A Survey of Energy Related Behaviour and Perceptions in South Africa

The Residential Sector

2013

energy
Department:
Energy
REPUBLIC OF SOUTH AFRICA

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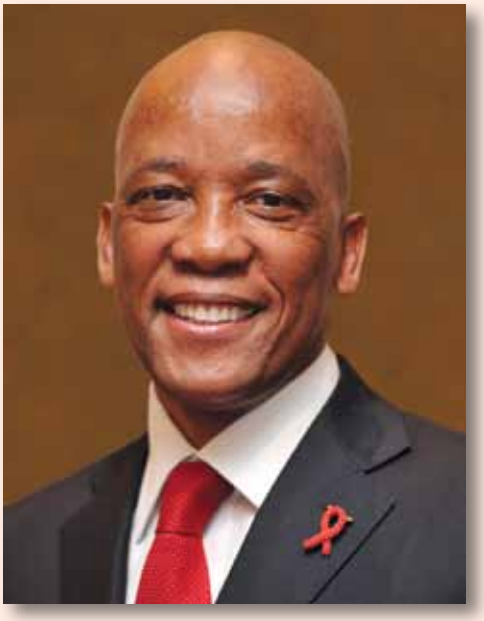
Minister's Foreword



The delivery of energy services are extremely important since, perhaps more than any other facet of development, energy touches upon virtually every aspect of society. At the United Nations Millennium Summit in September 2000, world leaders placed development at the heart of the global agenda by adopting the Millennium Development Goals (MDGs). The MDGs provide concrete, time-bound objectives for dramatically reducing extreme poverty in its many dimensions by 2015 while promoting gender equality, education, health, and environmental sustainability. Although none of the MDG refers to energy explicitly, improved energy services are necessary for meeting all these goals. For instance, cooking with coal, firewood, crop residues or dung is associated with significantly higher child mortality rates, diminishing maternal health and general disease burden from smoke. More and better energy service are needed to end poverty, hunger, educational disparity between boys and girls, the marginalization of women, major disease and health service deficits, as well as environmental degradation.

Even though South Africa has been lauded by the international community as a successful example of sustained political commitment to creating incentive frameworks that have led to significant expansion of electrification to all South Africans, we cannot rest on our laurels. Since 1994 the Integrated National Electrification Programme (INEP) has been able to connect 5.4 million households and to date about 85% of all households in South Africa have access to electricity. From 1994 to 2011, government had successfully increased the proportions of households that have access to energy from 30% to 85%. It is now striving to realise universal access by 2025 using a combination of grid and non-grid technologies. This timeline is coherent with the National Development Plan.

In striving towards universal access to energy and quality services it is imperative to conduct annual residential sector surveys, gathering information about energy related perception and behaviour in South Africa. The ultimate aim of these surveys is to provide the Department with valuable empirical evidence that will assist the Department to deliver on its mandate. These surveys contribute to understanding, monitoring, measuring and evaluating the impact and progress of the department. The execution of the actual surveys provides temporary job opportunities to the unemployed in the sampled areas and also provides training opportunities. This is done in a bid to improve people's chances of getting employment of a similar nature in future. The outcome and results of this survey, together with the recommendations, are cited in detail in this report.

Mr. Dikobe Ben Martins, MP
Minister of Energy

Deputy Minister's Foreword

As a developing country the effectiveness of our programmes should not be assessed on the benefits to the most prosperous of South Africans but should be measured by the improvement of the quality of life among those most vulnerable. While there has been substantial progress in servicing high income households, a significant proportion of low income households still do not have access to electricity. In addition, on average, South African households spend 14% of their total monthly household income on energy needs which is higher than the international benchmark of 10% for energy poverty. Furthermore, results show that close to half of all South African households is energy poor. Almost three quarters (72%) of households in the poorest quintile are energy poor. Even high income households are suffering under the burden of higher electricity prices with 18% of households among the richest quintile being energy poor.

Poorer households in South Africa are carrying an enormous energy burden. Remarkable strides have been accomplished by the Department in cushioning the poor against high energy costs. Policies such as the Free Basic Electricity (FBE), Free Basic Alternative Energy (FBAE) and Inclined Block Tariff (IBT) have been developed and offer welcome relief to ensure that these households do not get trapped even deeper into poverty and vulnerability. Currently, the FBE policy allows electrified households 50kWh of electricity free of charge. Non-electrified households benefit from the FBAE. In April 2010 the IBT was also introduced, implying that lower-consuming customers benefit from a lower tariff rate. All of these policies are designed to assist poor households.

