to facilitate households' access to additional finance over and above the capital subsidy.

#### *Reducing service costs*

In many instances, it has been found that low-income households are being steeply charged for services that they are not receiving. With a view to removing the opportunities for this abuse, standards must be set for the level of services to be provided, and charges for service infrastructure should be monitored to ensure that they are within an acceptable range. Where charges for service infrastructure are above this range, providers should be held accountable and required to produce a cost breakdown of their charges. Communities should also be informed about subsidy abuse, and encouraged to initiate their own investigations.

Local authorities tend to charge upfront for service costs in low-income areas. This is not generally the practice in wealthier areas but is regarded as a way of avoiding non-payment in low-income residential projects. With a view, again, to reducing service costs, payments for service infrastructure could be negotiated to be paid gradually through service tariffs. This approach could be beneficial as long as appropriate relationships between local authorities and communities are forged.

#### *Reducing costs of the top structure*

Few contractor-built houses have included energy efficiency measures. This is because building contractors and suppliers generally aim to maximise profits. Homeowners, therefore, incur high costs for building materials and developers and project manager fees. To free up capital out of the subsidy for thermal improvements, developers and contractors argue that the size of the house will have to be reduced. Considering the small size of the houses already, this is not a viable option.

Self-build options, however, provide varied opportunities for the installation of energy-efficient measures, even within the subsidy limits. This is due to the fact that in self-build projects, the cost of materials can be reduced by either making the blocks on site (thus only incurring the cost of the raw materials), or by purchasing blocks directly from the supplier. Furthermore, labour costs can be reduced or even eliminated by the use of unskilled or unpaid community labour.

The quality and size of a typical low-cost house is compromised by the fact that large, well-established suppliers enjoy relatively high profits from low-cost housing schemes. Communities could reduce the cost of building materials by entering into contractual arrangements with small suppliers who would benefit from bulk orders. This arrangement can benefit both the community – which is able to negotiate the purchase of building materials relatively cheaply and the rent of building equipment at low cost – and the suppliers who, through economies of scale, are able to recoup their reduced profits on the low-cost development by achieving wider profit margins on other projects they are involved in.

#### *Seeking additional finance for thermal improvements*

There is clearly a need for additional finance to supplement the housing subsidy, to provide not only adequate housing, but also thermally-improved housing.

In addition to supporting poor people via the capital subsidy scheme for building houses, the government has made available extensive funds, which are currently

being channelled through the National Housing Finance Corporation and non-traditional lending institutions, for housing loans to the low-income market segment. It appears that this housing finance is not reaching the *poorest* urban households, and that these channels are not suited to low-income households' needs. The South African People's Homeless Federation, a network of almost 300 housing savings schemes linked through nine regional federations, is distributing loans to this sector, however. Its target group is primarily poor people who are informally employed and living in households earning less than R800 per month. In 1995, the Department of Housing granted this Federation R10 million to enable it to expand the reach of the fund.

The potential also exists for top-down (South African and non-South African) finances from sources outside of existing housing finance channels (that is, the housing subsidy and financial lending institutions) for the specific purposes of covering the incremental costs of energy efficiency investments.

The domestic electricity industry with vested interests in reducing energy consumption could also be a possible source of funding. While Eskom has excess generation capacity at present, the peaks are likely to intensify, as more households are connected to the grid through the electrification programme. Eskom thus faces a problem of meeting future winter peak demand (attributed partially to a combination of cold temperatures, poor thermal performance of housing and a resultant need for additional space heating in the residential sector). One element of Eskom's Residential Demand Side Management (RDSM) is a thermal efficiency initiative which aims to establish appropriate space heating and insulation techniques, standards and technologies to create more energy-efficient systems and installations which will satisfy customer needs.

The use of coal, wood, paraffin and candles in low-income households exposes the occupants to a range of health and safety hazards such as indoor air pollution, fires and burns and poisoning, which can result in high health care costs to the state. Thermal performance improvements reduce energy requirements for space heating, thereby reducing exposure to air pollution and decreasing the risk of accidents related to fuel use. This represents a national saving in terms of health care costs. While the Department of Health has vested interests in promoting energy-efficient housing, budgetary constraints may diminish the role they can play in funding energy efficiency measures.

Finally, a local source of funding for thermal efficiency could be promoted through the subsidy scheme by making provision for a special subsidy grant to those houses which achieve a minimum standard of energy performance.

Now that South Africa has ratified the United Nations Framework Convention on Climate Change (UNFCCC), a whole array of opportunities have opened up for financing the incremental costs of projects which have global and national benefits in terms of reduced greenhouse gas (GHG) emissions. Possible sources of finance include the Global Environmental Facility (GEF), and the International Finance Corporation (IFC), an affiliate of the World Bank which is responsible for assisting private sector enterprises. Investment in energy efficiency may also be channelled through the mechanism of AIJ/JI. Finance from these sources could be for programme funding, or to finance the incremental costs of thermal improvements.

### 3.2.3.3 *Appliance efficiency*

The strategies presented below aim to remove, or at least reduce the barriers that inhibit low-income households from investing in appliances that use energy efficiently. These include strategies which target pricing structures in the appliance industry, incentive programmes for the appliance industry and end-users, and finally, opportunities for financing these initiatives.

#### *Evaluating pricing structures*

To increase the energy efficiency of all appliances, and to render energy-efficient appliances more competitive essentially requires that the pricing structures in the

appliance industry as a whole are reviewed. Indeed, this is what the Department of Trade and Industry (DTI) embarked upon a few years ago. They have been undertaking a series of cluster studies to develop strategies for making the industry more competitive, and able to contribute to economic growth. Strategies that have consequently been developed include reducing and eventually phasing out (i) tariff duties on all imported goods including components, and (ii) subsidies, most notably emanating from the General Export Incentive Scheme (GEIS). In essence this could result in more appliances, including energy-efficient appliances being imported to South Africa, at more competitive prices.

#### *Providing incentives to the appliance industry*

Financial incentives such as low-interest loans or grant finance, can also be used to encourage manufacturers, and distributors of appliances to invest in energy-efficient appliances, and in so doing, to make them more widely available on the South African market. Where appliances are manufactured domestically, incentives, which are large enough to cover the capital cost of developing a new product line, could be provided by the government or by Eskom. 'Golden carrot' type programmes, that include the use of competition and tender bidding amongst manufacturers, need to be considered. The manufacturer who then produces an efficient appliance that meets the specific energy consumption level and delivery date could qualify for an incentive amount (perhaps related to sales). Financial incentives could also be made available to cover the incremental cost of providing appliances that are significantly more efficient than existing models. Low interest loans or international grants could be made available for upgrading the local manufacturing, assembly or import infrastructure to make more energy-efficient appliances available. It must be stressed that utility promotion and financial mechanisms are needed to increase the penetration of these efficient appliances.

A bulk purchasing programme, also a type of golden carrot programme, could also be introduced whereby government, Eskom, or appliance retailers become involved in bulk purchasing schemes which would increase the quantities of energy-efficient appliances produced, while also contributing to price declines.

#### *Providing incentives to end-users*

Financial incentives can be used to encourage end-users to invest in energy-efficient appliances. Incentives could include leasing arrangements, rebates or coupon schemes, and free installation. Feasibility studies of these arrangements/schemes should be undertaken so as to determine which are the most effective.

Credit facilities targeting low-income households could be established, and could be funded by government, Eskom and private financiers. In addition, community savings schemes should be recognised, and well supported.

#### *Investigating international financing sources*

Important sources of funding which finance the incremental costs of projects which have global and national benefits in terms of reduced greenhouse gas (GHG) emissions include GEF, IFC, and AIJ/JI.

### **3.2.3.4 Energy-efficient lighting**

#### *RDSM's energy-efficient lighting programme*

Recently Eskom's RDSM team announced that it was planning to launch a project to distribute energy-saving lamps into low-income households. A simple cost-benefit study has shown that doing so will benefit Eskom and the national economy significantly. As has been noted, energy-saving lamps at their retail price are too expensive for investment by low-income households. As part of the energy-efficient lighting programme, Eskom should take the lead in distributing lamps to these households at reduced prices. There are various ways of doing this: these include give-away programmes (though this is inadvisable because people tend to de-value such items), rebate or coupon schemes, or cash discounts. Eskom, through

a series of important pilot projects, should initially determine what the price elasticity of demand for these lamps is (this kind of analysis should include sensitivity to price and to quality).

Eskom should also seek to determine whether the households would prefer to pay for the lamp in one cash payment, or in instalments. It is likely that the low-income sector will require access to credit in order to invest in energy-saving lamps. A number of credit incentives could also be made available: these include leasing arrangements, additional discounts/lamps for customers not defaulting on regular payments and so on. In the absence of an energy-saving lamp manufacturer in South Africa, these financing transactions would most probably have to go through Eskom, or a third party if Eskom chooses to contract out these activities. Lamp purchasers would gradually pay for the lamp via their utility bill, if they pay for their electricity this way. If electricity is purchased in advance of usage, finance arrangements could be linked to the means of pre-payment (for example, the card). The pay-back figure charged for the lamps should never exceed the value of the energy savings.

In order to distribute lamps at as low a cost as possible, it would be in Eskom's interests to thoroughly investigate the availability of energy-saving lamps on the world market. It would also be worthwhile for Eskom to lobby for a reduction or exemption of import duties on these lamps. Finally, as the programme gains momentum, it might be possible to prove that the demand justifies the establishment of a local manufacturer. It is highly likely that this would further help to reduce the cost of the lamps to the low-income household sector.

#### *Seeking additional funding sources for energy-efficient lighting*

Framed as a greenhouse gas (GHG) abatement project, possible sources of finance include international funding organisations such as the Global Environmental Facility (GEF), or as an Activity Implemented Jointly (AIJ). In addition, the International Finance Corporation (IFC) has recently expressed an interest in financing the lamps.

### **3.3. Information and awareness**

While low-income households do practise energy efficiency - shack dwellers have been found, for example to insulate their homes with cardboard - few of these households have been formally exposed to the concept of energy efficiency and are generally unaware of the range of energy-efficient technologies available. These households are thus unable to make informed choices with regard to their fuel and appliance use. To make investment decisions and allocate their resources efficiently, consumers not only need to know about the range of energy efficiency concepts and technologies available to them, but also the costs and savings generated by the different options, how to install and maintain these energy-efficient technologies, how to measure and weigh up the relative life-cycle costs and benefits of different options, and where and how to access financing for energy efficiency investments.

Apart from the participating consumers, there are a range of different stakeholders involved in the planning and implementation of energy efficiency programmes and the successful adoption of energy efficiency measures – government, utilities, manufacturers, developers, builders, NGOs and so on – all of whom have different informational requirements to guarantee their effective participation in the programme.

#### **3.3.1 Barriers**

There are several ways in which information is constrained. These include:

- **Misinformation:** Adoption of energy efficiency can be constrained by inaccurate information, for example, that energy conservation is about 'freezing in the dark' or that electricity is the best fuel for all end-uses.
- **Lack of information:** This includes a lack of current and credible information on the latest energy-efficient technologies, on the relative performance and savings of comparable appliances, and a lack of information on current energy consumption patterns and potential markets.
- **Lack of access to information:** While energy efficiency information may exist, it may be poorly disseminated or in an inaccessible form. Examples include lack of knowledge by consumers on the range of energy-efficient options available to them, lack of technical knowledge with regard to specification, installation and maintenance of the specific energy-efficient technology, and lack of understanding of concepts such as life-cycle costing.
- **Cost of information:** There may be high transaction costs associated with obtaining timely and credible information. For example, in the delivery of energy-efficient low-cost housing, design expertise is expensive to acquire in terms of both time and money.
- **The ability to use or act on information:** Consumers may be unable to use the information at hand due to affordability constraints or may lack education and training.

These information barriers as they stand in relation to the different programme elements – fuel switching, energy-efficient housing, appliance efficiency and energy-efficient lighting – are detailed below.

### 3.3.1.1 Fuel switching

There is a common misconception in South Africa that electricity is the most appropriate fuel for all end-uses. It is seen as the cleanest, most efficient, convenient and most modern fuel. As has been noted, however, while electricity is certainly the most economically cost-effective and efficient fuel for lighting and refrigeration, other fuels may be more appropriate for other services: LPG and coal are more appropriate for cooking; solar water heaters (integral and with electrical backup) and coal (stoves with a water jacket) are more economically cost-effective for water-heating; and coal stoves and braziers and gas heaters are the most economically cost-effective for space-heating. This focus on electricity can be attributed, in part, to the exclusion of the majority of the population from electricity as a domestic energy carrier and, in part, to the national electrification drive by Eskom since 1991. Furthermore, households do not have the information or the technical know-how to make comparisons of energy sources based on life-cycle costs and this constrains their ability to optimise their fuel-mix.

Other barriers which inhibit an optimal fuel mix include the lack of knowledge and familiarity with certain fuels, for example solar energy and gas, and the lack of knowledge of particular energy-efficient technologies, for example solar water heaters and compact fluorescent lamps. Limited exposure to these fuels and technologies breeds misconceptions of the dangers and effectiveness of their use. For example, there is a strong perception amongst low-income households that gas is an extremely dangerous fuel. This, in part, prevents its widespread adoption by the low-income residential sector.

A further informational concern is the lack of awareness of the safe use of different fuels and the knowledge to deal with accidents, for example paraffin poisonings or electrical fires, if they arise. This can be attributed to (i) a lack of familiarity with a particular fuel, for example, electricity, which reduces its safe and appropriate use, as well as (ii) inadequate information on the hazards of fuel use, for example carbon monoxide poisoning from coal-use.

### 3.3.1.2 *Thermally-efficient housing*

The delivery of housing involves a wide range of stakeholders who have different functional roles in the incorporation of energy efficiency into the housing process. These stakeholders include:

- those involved in the formulation of building codes and standards and planning legislation and the approval of building and local area plans, for example national, provincial and local government and municipalities;
- those involved in the planning and design of housing, such as municipalities, architects, designers, urban planners, draughtspeople and developers;
- those involved in the delivery of housing, for example, private developers, municipalities, builders, housing-support NGOs and communities;
- those involved in the financing of housing, such as national and provincial government and financial institutions; and
- purchasers of housing.