Going forward, as guided by this study, the Department will examine an official definition of energy poverty for the country. This will be used as a baseline to monitor and track energy poverty levels in South Africa. Energy price reviews are continuously being examined to ensure that households do not get further entrapped in energy poverty. As a matter of urgency, residential energy pricing models and tariff structures will be reviewed.

We hope that this report will help the Department to further assess and assist households with the provision of energy and will also help achieve an energy-literate South Africa, who would make well-reasoned decisions about energy options and who would use the national resources more optimally. The outcome and results of this survey, together with the recommendations, are cited in detail in this report.

Ms. Barbara Thompson, MP
Deputy Minister of Energy

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Acronyms

49M	49 Million Campaign
AgriSA	Agriculture South Africa
Amps	Amperes
ANOVA	Analysis of Variance
COSATU	Congress of South African Trade Unions
CPI	Consumer Price Index
CSP	Concentrated Solar Power
DME	Department of Minerals and Energy
EA	Enumerator Area
EAI	Energy Awareness Index
EC	Eastern Cape
EPI	Electricity Pricing Index
EQI	Electricity Quality Index
ESI	Electricity Satisfaction Index
ESI	Electricity Supply Industry
ESKOM	South African Electricity Supply Company
FBAE	Free Basic Alternative Energy
FBE	Free Basic Electricity
FS	Free State
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GP	Gauteng Province
GW	Gigawatts
HSRC	Human Sciences Research Council
IBT	Inclined Block Tariff
IEA	International Energy Agency
INEP	Integrated National Electrification Programme
IPP	Independent Power Producers
IRP	Integrated Resource Plan
KZN	KwaZulu-Natal
LP	Limpopo Province
LSM	Living Standard Measurement
MDG	Millennium Development Goals
MP	Mpumalanga Province
MW	Megawatt
MYPD	Multi-Year Price Determination
NERSA	National Energy Regulator of South Africa
NC	Northern Cape
NDP	National Development Plan
NW	North West
PAI	Protest Action Index
PV	Photo-voltaic
TAC	Treatment Action Campaign
SABRE-GEN	South African Bulk Renewable Energy Generation
SACP	South African Communist Party
SANCO	South African National Civic Organisation
SASAS	South African Social Attitudes Survey
SECC	Soweto Electricity Crisis Committee
SHS	Solar Home System
Stats SA	Statistics South Africa
TAC	Treatment Action Campaign
TWh	Terawatt hours
WC	Western Cape
YCL	Young Communist League

Concepts

Decile
A decile is one tenth or 10% of a given amount or number.

Energy Poverty
Expenditure-based approach: A household that spends more than 10% of their net income on energy is regarded as energy poor or in energy poverty.

Subjective approach: a household is considered energy poor if it is characterised by one or more of the following attributes: (i) the amount of energy the household uses is reported as being less than adequate for its needs; (ii) the amount of energy the household uses for lighting is reported as being less than adequate for its needs; (iii) the amount of energy the household uses for cooking is reported as being less than adequate for its needs; (iv) the amount of energy the household uses for heating rooms and keeping warm is reported as being less than adequate for its needs.

Thermal inefficiency approach: Another measure of energy poverty relies on assessments of the condition of one's place of residence, focusing particularly on thermal comfort levels relative to social needs. In essence, this involves rating the thermal efficiency of dwelling units, since this influences the amount of energy required to heat the home to an acceptable standard and typically represents a notable determinant of domestic energy costs.

Low income and thermal inefficiency: a household is considered energy poor if it has less than 60% of South Africa's median per capita monthly income, and meets one or more of the following conditions: (i) the household reports that it is dissatisfied or very dissatisfied with its accommodation; (ii) the state of repair of the household's accommodation is described as "poor"; (iii) one or more of the following problems are reported with the accommodation: lack of adequate heating, a leaky roof, damp walls, floor or foundations, or damaged or broken windows or doors; (iv) the health of a household member has deteriorated due to the housing conditions.

Household Monthly Income
The amount of income accruing to a household per month.

Kish Grid
It is a technique/grid used in equal-probability SAMPLING for selecting cases at random when more than one case is found to be eligible for inclusion when the interviewer calls at a sampled address or household.