These stakeholders require varied levels of information ranging from a broad understanding of the concepts and principles to inform policy-making, to practical design solutions, to information on life-cycle costing, and to information about the range of options and methods that can be employed to reduce costs of housing thus freeing up resources for energy efficiency investments.

In the case of housing in South Africa, the challenge is not so much the lack of energy-efficient information, but rather the poor dissemination of information to relevant stakeholders in an accessible format. A wide body of theoretical knowledge of passive thermal design exists, but this research has remained largely at the academic level and has been poorly communicated to stakeholders in the housing industry. The level of knowledge about passive thermal design amongst housing stakeholders is thus very poor. Few urban planners, architects and designers are trained in thermally efficient design and formulators of building regulations, building design educators, and housing designers are aware only of the broad principles of thermal efficiency. Housing decision-makers and building users, particularly low-income households, exhibit an even lower level of knowledge of the principles and concepts of energy efficiency. With this lack of practical training and education, there are few people who have the technical know-how to design thermally-efficient housing. Furthermore, without knowledge of the principles of thermally efficient design, the costs of energy efficiency investments and the potential savings which can accrue from these investments, it is impossible to expect that low-income households will prioritise energy efficiency and demand thermally efficient housing.

The acquisition of energy efficiency design information has both a time and monetary value. Low-cost housing projects are already forgoing on professional architects and designers as a means of reducing housing costs and increasing the proportion of the subsidy which is gained by the household. Low-income households, faced with the financial constraint of the subsidy, are likely to be deterred by the cost of energy efficiency expertise. The cost of specialist energy consultants, or even architects and designers, who can design thermally-efficient housing thus remains a constraint to the implementation of thermally-efficient housing at a large scale. Also, the time cost associated with accessing energy efficiency information acts as a deterrent in the low-cost, mass housing market, where timeous delivery is the primary imperative. Developers, both private and municipal, are thus likely to exclude energy efficiency expertise from the housing delivery process in order to maximise profits and reduce delivery time.

Finally, the lack of capacity to make investment decisions based on life-cycle costing may prevent developers, contractors and households alike from acting on energy efficiency information and building thermally-efficient housing.

### 3.3.1.3 *Appliance efficiency*

From the information that is available, it appears that the barriers to making investments in improved appliance efficiency are to a large extent the same as those which inhibit general improvements in energy efficiency. They include the following:

- At present, brand names are the main source of product differentiation and there is a general lack of consumer interest and understanding in the concept of energy-efficient appliances.
- Lack of understanding of life-cycle costing and, therefore, limited ability to make investment decisions over a long life horizon.
- Lack of information on the current availability of energy-efficient appliances, the energy performance of comparative appliances, and the potential savings from efficient appliances. The SABS endorsement mark does not cover energy performance at present. Furthermore, no appliance lists or brochures detailing the energy performance of the different appliances exist. Consumers are, therefore, provided with insufficient information to enable them compare data for the different models and make informed decisions based on issues of efficiency and life-cycle costs.
- Appliance manufacturers have limited knowledge of the capacity of the market to absorb/accept energy efficiency improvements.

Furthermore, to the extent that there has been research on and/or promotion of energy-efficient appliances, these have focused on electrical appliances only. Considering the scale of the problems associated with the use of fuels other than electricity, it is vital that this efficiency research be extended to non-electrical appliances.

### 3.3.1.4 *Energy-efficient lighting*

Informational barriers to the adoption of energy-efficient lighting can be categorised into those which inhibit utility implementation of an energy-efficient lighting programme and those which prevent consumer participation in the programme.

Barriers which constrain utility involvement include the following:

- In general, inadequate information on the low-income residential market sector exists.
- More specifically, little is known about household lighting behaviour, acceptance of energy efficiency and so on. This creates uncertainty for the utility implementing an energy-efficient lighting programme as it is unable to determine the impacts of the programme, such as possible penetration levels
- There is a great deal of uncertainty regarding the course the electricity industry restructuring will take.

Informational barriers that prevent end-users from investing in energy-efficient lighting include the following:

- There is a low-level of awareness of energy efficiency in general, and energy-efficient lighting technologies in particular, amongst low-income households
- Information about energy efficiency and lighting is not always readily available
- Households access to credit might also be partially impeded by informational constraints.

## 3.3.2 **Challenges**

A broad challenge which cuts across all the programme elements is the need to provide energy efficiency information, as well as the technical know-how to enable individuals to use that information.

### 3.3.2.1 *Fuel switching*

The informational challenge of a fuel switching programme is to promote an understanding of the relative costs and benefits associated with using different fuels for different end-uses so as to enable people to make the most appropriate choice of fuel-mix based on affordability, energy efficiency and environmental sustainability. A further challenge is to dispel the misconceptions about gas, coal and solar, so that they are considered as viable alternatives to electricity for specific end-uses. In addition, information programmes need to promote awareness of the dangers of fuel use and promote safer use of fuels, as well as to train and educate people in appropriate responses to burns, fires and poisonings.

### 3.3.2.2 *Thermally-efficient housing*

While a wide body of theoretical knowledge of passive and thermal design exists, the challenge is to transform this knowledge into a form that is appropriate and accessible to the different stakeholders and to disseminate this information to them. A specific challenge here is to make energy efficiency information affordable in the low-cost housing sector.

### 3.3.2.3 *Appliance efficiency*

Appliance-efficiency programmes should aim to establish an awareness of the energy efficiency of different appliances and to facilitate comparison between different appliances in terms of their energy consumption and performance, so as to enable people to make the best choices within their budgetary constraints. In addition, information programmes should aim to provide manufacturers with sufficient information about the market for energy-efficient appliances.

### 3.3.2.4 *Energy-efficient lighting*

The primary challenge is to make consumers aware of the performance of different lighting technologies, installation technologies and maintenance of energy-efficient lighting, while simultaneously testing market acceptance of the technology and establishing the potential impacts of the programme.

## 3.3.3 **Strategies**

Energy efficiency information and awareness initiatives can be categorised into five main types of activities:

- Labelling;
- energy auditing;
- training;
- general information and awareness; and
- research, demonstration and development (RD&D).

These are discussed in more detail below for the four programme elements. It is important that infrastructure and personnel are not duplicated and, therefore, these activities should be packaged together as far as possible.

### 3.3.3.1 *Fuel switching*

#### *De-marketing electricity*

Eskom should actively pursue a de-marketing strategy for electricity in urban areas. The aim of this strategy would be to reduce the impacts of newly-electrified households on Eskom's load profile by promoting alternatives to electricity for those end-uses which contribute most to the system peak. Eskom is currently operating a de-marketing strategy in rural areas through its *Energisation* programme. This programme involves the promotion and provision of solar PV systems and gas to households in areas which will not be receiving electricity in the medium term. Lessons from the *Energisation* programme could be adapted and extended to urban areas. Eskom could expand its *Electrowise* programme, which

currently operates in urban areas, to include fuels other than electricity, encompassing these lessons.

Key elements of this de-marketing strategy would be:

- To conduct a feasibility study to determine the impacts of de-marketing. To determine the impacts on Eskom's system load and on its revenue flows of promoting alternatives to electricity for specific end-uses, Eskom should conduct an analysis of the impacts of the economic best mix of fuels: electricity for lighting and refrigeration; gas and coal in addition to electricity for cooking; gas and coal for space-heating and solar for water heating.
- To counter the high profile status that electricity currently holds by raising the profile of alternatives through an aggressive marketing strategy. The marketing strategy should be targeted, communicated by bodies that are credible and trusted by the target group, and should use word-of-mouth, door-to-door and personal contact, and local media as a means of disseminating information. These information dissemination programmes should be piloted to determine their effectiveness.
- Eskom's rural Energisation programme could be used to evaluate and test certain financing mechanisms, as well as aspects of acceptability and affordability of different fuels (for example, LPG). The results of these pilots could be fed into the development of urban de-marketing strategies.
- To establish local energy agents in urban areas who would provide energy and financial advice, promote an appropriate fuel-mix, as well as take responsibility for installations and maintenance support and possibly administer loans. These energy agencies could be local shops or centres where households currently buy their electricity.

#### *Conducting demonstrations*

Demonstration projects of solar water heating technology should be conducted in the low-income residential sector. An information and awareness campaign should also be run concurrently with these demonstrations to familiarise new households with the technology and inform them of the availability of financing and likely savings. The Midrand solar water heater dissemination project could potentially demonstrate and test the acceptability of solar water heaters in the low-income sector. To this end, the DME should monitor and evaluate it for its replicability and wide-scale implementation.

Other demonstrations of energy-efficient lighting and energy-efficient housing (including ventilation considerations) should be implemented. These are discussed in more detail in sections 3.3.3.4 and 3.3.3.2 in this chapter.

#### *Supporting and enhancing the Energy and Environment Advisors Network*

As mentioned in the opportunities section, both the International Institute for Energy Conservation (IIEC) and the Energy and Development Group (EDG) are working toward establishing an energy advisory service. Specific functions of the energy and environment advisors should include educating communities in the relative costs and benefits of different appliance/fuel combinations, providing information on health and safety with regard to fuel use (for example, reducing air pollution through improved ventilation of new housing, using electricity safely and avoiding fires and burns resulting from the use of paraffin and candles), and disseminating information on financing options for appropriate appliance/fuel combinations.

To-date, funding has been sought for the salaries of ten energy and environment advisors for a period of three years. The DME should explore options to expand this programme and ensure its long-term sustainability.

### *Supporting and monitoring existing health and safety initiatives*

While PASASA's paraffin safety campaign (see 2.1.4 of Section I for more details) appears to be partially effective in reducing paraffin poisoning, the programme is yet to be evaluated in terms of its penetration and widespread acceptance. Strategies to improve the effectiveness of the programme include:

- PASASA should expand their activities around information dissemination and the distribution of 'safe caps'.
- The DME should commission an independent team to monitor and evaluate the existing paraffin safety campaign to determine its effectiveness.
- The DME should actively support research into the extent of the paraffin problem.

The activities of the Liquid Petroleum Gas Safety Association (LPGSA) as described in the opportunities section of this document, should be expanded to create an aggressive consumer awareness campaign, as well as to provide information on incentives, (for example, financing options for gas appliances), that will be provided through a fuel switching campaign.

Eskom currently promotes the safe use of electricity in newly electrified areas through its Electrowise activities (see 2.1.4 of Section I for more details). While the programme primarily focuses on electricity, it has recently expanded to include information on energy-efficient housing. As part of Eskom's de-marketing strategy, these Electrowise activities should be expanded to include other fuels, as well as to provide information on financing options for appliances.

### *Continuing R&D for low-smoke fuel*

The DME should undertake a full evaluation of the low-smoke coal programme, assessing the appropriateness of subsidising low-smoke fuels. The programme should be evaluated in relation to other options such as the widespread dissemination of efficient coal stoves which are already on the market and the improvement of stove maintenance infrastructure in order to improve the quality and efficiency of existing coal stoves.

### **3.3.3.2 Thermally efficient housing**

#### *Developing information materials*

There is a need for energy efficiency guidelines for urban planners, designers, architects, builders, developers and local authorities involved in housing delivery. These guidelines must go beyond broad principles, demonstrating practical steps for planning, designing and evaluating thermal performance of energy-efficient developments, as well as offering tools to complete these steps. It is imperative that these guidelines are negotiated and established as soon as possible, before the opportunity afforded by the mass housing programme is lost. The development of these guidelines must be linked to a national information dissemination strategy which ensures that they are communicated to the relevant housing stakeholders.

In addition to this, it is imperative that an information database and publication on the energy performance of building materials and thermally-efficient building innovations for builders and developers is developed and disseminated.

#### *Disseminating the energy handbook*

Through the HEAT programme, the DME has developed an energy handbook which provides accessible and easily understandable information on the broad concepts of energy-efficient housing and appliance and fuel use. The DME should pursue an aggressive dissemination strategy which ensures widespread distribution of the energy handbook to low-income communities. The energy handbook should also be widely distributed to housing support and delivery agencies to be used as a tool to educate communities engaged in the housing process on safe and efficient energy use practices.

### *Supporting the Energy and Environment Advisors Programme*

It is likely that most of the energy and environment advisors will be involved with low-income communities gaining access to housing for the first time. The role of the advisors in those communities could be to:

- provide the communities with the necessary knowledge to challenge the delivery of conventional housing projects;
- achieve buy-in to proposed energy-efficient housing developments;
- provide deliverers of housing with information to design and build energy-efficient housing;
- provide information on the potential cost, energy and comfort benefits of thermal improvements;
- provide communities with training with regard to how to effect thermal improvements and design ventilation to reduce air pollution;
- provide information on energy use, best fuel mix, and energy-efficient appliances;
- provide information on health and safety with regard to fuel use; and
- address broader environmental issues.

The DME should support the programme, encouraging programme implementation and commissioning an independent party to monitor and evaluate the programme's effectiveness as a tool to disseminate information to communities and to change housing and fuel practises.

### *Developing and promoting affordable expertise*

With a view to further reducing informational barriers to investing in thermal efficiency, a network of architects and designers who can provide affordable information on energy-efficient housing to the low-income sector should be established. This programme could possibly be linked to universities and technicians, utilising architecture and design students who could conduct practical energy efficiency design projects in low-income communities under the supervision of their lecturers.

### *Constructing thermally-efficient demonstration houses*

Thermally-efficient demonstration houses should be constructed in key climatic zones of South Africa with the aim of familiarising communities with the concept of thermally-efficient housing and obtaining their and their municipalities buy in, as well as to increase awareness in national and provincial government. To ensure the success of these demonstration projects, the community selected should be at the start of the housing delivery process, a process of awareness raising should accompany the design and construction of the demonstration house with the community being invited to participate in the design process, the house should be affordable to the community (within the subsidy amount) and the house should be replicable at scale. It is essential that the demonstration houses are constructed with a view to establishing small-scale energy-efficient housing developments which can demonstrate the feasibility of affordable energy-efficient housing, providing government with the impetus to develop energy efficiency standards for subsidised housing.

### *Conducting energy audits*

Energy audits provide information to the homeowner on the physical and energy operating characteristics of their house. Audits can vary from light identifier programmes which simply detail potential energy saving measures and require limited information, to comprehensive programmes which identify measures based on cost-effectiveness criteria using established payback periods, and which require extensive site evaluation. These programmes aim to reduce customers energy bills, stimulate their conservation awareness, develop a positive image of the utility and

encourage better bill paying behaviour (TEMM 1997). The audits can be implemented either directly by the utility or by a third party on behalf of the utility. TEMM (1997) suggest the use of CBOs to promote and carry out the delivery of such programmes. The utility would compensate the CBO for its services and by utilising local CBOs, the utility would increase its opportunities to gain the trust of low-income customers.

### 3.3.3.3 *Appliance efficiency*

#### *Undertaking sector-wide research*

With a view to future policy and strategy development, it is vital that research is undertaken to:

- assess the nature of the appliance industry in South Africa; and
- determine how strategies should be shaped so as to ensure the wide availability of efficient appliances.

#### *Implementing an appliance labelling programme*

The aim of appliance labelling is to provide consumers with information on the relative efficiency of comparable models of the same appliance. There are two main types of appliance labelling programmes – *endorsement* and *comparison* labelling. Endorsement labelling provides the buyer with a single ‘seal of approval’ for those products which meet or exceed certain specified energy performance standards. Such labels are akin to the SABS mark, which indicates that an appliance has met specified safety and performance standards set by the South African Bureau of Standards. Comparison labelling provides consumers with information on all of the models within a given appliance category, leaving it to each buyer to compare and evaluate the energy performance of the appliance along with price, convenience, reliability and other features of interest. Comparison labels provide information on the energy performance of the appliance in terms of annual energy consumption, an energy efficiency rating (expressed graphically, for example in terms of a bar graph or stars), energy usage in kWh of electricity or annual energy operating cost. Experience has shown that labels should:

- be vivid, personalised and targeted to specific users and energy end-uses;
- be simple and easy to understand;
- provide information avoided costs or losses, rather than on expected energy savings as most consumers are unfamiliar with concepts of energy units and tend to respond more positively to information on operating performance expressed in monetary terms than in energy consumption;

Appliance labelling programmes can be mandatory or voluntary. Stakeholder consultations conducted by Marbek Resource Consultants, and the Energy and Development Research Centre found that South African appliance manufacturers preferred mandatory labelling because they viewed it as a means of levelling the playing field. Mandatory labelling programmes need to be supported by legislation to ensure that the manufacturers and retailers provide, display and market the label.

As mentioned in Section one of Part II, a proposal has been put forward to the DME to implement an appliance labelling and awareness strategy which focuses initially on electrical refrigerators and freezers. Approval has not yet been granted and the programme was deferred until 1998. The DME, through the proposed national Energy Efficiency Agency, should take the lead in co-ordinating and initiating the implementation of the proposed appliance-labelling programme. Other stakeholders who must be included in the process are Eskom, the SABS, appliance manufacturers, the Association of Municipal Electrical Undertakings (AMEU), the Department of Trade and Industry (DTI) and the Department of Finance (DoF). In addition, the Energy Efficiency Agency should develop a

business plan detailing the expansion of the appliance labelling programme to include other electrical and non-electrical appliances.

#### *Training retail sales staff*

The effectiveness of the appliance labelling programme can be enhanced by a training programme targeted at appliance sales staff. The programme should educate sales staff in concepts of appliance efficiency and in the details of the appliance labelling programme, particularly with regard to reading and understanding the label and comparing appliance performance. Retail staff should also be trained to promote the appliance labelling programme and raise consumer awareness of appliance efficiency at the point of sale.

#### *Disseminating information, promotions and marketing*

Widespread awareness of the appliance labelling initiative is essential to the success of the programme. A general information and awareness programme should be run concurrently with the labelling programme. This awareness programme should aim to:

- provide general information on energy efficiency;
- raise consumer consciousness of their own energy consumption;
- market the appliance labelling programme so that consumers will notice the labels when purchasing appliances; and
- provide consumers with specific information on how to read the label and make comparisons between appliances.

#### *Supporting research and development*

The key to successful appliance efficiency improvements is sufficient R&D to develop advanced technologies. Government and Eskom should support the appliance industry in its R&D initiatives. This support could include:

- Funding of universities, the SABS and national laboratories to research and develop appliance efficiency and methods of testing and certifying appliances.
- Introduction of high profile technology procurement programmes and golden carrot awards to encourage appliance manufacturers to pursue R&D.

As mentioned above, research to-date has focused on electrical appliances. As electrified low-income households continue to use fuels other than electricity and as the economic best-mix of fuels includes a range of fuels, it is imperative that energy efficiency research and development be extended to include non-electrical appliances, such as gas heating and cooking appliances, solar water heaters and energy-efficient coal stoves.

#### *Establishing and supporting energy information centres*

*Electrowise* testing and demonstration centres should be used to promote and market appliance efficiency and the appliance labelling programme. Consumers visiting these centres, should be able to obtain both general energy information and advice and specific appliance efficiency information. The medium through which this information is made known should include demonstrations of the energy operating performance of different appliances. While it is envisaged that this will be limited to electrical appliances in the short term, in the medium term, Eskom, as part of their urban de-marketing strategy, should expand the information and advice provided at these centres to include demonstrations of other fuels and appliances.

#### *Providing a market pull for energy efficiency*

Government should lead by example, purchasing energy-efficient appliances for government buildings. This internal energy efficiency drive would not only provide manufacturers with an incentive to design more energy-efficient

appliances, but could be used to raise general consumer awareness of energy efficiency and influence consumer practices if widely publicised.

#### 3.3.3.4 *Energy-efficient lighting*

##### *Conducting pilot projects*

As very little is known about the market for energy-efficient lighting in the low-income sector, pilot projects are essential to the EEL programme development. The pilot projects should occur in stages. The first round of pilot projects should be exploratory, open-ended and designed to test broad issues, such as market penetration rates, lighting use patterns and the impact of the programme on the grid. The second round of pilot programmes should be more locationally specific, aiming to establish the needs and trends in specific areas.

##### *Developing information materials*

It will be important to develop materials with simple, easily understandable information demonstrating the benefits electricity users could derive from using energy-saving lamps. A display board physically showing the varying levels of energy use of normal bulbs versus energy-saving lamps is an example of the type of material that could be developed. These information boards/materials could be housed with local service providers or independent agencies set up to distribute the lamps, and provide ongoing support to communities.

##### *Conducting door-to-door visits*

The aim of these door-to-door visits is to provide Eskom or a third party with a direct interface with customers, introducing the programme to the electricity users, conducting brief energy audits, identifying the electricity users' needs, demonstrating the energy saving lamps, distributing the lamps, and calculating the costs and benefits of the lamps for the specific household.

##### *Marketing the programme*

Marketing is important to the EEL programme for two reasons – to disseminate information about the EEL programme and to educate electricity users on the benefits of energy-efficient lighting to achieve buy-in to the programme and to dispel myths and misconceptions of energy efficiency. For the low-income sector, a combination of radio advertising, face-to-face/interactive promotion and word-of-mouth dissemination is likely to achieve the best results. This could include household visits either directly, as an Eskom initiative, or through third party intervention. Other promotional activities targeted at the low-income sector could include a community 'event' offering hands on activities related to energy efficiency, documentation, demonstrations and special event prices for lamps.

##### *Monitoring and evaluating*

Ongoing monitoring is required both to determine the critical success factors of the project and to feed into programme refinement and development. Components to be monitored include impacts on the grid, technical aspects of lamps, as well as evaluating market dynamics and household data, such as the economic, sociological and environmental impacts of the programme. A database should be established to record these impacts and compare the projects in terms of, for example, their regional, socio-economic and climatic differences, acceptance rates and levels of participation.

##### *Providing ongoing informational support*

It is important that customer services are provided not only during the time of purchase of the light, but that they are also available for an extended period of time afterwards. Ongoing support is necessary for continued participation in the programme as well as to overcome perceptions by the customers that they are on their own with a new, high-risk technology. The support services must be easily accessible to avoid the loss of EEL programme participants to conventional lighting technologies. Support services should include information on financial planning,

strategic planning, other energy efficiency programmes, energy saving advice, environment, health and safety concerns, energy efficiency demonstrations and energy audits.

### **3.4. Access to new technologies, fuels and appliances**

#### **3.4.1 Barriers**

In section 3.2 on affordability, it was shown that low-income households are unable to access energy efficiency because they are inhibited financially from doing so. This section deals with other kinds of access barriers. Generally, households are unable to access technologies that could assist them in reducing the amount of energy that they require. Often this is because they are unaware that these technologies are available. This barrier is addressed in 3.3 of this Section. Also, the fuels and/or appliances are not physically accessible, either at all, or in small, affordable quantities.

##### **3.4.1.1 Fuel switching**

It has been shown, that in many instances, low-income households are unable to secure their best fuel mix because fuels and appliances are not readily available to them, and gaining access to them is too costly. Thus access barriers tend also to distort the package of energy services that households ultimately choose to use.

The barriers inhibiting low-income households from securing a best fuel mix include:

- Generally, paraffin networks are good: fuels are available as are appliances. Because of this, paraffin is used widely. The economic costs associated with doing so are high, however, since the fuel is polluting, inconvenient, and dangerous.
- Many South African's do not have electricity connections, and this excludes them from using this source of energy.
- Gas, which appears to be a financially and economically appropriate energy source for cooking and water heating, is less accessible than paraffin. This is because distribution networks are relatively weaker, and depots are less well distributed. In addition, poor people are sometimes unable to access this source of energy because of the size of gas containers which are inconvenient and unsuitable to their income flows. In addition, gas appliances are generally not as widely available as paraffin appliances, and also cost more.
- Coal is not used widely because distribution networks are not extensive in many parts of the country, and it is not as readily available as paraffin. Also, coal is not easily transported. Low-smoke coal is a relatively new and unknown fuel and is not available widely.

##### **3.4.1.2 Appliance efficiency**

Energy-efficient appliances are not readily available on the market in South Africa. The reasons for this follow.

- Until recently, when new strong strong players, such as Fridgemaster, L&G and Whirlpool, entered the local appliance industry, the industry was in a state of crisis. This crisis was characterised by an industry which performed poorly in international markets, lacked investment incentives, and experienced low profitability and poor returns. As a result, incentives for the local industry to invest in retooling to manufacture energy-efficient appliances were weak.
- Energy-efficient appliances which were available on the market were generally imported and, therefore, not affordable to low-income households.

##### **3.4.1.3 Energy-efficient lighting**

Access barriers inhibiting investment in energy-efficient lights are as follows:

- There are currently no local manufacturers of energy-saving lamps in South Africa. Thus, if lamps are made available locally, it is because they have been imported. As such they are not as readily available as incandescent lamps
- As energy-saving lamps are a relatively new concept for many South Africans, many people do not have access to them because they are not aware that they exist. This barrier is addressed in section 3 of this chapter.
- Finally, the low-income household sector may not be able to afford to operate energy-saving lamps because they are unable to access them for affordability reasons. This barrier has been addressed in section 3.2 of this chapter.

### 3.4.2 Challenges

The general challenge for role-players in the energy, housing and appliance industries in South Africa is to remove or at least reduce the barriers that inhibit poor people from physically accessing fuels and appliances. This challenge entails, most fundamentally, improving fuel and appliance distribution networks.

#### 3.4.2.1 Fuel switching

The challenge for role-players in the appliance and energy industries is to remove, or at least reduce impediments distorting poor households' choice of fuels and appliances.

#### 3.4.2.2 Appliance efficiency

The key challenge for role-players in the appliance and electricity industries is to make energy-efficient appliances more easily available on local markets, and to promote them as such. This challenge should be addressed together with the industries' challenge to make these types of appliances affordable to all households.

#### 3.4.2.3 Energy-efficient lighting

In order for energy-efficient lighting to be used more widely by the low-income sector, role-players in the electricity industry must make these lamps readily available for purchase, as well as distribute them to as many low-income households as is possible.

### 3.4.3 Strategies

#### 3.4.3.1 Fuel switching

The strategies presented here aim primarily to make fuels and appliances more readily available, thus increasing the fuel-options available to low-income households.

#### *Promoting gas as an economically competitive fuel*

As noted earlier in this Section (see 3.2), it is imperative that the access costs of gas are reduced. In addition to this, low-income households' physical access must be improved. Indeed, for gas to compete with paraffin, it should be available as widely as paraffin. This entails improving gas delivery networks and systems. One way of encouraging this is for the petroleum industry to take the lead in establishing (perhaps only in assisting with the finance) small gas depots in communities. These depots could be part of local spaza shops or could be set up independently. The petroleum industry could support operations, (through cross-subsidies for example), until the businesses are up and running. The rural Energisation programme could be extended to test financing mechanisms for depots.

#### *Electrifying and facilitating access to appliances*

Electricity is likely to be significantly more economically cost-effective than paraffin, and facilitating access to it is therefore another appropriate strategy for promoting a more economically sound fuel mix. Such a strategy would need to improve access to electrical appliances, particularly refrigeration and cooking

appliances. This may be undertaken via the local authority or by Eskom financing appliances (see strategies on affordability in 3.2.3.1 of this Section). Other initiatives which may be considered could include the provision of 'surfix', for example, to assist wiring the house thus enabling the use of electric lighting and other appliances to be used in all rooms.

#### *Re-assessing low-smoke fuels*

If low-smoke coal were determined to be a viable and acceptable energy source for low-income households, then it must be made more readily available, so that it can compete with other fuels. Existing coal distribution networks could be used initially, but should be piloted for workability, and practicality.

#### **3.4.3.2 Appliance efficiency**

The strategies presented here seek to make affordable energy-efficient appliances more readily available on the South African market. These strategies should be read together with those presented in 3.2.3.3 of this Section on strategies aimed at reducing affordability barriers.

#### *Encouraging bulk purchasing and/or assembly*

As noted in 3.2.3.3 of this Section, a bulk purchasing programme could also be introduced whereby government, Eskom, or appliance retailers could become involved in bulk purchasing schemes which would increase the quantities of energy-efficient appliances available in the South Africa marketplace.

#### *Designing and promoting an appliance-labelling programme*

Energy-efficient appliances should be made more widely available, but should be identified as such. Appliance labelling would help in this regard. See 3.3.3.3 earlier in this Section for more detailed strategies on this.

#### *Implementing minimum efficiency standards*

While the priority is clearly for appliance labelling as noted above, minimum efficiency standards, which prescribe levels of energy efficiency in appliances, could be developed. In this regard, the following must be taken into account:

- standards should be developed as part of an integrated appliance efficiency programme;
- standards should be dynamic and subject to regular review and negotiation to reflect changing conditions;
- standardised testing procedures are essential for assessing the energy efficiency of new appliances. The testing procedures should be agreed upon by various stakeholders;
- sufficient lead time is needed for implementation from the time the standard has been announced until it comes into force to facilitate the necessary appliance development.;
- efficiency standards need to be established in close co-operation with the manufacturers of the appliances and other interested and affected parties; and
- standards need to be enforced at the point of manufacture, import or point of sale.

#### *Encouraging and supporting research and development*

Research and development work must be undertaken in order to develop and advance suitable technologies. For more details, see 3.3.3.3 of this Section on strategies to overcome the information barriers to the adoption of appliance efficiency.

#### *Establishing an energy information/demonstration centre*

In addition to the incentives suggested in 3.2.3.3 on strategies combating affordability barriers, government or Eskom could offer support to retailers or local service providers to establish demonstration centres where energy-efficient appliances could be available for public viewing and testing.

#### **3.4.3.3 Energy-efficient lighting**

The strategies presented here assume that Eskom will take a lead in obtaining and distributing energy-saving lamps to low-income households. This said, Eskom does not need to be directly involved in all aspects of the process, but instead could contract out the various functions requisite of such a programme.

#### *Purchasing lamps and liaising with retailers*

Eskom should continue to import good quality lamps for distribution in the low-income sector. It is essential, when the energy-efficient lighting programme initiatives gain momentum, that energy-saving lamps are available to households on demand. The programme could be damaged significantly if the demand cannot be met.

Eskom should liaise closely with local retailers of energy-saving lamps, ensuring that these lamps continue to be stocked, and promoted. Eskom should monitor their sales, and collaborate with retailers whenever and wherever possible.

#### *Distributing lamps to end-users*

In order to increase the lamps available to the low-income sector, Eskom's RDSM team could choose to do the following. Firstly, Eskom could set up small, local agencies within low-income communities to distribute the lamps. These agencies could also provide maintenance services in the area, where people could come for advice and for returning faulty lamps. These agencies could be integrated into those centres selling pre-paid electricity. Thus, the buy-in of local service providers would be essential. Eskom could otherwise contract the agencies out to local spaza shop-owners, or resident electricians.

Secondly, Eskom could distribute these lamps out to households in chosen communities. Distribution channels could take the form of door-to-door installations, sales and competitions held locally.

Thirdly, Eskom could engage in a series of marketing campaigns aimed at informing people of the technology, its benefits, and where it can be obtained.

#### *Monitoring the market share*

Eskom should take the lead in monitoring the sales of energy-saving lamps in South Africa, with a view to lobbying for the establishment of a local manufacturer when it is evident that the demand makes this venture viable. Local manufacture of energy-saving lamps could potentially reduce the price of the lamps (as import duties would be eliminated and transport costs reduced), and make them more widely available.

## **3.5. Risk**

### **3.5.1 Barriers**

Risk barriers can be categorised into those which discourage manufacturers and utilities from implementing energy efficiency programmes and those which discourage consumers from participating in these programmes or buying energy-efficient technologies.

#### **3.5.1.1 Fuel switching**

The uncertainty barriers associated with fuel switching arise out of the risk aversion of low-income consumers. Switching to unfamiliar technology, for example, solar water heaters, or fuel, for example gas, poses high risks to poorer

households particularly where there are large costs associated with the switch and where households are unsure of the durability/reliability of the fuel and the appropriateness of the technology/fuel to meet their needs. These households are unlikely to make the switch to more efficient appliance/fuel combinations unless they are familiarised with the fuel, guaranteed support in the event of technology failure or provided with incentives.

### 3.5.1.2 *Thermally-efficient housing*

The participation of manufacturers and suppliers of building materials, and developers in promotion, research and development of energy-efficient building materials and building practices may be constrained by their uncertainty of the market for such products. Unless demand for thermally-efficiency products and thermally-efficient housing is demonstrated, participation on a voluntary basis is likely to be limited.

In addition, the aspirations of many low-income households are for a conventional detached, brick house and it is difficult to convince these households of the merits of certain energy efficiency concepts, such as row housing, and alternative thermally-efficient building materials and techniques. The design preferences of certain households also may create a barrier to energy-efficient housing. For example, householders have been found to desire large windows which face the street. Where window orientation to maximise solar penetration conflicts with these preferences, designers may meet with resistance.

### 3.5.1.3 *Energy-efficient lighting*

Electricity industry restructuring raises a number of questions for residential demand side management in general and the energy-efficient lighting programme specifically. Unanswered questions – such as whether RDSM and the EEL programme will survive this industry reform, whether DSM will be regulated for in the new restructured industry and, if the EEL programme survives, who will take ownership of the initiatives – create an uncertain future for energy-efficient lighting initiatives. With the exact form of the electricity industry still to be decided, the EEL programme is faced with uncertainty with regard to how the current programme should be structured to anticipate industry reform, and how restructuring should affect the programme time horizons and future programme planning.

As with fuel switching, consumer risk aversion means that low-income households are unlikely to purchase CFLs unless they are actively marketed and the consumers are provided guaranteed informational and technical support on an ongoing basis. Poorer households will not take on new technologies if they perceive that they are alone with the risk.

## 3.5.2 **Challenges**

The overall challenge is to reduce the risks to both low-income households and to programme implementors by eliminating uncertainties which arise with regard to programme participation.

### 3.5.2.1 *Fuel switching*

The challenge is to reduce the risks to low-income households by ensuring that the technology or fuel suits the needs of the households and that these households have access to ongoing support.

### 3.5.2.2 *Energy-efficient housing*

The challenge is to reduce the risks to manufacturer, developer and supplier involvement by creating a market for thermally-efficient housing products.

### 3.5.2.3 *Energy-efficient lighting*

The primary challenge is to reduce the risks to both the electricity industry and consumers by eliminating the uncertainties which arise with regard to programme implementation and participation.

### 3.5.3 Strategies

The strategies presented aim to reduce the perceived risks to consumer and industry buy-in to energy efficiency generally, and energy efficiency programmes specifically, by increasing knowledge of energy efficiency and the market and by providing support.

#### 3.5.3.1 Fuel switching

##### *Developing information and awareness programmes*

General information programmes should be developed to raise consumer awareness of the range of fuels and technologies available to them and to dispel misconceptions of different appliances and fuels. These awareness programmes should aim to familiarise low-income households with the:

- economic costs and benefits of different appliance/fuel combinations;
- appropriateness of the different fuels or appliances to meet specific needs;
- operation of specific technologies and fuels;
- health and safety aspects of different fuels; and
- financing options.

This information can be conveyed through the energy and environment advisors, energy advice centres and demonstration projects which are detailed earlier in this chapter.

##### *Providing ongoing support*

Guaranteed customer support is required to reduce the risks associated with embracing a new technology or fuel. A network of energy centres must be established to provide ongoing support and advice to low-income communities.

##### *Providing end-user incentives*

Incentives such as rebates or coupon programmes, low interest loans or free installations for solar water heaters need to be explored to overcome the high costs associated with fuel switching and thereby reduce the risks to low-income consumers (see section 3.2.3.1). Furthermore, financing mechanisms for energy-efficient gas and coal appliances and energy-efficient lighting technologies, need to be explored (see sections 3.2.3.1 and 3.2.3.4 respectively for more details).

#### 3.5.3.2 Thermally-efficient housing

##### *Minimum efficiency standards for low-cost housing*

Minimum efficiency standards for low-cost housing can be used to establish a market for energy-efficient products, thus encouraging developers of low-cost housing and manufacturers and suppliers of building materials to research, develop and promote energy-efficient housing. It is vital that these efficiency standards are practical and implementable or else they could constrain the delivery of low-cost housing.

##### *Providing incentives to build thermally-efficient houses*

To develop the market for thermally-efficient low-cost housing, government should provide incentives for their construction. One such way of achieving this would be to promote thermally-efficient housing through the subsidy scheme by making provision for a special subsidy grant to those houses which achieve a minimum standard of energy performance. A precedent exists for such a departure in the existing subsidy scheme. To encourage well-located low-cost housing, the subsidy makes provision for an additional grant of up to 15% of the maximum subsidy, for housing which is located close to economic, educational, recreational and cultural opportunities.

### *Encouraging a participative process of design*

To achieve buy-in to energy-efficient design concepts and building materials, it is necessary to involve the community in the design process, explaining the concepts and the expected benefits of energy-efficient housing (see 3.3.3.2 earlier in this Section for more details).

### **3.5.3.3 Energy-efficient lighting**

#### *Tracking and interacting with industry restructuring debates*

Considering the huge impact that electricity industry restructuring could have on the long-term viability and ownership of demand-side management and energy-efficient lighting activities, it is essential that Eskom keep abreast of the industry restructuring debates. Research is required to determine the potential impacts of restructuring on the energy-efficient lighting programme. This research should be fed into the strategic planning of the programme.

#### *Developing and implementing information and awareness campaigns*

The aim of these information and awareness activities is to familiarise households with energy-efficient lighting technologies, provide information on the costs and benefits of their use and provide information on the programme support networks. This information could be disseminated through door-to-door visits, energy advice centres and general advertising (see 3.3.3.4 of this Section).

#### *Establishing support networks*

To encourage low-income households to participate in the energy-efficient lighting programme, it is essential to provide guaranteed informational and technical support. In particular, low-income participants need to be assured that if the lamp fails, it will be replaced. It is important that centres for lamp replacement are easily accessible and that the procedure for exchange is uncomplicated. The potential structure of the support networks is discussed in more detail in section 3.5.3.4.

## **3.6. Summary of strategies**

This section presents a summary of the strategies that have emerged from the work undertaken for the E4 project. The strategies are presented as *fuel switching*, *thermally-efficient low-cost housing*, *appliance efficiency* and *energy-efficient lighting* strategies. It should be noted that in some cases, strategies are detailed even though they do not appear in the detailed strategy section above. This is either because:

- the strategies could not be classified according to the barriers that have been identified, but are still viewed as being important, or
- the strategies have emerged as a result of those presented, that is they are linking strategies.

<b>FUEL SWITCHING STRATEGIES</b>		
<b>Objective: 'To achieve a best-mix of fuels in low income households'</b>		
Initiatives	Lead organisations	Roleplayers
<b>Policy I: To reduce the negative health and safety externalities associated with fuel use</b>		
Strategies:		
i. Support, expand and monitor the PASASA safe cap campaign	i. DME, PASASA	i. PASASA, petroleum industry, Eskom, Energy advisors, retailers, petroleum industry, clinics
ii. Support research into the extent of the 'paraffin problem'	ii. DME, DoHealth	ii. Research organisations and councils, PASASA
iii. Support, expand and monitor the LPGSA initiative	iii. DME, LPGSA, petroleum industry	iii. Energy advisors, clinics, retailers
iv. Assess the viability of the low-smoke fuel programme and possible alternatives	iv. DME	iv. Research organisations, universities
vi. Investigate the feasibility of efficient coal stoves	v. DME, research organisations, universities	v. Research organisations
<b>Policy II: To promote gas as an alternative to paraffin</b>		
i. Reduce the deposits on gas bottles	i. Petroleum industry	i. DME
ii. Finance entrepreneurs to set up small gas depots	ii. Petroleum industry	ii. DME
iii. Lobby to break the cartel on the gas price	iii. Eskom, DME, research organisations	iii. DME, competition board
<b>Policy III: To promote electricity for lighting and refrigeration</b>		
Strategies:		
i. Support the appliance labelling initiative to promote refrigeration efficiency	i. DME, Eskom	i. Appliance industry, retailers, SABS, AMEU
ii. Make refrigerators and lighting more affordable	ii. Eskom, local government, REDs	ii. DTI, banks, community saving schemes
iii. Implement a CFL programme for low-income households	iii. Eskom	iii. lighting industry, research organisations, CBOs, marketing agencies, local service providers, REDs, implementing agencies
iv. Investigate methods to finance appliances and lamps	iv. appliance industry, Eskom, local authorities	iv. Energy advisors, local service providers, community saving schemes
<b>Policy IV: To promote solar water heaters</b>		
Strategies:		
i. Investigate financing options for solar water heaters (financing through housing bond repayments, through the electricity tariff, low-interest loans, rebate or coupon schemes, free installations )	i. Eskom, local authorities, developers	i. DME, commercial and non-traditional lending houses, industry (solar and water heaters), Middev, developers, DoH
ii. Seek funding to cover the incremental cost of solar water heaters	ii. Eskom, research organisations, developers	ii. GEF, IFC, appliance industry, developers, energy advisors
iii. Seek funding to promote the manufacture and dissemination of solar water heaters	iii. DME	iii. AJJ sources, appliance industry, developers, energy advisors
iv. Conduct demonstration projects to pilot solar water heaters in low-income communities	iv. Eskom, local authorities, developers, DME	iv. Implementing agencies, research organisations
v. Conduct an information and awareness campaign for solar water heaters in targeted communities	v. HEAT programme	v. DME, research organisations, implementing agencies
vi. Provide ongoing customer support	vi. Eskom, retailers	vi. DME, research organisations, implementing agencies

<b>Policy V: To create an awareness around the best-mix of fuels</b>		
Strategies:		
i. Expand the Electowise programme to include fuels other than electricity	i. Eskom	i. HEAT programme, community
ii. Support the HEAT programme and expand EEA's network	ii. DME, Eskom	-
iii. Develop a national information and awareness campaign	iii. DME, Energy Efficiency Agency	iii. Eskom, HEAT programme, local authorities, energy advisors
iv. Disseminate the energy handbook	iv. DME, Energy Efficiency Agency	iv. Energy advisors, energy advice centres, housing support groups, environmental groups, local authorities
v. Establish energy advice centres	v. Local authorities, Eskom, REDs	v. CBOs, EEAs, ESCOs, local service providers, appliance industry, petroleum industry, independent organisations
<b>Policy VI: To develop a policy to promote more appropriate fuel use nationally</b>		
Strategies:		
i. Restructure the DME	i. DME	i. International expertise
ii. Establish an intra-departmental working group	ii. DME	ii. DoH, DTI, DoF, DPW, DEAT, national Energy efficiency Agency
iii. Embark on a de-marketing strategy for electricity	iii. Eskom	iii. local service providers
<b>Policy VII: To promote ongoing research and development</b>		
i. Undertake research to determine what South Africa's capacity is to produce LPG	i. DME	i. Petroleum industry, LPGSA, research organisations
ii. Assess patterns of fuelwood use in urban areas	ii. DME	ii. Research organisations, universities, World Bank
iii. Assess the viability of the low-smoke fuel programme and possible alternatives	iii. DME	iii. Research organisations, communities
iv. Assess the viability and acceptability of fuel-efficient coal stoves	iv. DME, research organisations	iv. Communities

<b>THERMALLY-EFFICIENT LOW-COST HOUSING STRATEGIES</b>		
<b>Objective: 'To promote investment in materials and practices that enhance thermal efficiency in low income households'</b>		
Initiatives	Lead organisations	Roleplayers
<b>Policy I: To reassess the way service costs are being allocated</b>		
Strategies:		
i. Develop standards	i. DoH	i. Local and provincial housing authorities
ii. Monitor levels at which services charges are pitched	ii. provincial housing authorities, community	ii. Community, developers, builders, local service providers, housing support organisations, urban sector networks
iii. Recover the cost of services through the tariff structure	iii. local authorities/ municipalities	iii. Provincial government, Eskom
<b>Policy II: To reduce the costs of the top-structure</b>		
Strategies:		
i. Promote and support self build housing	i. DoH, housing support organisations, energy research organisations	i. Community, developers, builders, local service providers, urban sector networks, architects, designers
ii. Promote agreements with small-scale suppliers	ii. DTI, energy advisors	ii. Community, builders, developers
iii. Develop and promote affordable planning and expertise	iii. research organisations, Eskom, DME	iii. Universities, students, DoH
<b>Policy III: To strengthen housing finance channels</b>		
Strategies:		
i. Support the South African Homeless People's Federation	i. DoH, other funders	i. DME
ii. Continue to support the NHFC	ii. DoF, DoH, Ministry of Housing	ii. DoH, DME
iii. Seek additional sources of finance	iii. DoH, DME, (interdepartmental committee)	iii. GEF, AIJ, IFC
iv. Dedicate additional funding for thermal efficiency	iv. DoH, Ministry of Housing	iv. DoF, DME
<b>Policy IV: To increase awareness for thermal efficiency</b>		
Strategies:		
i. Construct thermally-efficient demonstration houses	i. Eskom, DME, local authority, research organisations	i. GEF, IFC, communities, builders, developers, local authorities, banks
ii. Disseminate energy handbook	ii. DME	ii. research organisations, community networks, energy advisors
iii. Conduct energy audits	iii. Eskom	iii. ESCOs, energy advisors (facilitations), local service providers, CBOs, community.
iv. Develop and disseminate guidelines for thermally- efficient housing	iv. DME	iv. HEAT programme
v. Support and expand Energy and Environment Advisors programme	v. DME	v. DoH, research bodies, architects, planners, developers, National Lotteries Commission, energy advisors, DANCED's SEED prog.
vi. Promote and expand Electrowise initiative	vi. Eskom	vi. DoH, DME, research bodies (advising), energy advisors, architects, planners, developers
vii. Develop a general information programme on thermal efficiency	vii. Energy Efficiency Agency	vii. DoH, DME, research bodies, energy advisors, architects, planners, developers, community

<b>Policy V: To encourage organisational and inter-departmental collaboration</b>		
Strategies:		
i. Establish an inter-departmental committee	i. DME	i. DoH, DEAT, DTI (core members), DoF, DPW, Eskom, urban sector networks, housing support organisations
ii. Strengthen networks between stakeholders	ii. Energy Efficiency Agency	ii. Housing support organisations, urban sector network, Eskom
<b>Policy VI: To continue to undertake research and development regarding thermal efficiency</b>		
Strategies:		
i. Use demonstration housing to test technologies	i. Eskom, DME	i. Housing support organisations, energy advisors
ii. Develop affordable materials to enhance thermal efficiency	ii. Eskom, DME	ii. Universities and other research organisations, manufacturers, SABS
<b>Policy VII: To create a market for thermal efficient housing products</b>		
Strategies:		
i. Develop and introduce minimum energy performance standards	i. Inter-departmental committee, DoH, Housing Ministry, DME	i. SABS, research organisations, provincial housing authorities
ii. Provide incentives for investment in thermal efficiency	ii. Inter-departmental committee, DoH, provincial and local housing authorities	-

Note: Housing support groups include DAG, Urban Sector Network, People's Dialogue, Triple Trust etc.

<b>APPLIANCE EFFICIENCY STRATEGIES</b>		
<b>Objective: 'To promote the availability and use of energy-efficient appliances'</b>		
Initiatives	Lead organisations	Roleplayers
<b>Policy I: To increase the efficiency of all appliances (electrical and non-electrical)</b>		
Strategies:		
i. Establish minimum efficiency standards	i. DME, SABS	i. DTI, Appliance manufacturers/ importers, research organisations, universities.
ii. Develop technology procurement and 'golden carrot' type programmes	ii. Eskom, DME, large business	ii. Appliance producers/ manufacturers/ importers
iii. Provide low-interest loans or grant finance to upgrade local manufacturing infrastructure	iii. DTI	
iv. Investigate additional sources of funding to promote the manufacture/assembly/import of energy-efficient appliances	iv. DME, DTI, appliance industry, Eskom	iv. GEF, IFC, AIJ,
v. Support research and development especially with regards the advancement of non-electrical energy efficient appliances	v. Eskom, DME, Energy Efficiency Agency	v. Research organisations, SABS, universities
<b>Policy II: To make appliances more affordable to the low-income sector</b>		
Strategies:		
i. Provide incentives for end-users (for instance, leasing arrangements, rebates, coupons, free installation)	i. Eskom, local authorities, appliance manufacturers and importers	-
ii. Encourage community savings schemes	ii. Eskom, DME	ii. HEAT programme,
<b>Policy III: To design and implement an appliance labelling programme</b>		
Strategies:		
i. Conduct market and industry-related research	i. DME	i. Research organisations, universities
ii. Conduct stakeholder consultations with a view to designing the best programme	ii. DME	ii. Eskom, appliance industry, AMEU, SABS, research organisations, universities
iii. Establish testing and certification methods for appliances	iii. Eskom, SABS	iii. Universities, research organisations
iv. Develop and pilot labels	iv. DME	iv. Universities, other research organisations, marketing agencies, implementing organisations
v. Train retail staff in concepts of energy efficiency and in concepts of the appliance labelling programme	v. DME	v. Training organisations, energy advisors
vi. Promote and market the appliance labelling programme	vi. DME, Eskom	vi. Marketing agencies
vii. Monitor and enforce	vii. SABS	-
viii. Monitor and evaluate	viii. DME	viii. Research organisations, universities
<b>Policy IV: To stimulate awareness of energy-efficient technologies</b>		
i. Establish demonstration centres to broaden awareness about energy efficiency on a local level	i. Eskom, local authorities	i. CBOs, appliance industry
ii. Provide leadership, set an example; pursue an internal energy efficiency drive	ii. Eskom, DME, large industry	-
iii. Support the Energy and Environment Advisors programme	iii. DME, Eskom	iii. energy advisors, training organisations
iv. Train retail staff about energy efficiency concepts	iv. DME, Eskom	-
<b>Policy V: To build government capacity</b>		
i. Establish an appliance efficiency working group	i. DME, Energy Efficiency Agency	i. Appliance industry, Eskom, research organisations
ii. Build relationships with other departments who have an impact on appliance efficiency	ii. DME	ii. DoF, DTI, Eskom

<b>ENERGY-EFFICIENT LIGHTING STRATEGIES</b>		
<b>Objective: 'To promote the use of energy-efficient lighting in low income households'</b>		
<b>Initiatives</b>	<b>Lead organisations</b>	<b>Roleplayers</b>
<b>Policy I: To reduce the customer cost of CFLs</b>		
Strategies:		
i. Subsidise the consumer purchase price	i. Eskom	i. IFC, GEF, retailers
ii. Reduce customs duties on imports	ii. DTI	ii. Eskom, DoF, DME
iii. Monitor world CFL prices trends with a view to planning strategically about imports or local manufacturing	iii. Eskom, local retailers	-
iv. Monitor CFL sales in South Africa to determine when local CFL manufacture becomes feasible	iv. Eskom, local retailers	iv. DTI
<b>Policy II: To develop a better understanding of the market for energy-efficient lighting</b>		
Strategies:		
i. Conduct a series of market surveys to learn more about prevailing socio-economic trends, and the nature of the demand for lighting	i. Eskom	i. Market survey groups
ii. Conduct a series of pilot projects	ii. Eskom	ii. Implementing agencies, research organisations
iii. Monitor and evaluate the pilot projects with a view to developing better practice for future larger-scale projects	iii. Eskom	iii. research organisations, implementing agencies, CBOs, local agencies, energy centres.
<b>Policy III: To increase the market penetration rate for CFLs</b>		
Strategies:		
i. Ensure that CFLs are readily available in order to avoid lost opportunities for penetration	i. Eskom, retailers	-
ii. Develop a marketing strategy for CFLs	ii. Eskom, retailers	ii. Energy centres, local service providers, agencies, community networks.
iii. Provide customer support on an ongoing basis	iii. Eskom, retailers	iii. Research organisations, implementing agencies, GEF (funding source), IFC (funding source)
<b>Policy IV: To encourage stakeholder collaboration</b>		
Strategies:		
i. Bolster EEL working group	i. Eskom	i. retailers, research organisations, agencies, Energy Efficiency Agency
ii. Encourage liaison between stakeholders so as to avoid duplication of activity, maximise benefits, and enhance co-operation between all interest groups	ii. EEL working group	ii. retailers, research organisations, agencies, local service providers, housing authorities, developers, international organisations, funders
<b>Policy V: To increase awareness for energy efficient lighting</b>		
Strategies:		
i. Develop and disseminate information materials	i. Electrowise/Eskom marketing	i. HEAT programme, energy advisors, adult education programmes
ii. Conduct energy audits	ii. Eskom, energy advisors	ii. ESCOs, local service providers, energy advice centres
iii. Conduct door-to door visits	iii. Eskom	iii. University trainees, community groups
iv. Market CFLs	iv. Eskom, retailers,	iv. Eskom, advertising agencies

# The Way Forward

## 4.1. Introduction

As presented in Part II, research undertaken for this project has resulted in the proposal of over 80 strategies aimed at enabling low-income households to choose the best fuel mix for their needs, as well as enhancing thermal, appliance and lighting efficiency in households. If many of these strategies were to be implemented, considerable investments in human and monetary resources would be required. This section of the report seeks to:

- Describe instances where careful integrated energy planning could reduce the number of strategies suggested, thus using scarce resources more efficiently;
- Identify areas of priority (section 4.2 below outlines the principles used to prioritise the strategies).

One of the clearest pictures emerging out of this research is that the energy supply sector should look towards moving beyond only providing its customers with a good (i.e. gas or electricity), and rather seek to provide a good *as well as a service*. If the energy supply sector, for instance, were to provide more information on the fuels best used in households, how these fuels can be used efficiently, or how to secure funding for energy efficiency, it is likely that the energy supply sector will also benefit. As the electricity industry is restructured and competition is gradually introduced, it will become increasingly important that the energy sector plans in this manner. The strategies to follow take cognisance of this.

It is important when formulating an energy efficiency strategy that the programme of actions does not rely too heavily on any one institution for its successful implementation. As there are already a diverse range of organisations involved in the development, and, to a lesser extent, delivery of energy efficiency strategies to the low-income sector in South Africa, it makes sense that an energy efficiency plan build on the activities of existing institutions. These organisations include the Department of Minerals and Energy (DME), Eskom, energy research organisations and universities, implementation agencies, energy and environmental NGOs and private sector companies. There is, however, a need to ensure that these activities are co-ordinated to prevent duplication of activities and resources. While different intervention areas – fuel switching, thermal efficiency, energy-efficient appliances and energy-efficient lighting – may require different co-ordinating bodies, for the most part this function can be fulfilled by either the DME or Eskom. Beside the need for this top-down co-ordinating function, there is a need also for small-scale initiatives to influence policy from the bottom-up. This is particularly important in South Africa where the development of a comprehensive and innovative energy efficiency programme for the urban poor is threatened by a lack of institutional capacity. Recognising this need, the strategies presented below are a combination of top-down planning and bottom-up innovation, demonstration and lobbying.

## 4.2. Principles for prioritisation

A set of guiding principles, listed below, have been used to prioritise the strategies presented in Part II. These principles are only meant to *guide* the prioritisation process: as such, for a strategy to emerge as a priority, it is not necessary for it to comply with the entire set of principles. Each strategy must comply, however, with the first principle presented.

- *The strategy must be realistic*

The strategy must be achievable given the economic, human, technological and institutional capacity available. Where capacity (especially human and institutional) is not available, the strategy should address this.

The strategy must also be achievable within the context of existing legislation and planning frameworks, or at least the vision of the relevant sector (for example, this document will not suggest the imposition of extensive import tariffs, when clearly policy has been geared for market liberalisation).

- *Opportunity to implement the strategy is currently available, and/or*

In consequence of the apartheid era in South Africa as well as the relatively new climate change initiatives, there are currently numerous opportunities - emanating both from within South Africa and externally - which offer funding, skills transfer, and support for changes in policy and planning frameworks. It is unlikely that these opportunities will continue to be available in the long term, and, as such, should be taken up urgently. For details of these types of opportunities, see Part II of this document.

- *The strategy can be linked to existing initiatives, and/or*

In order that resources are used efficiently and effectively, it would be beneficial if strategies chosen as priorities link in with other initiatives already underway. Not only will this ensure that duplication of activities and expenditures are minimised, it will also reinforce or strengthen the existing initiatives. For details on the initiatives already underway, see Part II of this document.

- *The strategy is a catalyst for other improvements, and/or*

Strategies which catalyse broad change or which have the potential for multiplied positive effect in the sector should be prioritised. An example of this relates to the strategy which calls for government to be lobbied. It is possible that this could result in new policy formulation which could have a significant impact on the entire sector.

- *The strategy addresses a barrier requiring immediate attention*

In some instances, intervention is vital if there is to be any change in current circumstances. An example of this relates to energy-saving lamps: unless they are made more affordable, they will not be invested in by low-income households. Strategies which seek to address problems that require immediate attention should therefore also be prioritised.

- *The strategy supports local economic development*

A strategy which supports processes which keep wealth (or promote its generation) in local communities is preferable to one where third parties benefit from the intervention.

### **4.3. Integrated energy planning**

Strategies which cut across sectors and promote integrated energy planning should be prioritised. These are addressed in sections 4.3.1 to 4.3.5 below.

#### **4.3.1 Cross-cutting strategies**

##### **4.3.1.1 *Establishing and supporting a national energy efficiency agency***

In 1996, the DME commissioned a group of consultants to develop a business plan for the establishment of an 'Energy Efficiency Agency' to provide a home for the department's energy efficiency activities. The draft plan has been completed. Although it is unlikely that this agency will be established in the next two years, the strategy here is for continued support and lobbying for its formation. Until there is a home for energy efficiency in government, there is a danger that it will fall off the agenda, making it unlikely that energy efficiency will become an important

element of energy or housing policy. This could result in limited national government support for the introduction of thermal and energy efficiency concepts and practices at a local level. In turn, this means that there will be little top-down commitment from government to address the barriers inhibiting low-income households from investing in energy efficiency. The DME should seek to establish this body as soon as is possible.

The energy efficiency agency could be responsible for a number of the initiatives proposed by the strategies in this document, including:

- developing a strategic framework for energy and thermal efficiency in South Africa;
- assisting DME and Eskom to bring stakeholders together into constructive debate;
- seeking funding for project development, piloting and so forth;
- lobbying DoH and DME to formulate policy;
- expanding the Enerwise programme to include low-income households;
- supporting research and development in energy and thermal efficiency; and
- developing and disseminating information materials on energy and thermal efficiency.

This body should be given a mandate to undertake *broad strategic thinking* about energy and thermal efficiency on a national scale, rather than to implement activities. Implementation and operations, which should take place within the context of national energy efficiency agency's strategic framework, should be undertaken by energy service companies (ESCOs), energy advice centres, as well as research and implementation agencies.

#### 4.3.1.2 *Restructuring the DME*

The DME committed itself to restructuring and capacity building in 1997. This has yet to occur, but is expected to take place in 1998. While proposals for a restructured DME promise a new commitment to integrated energy planning, it is not presented as an overarching function, but as a separate branch to the supply and demand sector activities. A high level separation between energy supply and demand research and policy formulation thus continues to exist in the proposed new structure. To develop appropriate policies for the low-income residential sector, the DME should:

- develop a vision for the Department which complements the draft Energy White Paper;
- restructure the Department so as to facilitate integrated energy planning; and
- build capacity within the Department to develop and enact policy and strategies for low-income households which are based on an integrated energy planning approach.

Restructuring should occur as soon as possible: once this has happened, other initiatives proposed in this document can find permanent homes.

#### 4.3.1.3 *Developing information materials*

Strategies that seek to remove or reduce information barriers were presented in Part II. Many of these strategies could be integrated into a *single* broad-based national information campaign targeted at the low-income residential sector. Elements of a strategic plan for this could include the following:

- developing and disseminating to households as well as policymakers and politicians, practical guidelines on how to make energy or thermal efficiency improvements, as well as how to shape the best household fuel mix, including information on what to look for when purchasing second and/or new electrical and non-electrical appliances;

- developing information to be disseminated to households, policymakers and politicians on how to use fuels safely;
- distributing the energy handbook and other existing, useful informational materials;
- providing details to households, and other stakeholders on how to seek financial assistance, where to go for more detailed information or support on energy or thermal efficiency; and
- establishing and maintaining an appliance labelling programme.

In the absence of a national energy efficiency agency, this campaign should be initiated by the DME's energy efficiency sub-directorate within the Electrical Energy directorate, with support from the Energy for Development directorate as well as from Eskom and the petroleum industry. It is important that informational programmes which are already underway are assimilated into the design and framework of this initiative. Such programmes include, for example, the HEAT programme which developed the energy handbook, as well as the outputs of the Electrowise and Enerwise initiatives. The work of energy advice centres as well as the Energy and Environment Advisors (as described below) could form part of this campaign, helping to disseminate information materials developed under the initiative, and also contributing to the development of the information materials. Care should be taken to ensure that *all fuels* and not just electricity are adequately addressed.

Considering the enormity of the problems faced by low-income households resulting from informational barriers, this initiative should be urgently addressed. It is important because it directly addresses information barriers experienced by low-income households, it links in with other initiatives, it is a catalyst for change in the low-income sector, and would indirectly support local economic development.

#### 4.3.1.4 *Establishing and supporting energy advice centres*

In many countries, energy service companies, or ESCOs assume responsibility for numerous retail energy-sector services. In South Africa, ESCOs are a new concept. Presently small in number, it is likely that they will emerge to service commerce and industry where the greatest energy savings are likely to be made. To ensure that the residential sector, in particular low-income households, receive energy-related support, the strategy is to establish energy advice centres. Energy advice centres should collaborate closely with the emerging ESCOs (and could even be formally linked to them), but should focus specifically on the residential sector.

Energy advice centres have been referred to frequently in this document, each time with specific regard to household fuel switching, appliance or lighting needs. Clearly, it would be optimal for these centres to be established and resourced in such a way that they are able to target *numerous* energy-related needs as experienced by the low-income sector.<sup>1</sup> In planning and designing these centres, every attempt should be made to integrate/build onto other, similar initiatives already being undertaken in various parts of the country. In addition, it would be important to encourage close interaction between the various energy advice centres already established.

Though energy advice centres should be piloted to determine best practice, it is likely that they should perform the following activities:

- providing and disseminating information on, and increasing awareness of, energy and thermal efficiency in general;
- providing and disseminating information on the best fuel mixes;

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<sup>1</sup> In fact, the activities of these centres do not necessarily need to be confined to energy service, but could also undertake activities related to water and sanitation.

- undertaking demonstrations to show the benefits of energy efficiency;
- supporting appliance-labelling initiatives;
- undertaking household energy audits, and (free) installations (and wiring) upon request;
- promoting and distributing goods and services 'packages' (as described below);
- lobbying national, local and provincial government, and feeding into their policy making processes;
- lobbying the energy supply sector;
- monitoring health and safety aspects of fuel use; and
- seeking and acquiring funding to expand activities and outreach.

Depending on the types of activities that individual energy advice centres choose to undertake, it should be noted from the above that energy advice centres could make considerable inroads into reducing barriers to affordability, information, access and risk currently faced by low-income households. In addition, these initiatives would support local economic development as well as catalyse positive development in the sector.

It is likely that these centres or agencies will evolve out of the needs of particular communities. Thus, it is highly probable that there would be significant regional and sub-regional variations in the nature of the centres. It is likely, however, that they would operate best if they were endorsed by Eskom and the DME, but were run by local service providers, municipalities, ESCOs, or other independent bodies, and were (partially) funded by the petroleum and appliance industries as well as other organisations interested in the development of a particular area (for example, the largest employer in the area).

The need for these centres is clear. As such, they should be given priority status. Once these centres have been established, other initiatives such as that described in section 4.3.1.5 below can be considered. Indeed, if the base structures are in place, this initiative is more likely to be successful.

#### **4.3.1.5 *Distributing packages of good(s) and services***

In Part II of this document, numerous calls were made for assistance to be given to households, not only in purchasing construction materials that would enhance thermal efficiency, but also in the procurement of appliances and lamps that use energy efficiently. Generally, these strategies call for research to be undertaken on the most appropriate mechanisms for financing these goods, followed by a piloting process. In addition to rendering appliances and lamps more affordable, there is also a need to make them more easily and widely accessible. These strategies seek to reduce affordability and access barriers by providing specific goods (for example, solar water heaters, CFLs) to the urban low-income sector.

With a view to making the most of scarce resources, it should be possible to provide a *flexible package of goods and a service* to low-income households. A household could, for instance, be given options to purchase over time a CFL for example, or a hotplate and a CFL, or a CFL and a refrigerator, or a refrigerator and a gas cooker. Essentially, this would reduce the number of agreements that the household is tied to, rendering financial planning simpler. Rewards could be given for good payment records (for example, foregoing final payments due, discounts and so on). This type of agreement would probably work best if limited to appliances and lamps but could possibly be extended to building materials as well. The priority would be to get the initiative working well for a limited number of goods, and thereafter to expand upon this in terms of goods available for finance, but also with regard to outreach services.

In addition to designing packages to help finance, and increase access to, appliances and lamps (and possibly building materials) for the low-income sector, it would also make sense if the opportunity were used to disseminate information

about energy efficiency in general, and also about what fuels are best used for the various household needs. These 'packages' present an ideal means of distributing the energy handbook as well as other materials developed under the information and awareness programme as described above.

In order to avoid duplication, it is important that this initiative take account of similar activities such as those suggested in the FINESSE business plans as well as in the HEAT programme. In addition to this, the housing and electrification initiatives should be kept in mind. There are considerable opportunities for integrated planning in this regard.

DME or Eskom could endorse the concept, and promote it to ESCOs, energy advice centres, local appliance and lamp retailers, implementing organisations, housing-support groups, community saving schemes, or even private business. The buy-in of local and provincial authorities would be important (hence the importance of the involvement of Eskom and DME). These 'packages' could also be made available at the energy advice centres, or could be distributed as a DME or Eskom initiative through door-to-door visits. These packages should be marketed widely, and the support of community organisations should be actively sought.

In section 4.3.1.4 above, it was noted that this initiative should only get under way once the ground-level structures to manage it are in place. This may occur in some areas sooner than in others. 'Show case' examples could be developed in the advanced areas, for promotion of the concept in others.

This initiative should be considered a priority because it is realistic to implement, it *directly* addresses the affordability, access, and risk barriers faced by low-income households, and it links in with other initiatives and opportunities (for example, the energy advice centres, the Energy and Environment Advisors noted in section 4.3.1.6 below, and the FINESSE programme).

#### 4.3.1.6 *Supporting energy and environment advisors (EEAs)*

The primary role of these advisors will be to interact with communities involved in housing and development projects in order to integrate sustainable energy and environment practices into these projects to the benefit of those communities. Specific to energy issues, the work of EEAs could include the following:

- conducting energy audits;
- promoting an awareness of thermal and energy efficiency concepts;
- building capacity within housing support groups to design and implement thermally-efficient housing developments;
- providing assistance with layout principles on better passive thermal efficiency;
- providing assistance with determining comparative energy options and practices, sources and appliances;
- networking between stakeholders and other advisors; and
- providing information on health and safety aspects of fuels.

The final responsibility for this initiative should rest with the DME (Energy for Development sub-directorate). Research/implementing organisations such as the Energy and Development Group (EDG) and the International Institute for Energy Conservation (IIEC) could assume most of the work required to get the initiative underway as well as to maintain it (for example, selection, training, publicity, support and evaluation).

This initiative should be considered by the DME as a priority for the medium term (to be launched within five years). It is an important initiative because it addresses information, access and risk barriers experienced, not only by low-income households, but also by local authorities, NGOs and possibly even retailers. In addition to this, it can be linked with the HEAT and SEED programmes, as well as add value to government's electrification initiative. Finally, it is a catalyst, potentially, for significant change in the energy sector.

### 4.3.2 Fuel-switching

#### 4.3.2.1 *Integrating all fuels into strategic frameworks and information materials*

It is essential that strategic planning frameworks and information materials – particularly those targeted at the low-income sector – begin and/or continue to take account of *all fuels*, and not just electricity, as viable options for meeting specific household needs. If all fuels are integrated into strategic frameworks, it is more likely that comprehensive, broader-based planning exercises to finance and facilitate access to fuels and appliances will result. Similarly, if all fuels are included in information materials, households will be in a better position to choose the most appropriate fuels for their particular needs, as well as to know how to use the fuels more efficiently and safely. Politicians and policymakers will also be able to endorse, plan for and communicate best fuel mix strategies. In some instances, particularly in relation to the DME and Eskom, this would require that institutional capacity within the organisation be broadened to include expertise on a wider range of fuel options and mixes.

This approach should be taken up immediately. It is important because more comprehensive planning frameworks and information materials would catalyse further positive developments in the sector. This approach has also been adopted by a number of other energy sector initiatives such as the energy handbook and the HEAT programme, and is in keeping with current thinking on energy planning practices.

To achieve a best-mix of fuels in low-income households, it is essential that the DME take the lead in integrating all fuels into their policy frameworks and residential energy plans. At present, the energy sector is highly divided according to fuel type with different controlling bodies, distribution networks and regulatory environments. The different sectors of the supply industry are motivated essentially by profit maximisation and cannot, therefore, be expected to develop a socially optimal and energy-efficient supply picture for the low-income residential sector. Directives for integrated energy planning thus need to come from government. As mentioned in section 4.3.1.2, the current structure of the DME is not conducive to integrated energy planning. Restructuring of the DME is thus required.

#### 4.3.2.2 *Developing and disseminating information<sup>2</sup>*

One of the most important of all the fuel-switching strategies presented in Part II of this document relates to the creation of an *awareness* about the best fuel mix that households can achieve, as well as how to use these fuels safely. Information campaigns are seen here as the most important tool in developing this kind of awareness. Information should be gathered where it is available, or developed where it is not available, and should target low-income households as well as policymakers and politicians. The information should be presented in accessible, easily understood formats. The energy handbook developed under the HEAT programme is an example of the type of information that is useful in this regard. Information could also be disseminated through demonstration projects which could expose communities to a fuel or technology, to its costs and benefits, and test community acceptance.

Much of the information required to create this type of awareness already exists. There is, however, no organising or co-ordinating body currently responsible for disseminating this information widely as well as ensuring that resources are used

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<sup>2</sup> In section 4.3.1.3, a national information strategy on developing and disseminating information on energy and thermal efficiency as well as best household fuel mixes, was called for. Essentially, the strategy in this section is for the same type of activity. Because of its importance, it has been dealt with broadly, and then re-visited in various specific contexts (fuel switching, thermally-efficient housing, appliance efficiency and energy-efficient lighting).

efficiently and that duplication of effort does not take place. In the medium term, it would be most appropriate for this initiative to be managed by the proposed national energy efficiency agency. As it is unclear when this body will be established, and as this initiative should be treated with urgency, the strategy here is for the Energy for Development directorate of the DME to take responsibility for it in the meantime.

This initiative is important because it seeks to directly address information and affordability barriers faced by low-income households. As noted, much of the information being called for here already exists. This initiative could thus link in with these efforts. In addition, the energy advice centres and energy and environment advisors (sections 4.3.1.4 and 4.3.1.6) could carry out much of the work required to disseminate the products. With regard to the health and safety aspects of fuel use, programmes such as the PASASA and LPGSA should be supported by the DME and key role-players in the petroleum industry, as well as encouraged to expand their outreach. The DME should also evaluate its low-smoke fuel programme to determine its feasibility in relation to alternative programmes, such as more efficient coal stoves and improved maintenance infrastructure.

#### **4.3.2.3 De-marketing electricity**

In addition to the above-mentioned information development and dissemination programmes which focus on providing information on the range of fuels, it is necessary to develop marketing strategies which counter the current conception that electricity is the best fuel for all needs. To this end, Eskom should pursue a de-marketing strategy for electricity in urban areas. The aim of this strategy would be to reduce the impacts of newly electrified households on Eskom's load profile by promoting alternatives to electricity for those end-uses which contribute most to the electricity demand peaks. Key elements of this de-marketing strategy would be:

- to conduct a feasibility study to determine the impacts of de-marketing on Eskom's load and on its revenue flows;
- to develop a marketing strategy which counters the high profile status that electricity currently holds and raise the profile of fuel alternatives. These information dissemination programmes should be piloted to determine their effectiveness;
- to adapt lessons from Eskom's rural Energisation programme and feed these into an urban de-marketing strategy. Eskom could expand its Electrowise programme to include fuels other than electricity, encompassing these lessons; and
- to establish local energy agents who could provide energy and financial advice, promote an appropriate fuel-mix, as well as take responsibility for installations and maintenance support. The energy advice centres mentioned in section 4.3.1.4 could take on this role.

#### **4.3.3 Thermally-efficient housing**

Strategies proposed in this document for the housing sector have emerged from a need to remove the barriers inhibiting poor people from acquiring housing.<sup>3</sup> The Department of Housing (DoH) appears to be beginning to address some of the more general barriers impeding investment in housing. The energy sector should support these initiatives as well as address barriers applicable specifically to thermal efficiency.

Probably the most effective way to achieve thermally efficient low-cost housing is to establish and enforce minimum efficiency standards for new, subsidised houses and to develop policy and legislation which will support and enhance these standards. This has, however, proved difficult to achieve. There has, until recently,

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<sup>3</sup> Indeed, many of the barriers inhibiting investment in housing are the same as those inhibiting investment in thermal efficiency.

been little dialogue between the energy sector and housing policy decision-makers and as a result, housing authorities – the Ministry, DoH, the Parliamentary Portfolio Committee – remain relatively unaware of the concepts of thermal efficiency. Furthermore, those that are aware have their hands full with competing demands and are, therefore, unable to further explore or champion the issue of energy efficiency. Energy efficiency therefore remains obscure to the housing sector. The strategies presented below include both top down, and bottom up approaches.

#### **4.3.3.1 *Establishing and supporting the inter-departmental committee<sup>4</sup>***

The DoH is taking the lead in constituting an Interdepartmental Committee on energy-efficient housing. This committee will include representatives from the DoH, the DME, DWAF and the DEAT. The Committee should aim to pursue an environmentally sound and sustainable energy model in low-cost housing. It should focus on three main areas: policy development to address the main barriers to the implementation of thermally-efficient low-cost housing, initiating and supporting awareness and training activities, and developing market support strategies for implementation. The Committee should consult widely with stakeholders in the thermally-efficient housing industry – including energy efficiency experts, energy suppliers, housing delivery and support agencies, education and training institutions – to determine the level of expertise, knowledge and the gaps in research.

Policy development activities include formulating a policy framework which will support and enhance the construction of environmentally sound, thermally-efficient homes; drafting policies which establish minimum standards for thermal performance of low-cost housing and lobbying the Ministry of Housing to include no-cost energy efficiency measures in the housing subsidy criteria; and promoting policies and incentives to encourage a competitive materials supply market and the development of energy-efficient and environmentally sound technologies.

Awareness and training activities could include developing and co-ordinating the dissemination of information materials; funding and supporting training seminars which will result in the accreditation of builders and town planners; establishing a support network of experts who can consult on projects and provide the technical expertise to facilitate the construction of thermally-efficient houses; and endorsing and promoting energy-efficient housing initiatives to raise awareness and encourage replication.

Market support activities could include developing programmes to encourage builders and materials suppliers to construct thermally-efficient homes; initiating demonstration pilot projects; and creating a network of manufacturers and project developers to expand the market and technologies for thermally-efficient homes.

Other roles of the Committee may include seeking and channelling funding for energy-efficient housing projects and co-ordinating existing and new energy-efficient housing strategies to prevent duplication of research and to distil and learn from these project experiences. Together, these roles will enable the Committee to guide and develop a national programme of activities which aims to achieve energy-efficient low-cost housing at scale.

It is important that this Committee is established as soon as possible. The most obvious reason for this is that, until proactive interaction between government departments is formally established, it is unlikely that sustainable energy and environmental approaches will be practised in low-cost housing developments.

#### **4.3.3.2 *Lobbying government***

While much research effort has been put into energy-efficient low-cost housing, it has to-date failed to make an impact on housing policy and practice. There is thus a

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<sup>4</sup> This section is based on discussions with Mike Scholand from the International Instituté for Energy Conservation.

need for the energy efficiency research community and implementers of energy-efficient housing strategies to mobilise to make an impact on housing policy and practice. This could occur through the establishment of locally- or nationally-based advocacy groups. Eskom, through its working group on thermal efficiency, could co-ordinate and conduct a workshop which brings together energy efficiency research organisations, implementation bodies and other stakeholders, with a view to forming a strong lobbying or advocacy body. This body could be tasked with keeping abreast of developments in the housing and energy sectors, providing informational and technical support to government, and lobbying for energy efficiency on national, provincial and local housing agendas. In addition, the proposed Inter-departmental Committee discussed in section 4.3.3.1 above could begin to lobby for the formulation (by DoH) or even co-formulation (by DoH and DME) of appropriate policy.

Targeting local or provincial level housing authorities is likely to achieve better results than focusing all lobbying efforts on the national Ministry. Lobbying and advocacy groups should target those local or provincial authorities which are known to be receptive to environmentally sound energy strategies. These may be local authorities, for example, which have participated in Agenda 21 initiatives or those which have dynamic and proactive leadership. If these local authorities were to develop guidelines and practices that could be presented as showcases of what could be done on a broader basis, it is more likely that national government will embark on proactive policymaking. To influence national policy, it is vitally important that the results of local level initiatives are fed back up to national housing authorities.

This strategy is important, particularly because it has the capacity to initiate significant change in policy, planning and implementation practice at a high level.

#### **4.3.3.3 *Regulate for no-cost energy efficiency measures***

Certain energy efficiency measures – building orientation, window placement and roof pitch – add no extra cost to the building, while adding substantially to the quality and comfort of the house. These no-cost measures continue to be overlooked in the design and construction of new, low-cost housing. This can be attributed to two main factors:

- Firstly, orientation of houses is heavily influenced by the shape and size of the plots. The layout of already planned sites may prohibit the correct orientation of the houses on the erven.
- Secondly, planners and designers may not have the information or knowledge required to plan or design along energy-efficient principles.

To achieve the inclusion of no-cost energy efficiency measures in low-cost housing developments, the following steps should be taken:

- The inter-departmental committee should develop policy and lobby the Housing Parliamentary Portfolio Committee and the Housing Ministry to include no-cost measures into the subsidy criteria of the mass housing programme.
- Energy efficiency research bodies should lobby government by providing targeted inputs on practical guidelines and policy for no-cost energy efficiency measures into the housing policy and regulatory development process.
- The inter-departmental committee should commission research to revise existing planning guidelines for 'Greenfield' sites. These guidelines should detail the planning requirements for passive solar design. Specifically, the guidelines should detail the layout requirements for correct solar orientation of dwellings.

#### **4.3.3.4 *Constructing demonstration houses***

The construction of demonstration houses have multiple benefits. Firstly, demonstration houses represent an important mechanism to familiarise

communities with the concept of thermally efficient housing and the associated costs and benefits, and obtain their buy-in to the concept and that of the municipalities. Secondly, they can demonstrate the feasibility and effectiveness of energy-efficient housing to national government. Clearly, this could have significant implications for policy-making, and housing construction techniques. Thirdly, demonstration houses provide important opportunities for testing new technologies and the variability in needs of various climatic zones. Fourthly, demonstration houses represent a useful way of taking up the opportunities currently being afforded by international funding agencies (specifically, GEF) to investigate approaches to remove the institutional, economic and social barriers to achieving investments in thermal improvements. These houses can therefore have both lobbying and informational benefits, and at relatively little cost.

Demonstration houses could be constructed by a number of different institutions including government, Eskom, research and implementing agencies, housing support groups, developers as well as by coalitions of any of these groups. Their construction should be prioritised, because information and access barriers experience by the urban poor are directly addressed, as well as affordability and risk related concerns. The construction of these homes can catalyse extensive new investment in thermal efficiency, and possibly even local economic development.

To ensure the success of the demonstration housing projects:

- the selected community should be included at the start of the project;
- a process of awareness raising should accompany the design and construction of the demonstration house and the community should be invited to participate in the design process;
- the house should be affordable to the community (within the subsidy amount);
- the house should be replicable at scale; and
- monitoring and evaluation of the process (including replicability, acceptance, and affordability) and the scale and stability of project benefits (including avoided energy consumption, avoided greenhouse gases, local economic development and community capacity building) should be built into the design of demonstration project.

#### 4.3.3.5 *Disseminating information materials*

Information dissemination programmes about thermal efficiency are important for reasons already discussed in the document. The development and dissemination of information materials needs to occur at different levels. Firstly, information should target the household and community level. Providing information to (prospective) homeowners would enable them to voice their concerns about the types of materials that are used by developers in the construction of their homes, as well as the houses' design and orientation. Self-build construction practices would also be informed. Secondly, information materials should be targeted at those involved in the housing design and delivery process. Finally, housing policy-makers require information to assist them to create an enabling environment for the construction of energy-efficient low-cost housing.

It is vital that the information materials are accessible to their target audience – that is, that they are practical and easy to understand and to implement. The types of information required include guidelines for planners, designers, architects, builders, developers and local authorities. These guidelines must go beyond broad principles, demonstrating practical steps for planning, designing and evaluating the thermal performance of energy-efficient housing developments. Furthermore, the guidelines should offer tools to complete these steps and should include process issues such as, for example, community participation processes. A database of energy-efficient building materials and existing environmentally sound housing projects is required to support the initiatives of developers and designers. Information targeted at policy-makers could include policy-related briefs and information on new developments, projects and critical success factors. A range of

planned and existing information programmes and materials are already targeted at the community and local level. These include the DME energy handbook and Electrowise and HEAT programme information materials.

The above-mentioned Interdepartmental Committee should be responsible for developing or commissioning new information materials and guidelines. Eskom, research organisations, environmental NGOs and housing support and implementation bodies are among the groups who could be drawn on by the Interdepartmental Committee to support this endeavour. The dissemination of information to communities can take place through the activities of the proposed energy and environment advisors, Eskom's local representatives and private and local authority developers.

#### **4.3.4 Appliance efficiency**

##### **4.3.4.1 Building capacity in government**

Human resource development is necessary to build capacity in government to develop appliance efficiency programmes and co-ordinate their implementation. Part of the capacity building exercise should be to build relationships with other government departments who make policies that will affect the appliance efficiency product.

A working group could be constituted by the DME with representation from various stakeholders, including Eskom, manufacturers, the SABS, consumer bodies, the Association of Municipal Electrical Undertakings (AMEU), research organisations and retailers, to drive a national appliance efficiency programme and to oversee and give direction to the implementation of appliance efficiency strategies in South Africa. This working group could become part of the proposed national energy efficiency agency or should be, at the very least, linked to the activities of the agency.

Establishing capacity to run an appliance efficiency campaign in South Africa is important. Initiatives such as the one described in section 4.3.4.2 below cannot realistically be implemented until this is done.

##### **4.3.4.2 Disseminating information**

The most important strategy for the appliance sector is to disseminate information to as many people and organisations in the low-income sector as possible on what to investigate when purchasing new and second-hand appliances, as well as on why energy efficiency is important. This strategy calls for the incorporation of existing initiatives such as the energy handbook, and the HEAT programme, as well as the Electrowise and Enerwise campaigns. The energy advice centres (section 4.3.1.4, and the energy and environment advisors (section 4.3.1.6), could also assist in developing and disseminating this information.

It would make most sense for the appliance efficiency working group, linked to the national energy efficiency agency proposed in section 4.3.4.1 above to lead this initiative. Eskom could support it, though care should be taken that electrical appliances are not prioritised over and above non-electrical appliances.

As part of an appliance efficiency information campaign, priority should also be placed on launching an appliance labelling programme, and perhaps thereafter a programme to develop and enforce minimum energy performance standards.

Information about appliance efficiency is important, but as noted in section 4.3.4.1, it is unlikely that a campaign such as this could be launched until capacity had been established in government for this sector. Therefore, the first priority is to do address this. Once this capacity has been put in place, however, one of its first tasks should be to look into informational needs in this sector.

#### **4.3.4.3** *Establishing or reviewing structures to test, certify, monitor and police*

The SABS has adequate testing facilities and capacity to test the energy performance of appliances. Furthermore, the SABS has safety inspectors who buy appliances from shops to test them. If there are critical problems with the product, the SABS is obliged to advise and assist in the upgrading of the product. Prior to implementation of any appliance efficiency initiative (such as the appliance labelling and minimum standards programmes mentioned in section 4.3.4.2 above), however, it is essential that testing and certification methods are developed and that the internal arrangements are in place within the SABS to ensure that its activities are effective. These should include mechanisms for ensuring that quality control for the energy performance of appliances are not only in place, but are also effective.

This initiative should be co-ordinated by an appliance efficiency working group within the DME. As with information dissemination, these structures should be set up and/or refined once there is capacity within government to manage these processes.

#### **4.3.4.4** *Undertaking research and development*

It is important that research investigating how best the South African appliance industry can assimilate itself into the global market is undertaken. Research and development activity should address electrical as well as non-electrical appliances: indeed, it is possible that South Africa's niche could be found in the development of energy-efficient non-electrical appliances.

Research initiatives (by research organisations, standards bodies, as well as Eskom and appliance manufacturers) investigating these types of issues are already under way in South Africa. They should be supported and encouraged. National research councils, as well as international funding agencies, could potentially provide support for such research and development.

This strategy has been prioritised in this document because of the dearth of energy-efficient appliances in the country. Until more efficient appliances are made available, low income-households cannot hope to make energy efficiency improvements in this regard.

### **4.3.5** **Energy-efficient lighting**

It makes sense for Eskom to head the South African initiative on introducing energy-efficient lighting into low-cost housing. The strategies presented below are therefore directed specifically at Eskom's programme, which, as noted in Part II of this document, is currently being designed. Thus, the strategies proposed below are more specific than the ones presented for fuel-switching, thermally-efficient housing and appliance efficiency.

#### **4.3.5.1** *Strengthening Eskom's energy-efficient lighting working group*

Eskom's energy-efficient lighting working group is currently small, and operates on an ad hoc basis. This group has the potential to shape and initiate the way in which energy-efficient lighting is introduced into low-income households, and as such should be bolstered. This can be done in two ways. Firstly, Eskom should allocate additional capital and human resources to the working group. Secondly, a wide range of stakeholders should be invited to become part of a reference group to be called upon for guidance and support when and where necessary. Stakeholders invited to contribute to this process could include retailers, local service providers, local government, research and/or implementing organisations, funders as well as the proposed national energy efficiency agency. Importantly, retailers and other organisations seeking to sell CFLs should not be seen as competitors, but rather as allies.

This approach should be adopted immediately by Eskom. Not only will it lend credence to Eskom's activities, but it also has the potential to widen the outreach of the programme.

#### **4.3.5.2 *Developing and disseminating information materials***

In order to promote the investment by households in energy-efficient lighting, it is vital that information materials are developed and disseminated as widely as possible. Information which targets policymakers and politicians should also be developed. Materials developed should be in the form of easily understood brochures as well as other media forms (television advertisements, posters, radio and so on). These information materials should also be used to bolster the national information programmes on energy efficiency as proposed in section 4.3.1.3.

Some of this lighting information exists, but much of it must still be put into a simple format, and then disseminated. Eskom's energy-efficient lighting working group, with support from its reference group should take responsibility for this. The proposed energy advice centres and energy and environment advisors could be used as mechanisms to disseminate the information developed, together with Eskom and local service providers' meter readers.

This initiative is important, and should be addressed immediately. It directly addresses information, access and risk barriers faced by poor households, it can be linked in with initiatives already underway (for example, the energy handbook, Electrowise campaigns, as well as meter reading services), and it can be realistically implemented.

#### **4.3.5.3 *Undertaking social analysis***

It makes sense that Eskom lead the energy-efficient lighting initiative for low-income households in South Africa. This does not mean, however, that the research undertaken by Eskom should focus only on determining the impact of the programme on the grid. Research should also include a thorough investigation into the potential social impacts of such a programme. This is vital as desired impacts on the grid can only be achieved if customers are content with the lighting devices that enable peak energy savings to occur.

Social analysis should commence at the outset of first pilot projects. Eskom should take lead responsibility for the various analyses, but contract them out to relevant research and implementation bodies. Social analysis is viewed as a priority in this document because it lends to the sustainability of the programme.

#### **4.3.5.4 *Conducting door-to-door visits and encouraging community participation***

As a means of introducing energy-efficient lighting to poor communities, it is suggested that Eskom undertake door-to-door visits to households in this sector. Not only will this improve Eskom's and local service provider's relationship with its customers, it will also allow people to gain first hand experience of what this type of lighting entails. This initiative could also be undertaken by the proposed energy advice centres. Eskom should also seek to actively engage community organisations in their initiative to distribute the lamps.

The energy efficiency lighting groups should take responsibility for this activity. The working group could contract it out to research or implementing organisations, or local service providers, or it could be undertaken by Eskom staff (or students). The bodies that finally undertake the visits should work closely with those undertaking the social analyses. This activity has been prioritised here because it seeks to address the access and information barriers faced by the urban poor. It could also link in with other activities (such as meter reading).

#### **4.3.5.5 *Subsidising lamp purchases***

Eskom, or retailers should not rely only on marketing strategies as a means of distributing lamps. Economic analysis has shown that investments in energy-efficient lighting will be feasible for low-income households only if the retail price of CFLs is subsidised.

Economic analysis shows that Eskom can subsidise R50 lamps by at least 20% and still make savings in terms of avoided generation costs and peak installed capacity. The energy-efficient lighting working group should collaborate closely with lamp

retailers in South Africa. If, for instance, retailers are able to offer discounted prices for the lamps, the working group should support their initiatives, as well as using the opportunity to conduct or commission social analyses of the purchases.

This activity is important because it directly addresses the affordability and access barriers faced by low-income households. In addition, it has the potential to make the most of opportunities and/or initiatives currently available (collaboration with retailers, and distribution of lamps partially subsidised by international organisations such as GEF, for instance). Furthermore, it could be a catalyst for spin-off development in low-income areas: if households pay less for energy-efficient lighting, there will possibly be additional spending capacity for other services, or lighting improvements.

#### **4.4. Summary of prioritised strategies**

This section presents a summary of the prioritised strategies that have emerged. The strategies are presented as cross-cutting, fuel switching, thermally-efficient low-cost housing, appliance efficiency and energy-efficient lighting strategies. The tables show why the strategies have been prioritised, as well as which barriers they address.

Strategies	Barriers addressed				Planning period		Priority criteria addressed				
	Afford-ability	Inform-ation	Access	Risk	ST	MT	Realistic	Maximising current opportunities	Links with other initiatives	Catalyzer of change and/or progress	Supports local economic development
<b>Cross-cutting</b>											
Establishing and supporting a national energy-efficiency agency		✓				✓	✓	<ul style="list-style-type: none"> <li>US/SA Bi-National Commission's interest</li> </ul>	<ul style="list-style-type: none"> <li>DME business plan</li> </ul>	✓	
Restructuring the DME					✓		✓	<ul style="list-style-type: none"> <li>Political climate/policy review</li> </ul>	<ul style="list-style-type: none"> <li>Ongoing departmental debate</li> <li>Energy policy white paper</li> </ul>	✓	
Developing and disseminating information materials about energy- and thermal efficiency, and best fuel mixes		✓	✓	✓	✓		✓		<ul style="list-style-type: none"> <li>HEAT prog.</li> <li>Energy handbook</li> <li>Enerwise</li> <li>Electrowise</li> </ul>	✓	
Establishing and supporting energy advice centres		✓	✓	✓	✓		✓	<ul style="list-style-type: none"> <li>Government's electrification prog.</li> </ul>	<ul style="list-style-type: none"> <li>Various local initiatives</li> </ul>	✓	✓
Distributing packages of good(s) and services	✓	✓	✓	✓			✓		<ul style="list-style-type: none"> <li>FINESSE prog.</li> </ul>	✓	
Supporting energy and environment advisors		✓	✓	✓	✓		✓	<ul style="list-style-type: none"> <li>DANCED's SEED prog.</li> <li>National Lotteries Commission</li> </ul>	<ul style="list-style-type: none"> <li>HEAT prog.</li> <li>IIEC</li> </ul>	✓	

Strategies	Barriers addressed				Planning period		Priority criteria addressed				
	Afford-ability	Inform-ation	Access	Risk	ST	MT	Realistic	Maximising current opportunities	Links with other initiatives	Catalyzer of change and/or progress	Supports local economic development
<b>Fuel switching</b>											
Integrating all fuels into strategic frameworks and information materials		✓	✓	✓	✓		✓	<ul style="list-style-type: none"> <li>• DME's proposed restructuring</li> <li>• Energy Policy White Paper</li> </ul>	<ul style="list-style-type: none"> <li>• Eskom's demarketing initiatives</li> <li>• HEAT prog.</li> <li>• FINESSE prog.</li> </ul>	✓	
Disseminating information on and promoting an awareness for the best fuel mix as well as the health and safety aspects of fuel use		✓		✓	✓		✓	<ul style="list-style-type: none"> <li>• Energy Policy White Paper</li> <li>• DANCED's SEED programme funding</li> <li>• National Lotteries Commission</li> <li>• Government's electrification prog.</li> </ul>	<ul style="list-style-type: none"> <li>• Energy handbook</li> <li>• PASASA's safe cap programme</li> <li>• LPGSA's health and safety initiatives</li> <li>• Energy and Environment Advisors</li> <li>• Electrowise</li> <li>• Enerwise</li> <li>• Low-smoke fuel prog.</li> <li>• HEAT prog.</li> <li>• FINESSE</li> </ul>	✓	

Strategies	Barriers addressed				Planning period		Priority criteria addressed				
	Affordability	Information	Access	Risk	ST	MT	Realistic	Maximising current opportunities	Links with other initiatives	Catalyzer of change and/or progress	Supports local economic development
<b>Thermally-efficient housing</b>											
Establishing and supporting the inter-departmental Committee		✓		✓	✓		✓	<ul style="list-style-type: none"> <li>Government's housing prog</li> </ul>	<ul style="list-style-type: none"> <li>Ongoing departmental debate</li> </ul>	✓	
Lobbying government		✓			✓				<ul style="list-style-type: none"> <li>Eskom and others' lobbying interests</li> </ul>	✓	
Constructing demonstration houses	✓	✓	✓	✓	✓		✓	<ul style="list-style-type: none"> <li>GEFs funding opportunities</li> <li>AIJ/IFC funding opportunities</li> <li>US/SA Bi-National Commission's interest</li> </ul>	<ul style="list-style-type: none"> <li>Eskom's activities</li> <li>Local-level initiatives</li> <li>DME activities</li> </ul>	✓	✓
Disseminating information on thermal efficiency		✓	✓	✓	✓			<ul style="list-style-type: none"> <li>Government's electrification prog.</li> </ul>	<ul style="list-style-type: none"> <li>Energy handbook</li> <li>Energy and Environment Advisors</li> <li>HEAT prog.</li> <li>Eskom's work</li> </ul>	✓	
Including no-cost options into the subsidy criteria	✓		✓	✓	✓		✓	<ul style="list-style-type: none"> <li>Government subsidy scheme</li> <li>Government housing prog.</li> </ul>		✓	
Establishing a database of available materials		✓	✓		✓		✓			✓	✓
Training and accrediting builders and developers			✓	✓		✓					✓

Strategies	Barriers addressed				Planning period		Priority criteria addressed					
	Affordability	Information	Access	Risk	ST	MT	Realistic	Maximising current opportunities	Links with other initiatives	Catalyzer of change and/or progress	Supports local economic development	
<b>Appliance efficiency</b>												
Building capacity in government					✓		✓			• Eskom's work		
Disseminating information and thermal efficiency		✓				✓	✓			• DME's appliance labelling work	✓	
Testing, certification, monitoring and policing		✓				✓	✓					
Undertaking research and development		✓		✓		✓	✓			• Manufacturers / distributors R&D	✓	

Strategies	Barriers addressed				Planning period		Priority criteria addressed				
	Affordability	Information	Access	Risk	ST	MT	Realistic	Maximising current opportunities	Links with other initiatives	Catalyzer of change and/or progress	Supports local economic development
<b>Energy-efficient lighting</b>											
Strengthening Eskom's energy-efficient lighting working group					✓		✓	• IFC interest		✓	
Developing and disseminating information materials		✓			✓			• Government's electrification prog.	• Energy handbook • Electrowise initiatives	✓	
Undertaking social analysis		✓		✓	✓				• Pilot projects • Retailers activities		
Conducting door-to-door visits and encouraging community participation		✓	✓		✓				• Meter reading • Local service providers' services	✓	✓
Subsidising lamp purchases	✓				✓			• IFC interest	• Retailers' initiatives • Pre-payment card sales • Utility bills	✓	

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