Living Standard Measurement (LSM)
A wealth indicator which uses assets or basic services to determine a living standard measure. The measurement is classified from LSM 1 to LSM 10.
Low LSM: This group comprise LSM 1-LSM 3 categories.
Medium LSM: This group comprise LSM 4-LSM 6 categories.
High LSM: This group comprise LSM 7-LSM 10 categories.

Table 1: Imputed Average Monthly Income for Each Living Standard Measure (LSM) Category

LSM	2001/02	2003/04	2005/06	2007/08	2009	2010	2011
LSM1	R 804	R 878	R 999	R 1 080	R 1 386	R 1 448	R 1 369
LSM2	R 963	R 1 076	R 1 214	R 1 401	R 1 564	R 1 859	R 1 952
LSM3	R 1 200	R 1 412	R 1 521	R 1 795	R 2 116	R 2 153	R 2 545
LSM4	R 1 596	R 1 792	R 1 940	R 2 536	R 2 580	R 2 966	R 3 141
LSM5	R 2 239	R 2 436	R 2 681	R 3 122	R 3 627	R 3 965	R 4 200
LSM6	R 3 625	R 4 057	R 4 404	R 5 386	R 5 990	R 6 573	R 6 454
LSM7	R 5 662	R 6 437	R 6 841	R 8 677	R 9 694	R10 081	R11 022
LSM8	R 7 537	R 8 429	R 9 252	R12 337	R13 188	R13 979	R14 877
LSM9	R10 234	R11 499	R12 558	R16 296	R17 809	R18 860	R20 667
LSM10	R15 072	R18 643	R19 817	R23 054	R26 602	R28 038	R30 559

Source: Developmental Indicators (2012)

Per Capita Monthly Income

The amount of money accruing to a household per month

Quintile

A quintile is one fifth or 20% of a given amount or number.

Poorest per capita quintile

The poorest quartile represents the lowest fifth of the data (1-20%).

Quintile 2 (Q2)

The second quartile represents the second fifth (21% - 40%) of the data.

Quintile 3 (Q3)

The third quartile represents the third fifth (41% - 60%) of the data.

Quintile 4 (Q4)

The fourth quartile represents the fourth fifth (61% - 80%) of the data.

Richest per capita quintile

The richest quartile represents the highest fifth (81% - 100%) of the data.

Solid Fuel

Solid fuel refers to various types of solid material that are used as fuel to produce energy and heating, usually released through combustion (eg. firewood, coal, animal dung).

Universal household access to energy

All households to have access to modern energy sources which includes electricity and a range of renewable energy sources while it excludes health and environmental hazardous energy sources such as paraffin, candles, firewood.

Year of Study

The 2011 results in this study refer to the 2011/2012 financial year.

The 2012 results in this study refer to the 2012/2013 financial year.

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Executive Summary

The **primary objective** of this survey was to gather information about energy related behaviour in South Africa. A similar survey was conducted in 2011 and the intention is that this study will become an annual study with a survey on energy related behaviour conducted every year. This survey intended to explore multiple energy use and energy poverty in South Africa and also explored satisfaction with electricity provisions as well as perceptions about the quality and pricing of electricity and other energy sources. In addition, the survey gathered views on electricity-saving strategies and policy preferences. Two thousand five hundred and eighteen South Africans participated in the survey, a sample representative of the country's population.

Despite the stated problems as well as some delays with universal access, the Department of Energy as the provider of electricity is generally hailed as successful by South Africans. The South African Social Attitudes Survey (SASAS) has been monitoring satisfaction with key services in the country since 2003 and results show that South Africans are relatively **satisfied with the provision of electricity**. The provision of electricity is rated second highest, after the provision of social grants.

For those that have access to electricity, it is mainly in the form of an in-house pre-paid meter (60%) or an in- house convention meter (30%). Those households which do not have electricity were primarily found in KwaZulu-Natal (15%) and Eastern Cape (19%). This finding is consistent with national figures which indicate that these provinces have the biggest backlog. One percent indicated that they are connected to some other source which they either pay for or don't pay for. Speculations about the existence of illegal connections are rife but in this survey only 1% of households reported having an illegal connection. Although there might be some underreporting (since this is not a socially desirable response) the number of households using illegal connections to gain access to electricity is not common. According to this finding approximately 144 501 households in South Africa therefore have an illegal electricity connection with most of these illegal connections found in informal settlements.

Looking at **household energy sources**, it is evident that considerable patterns of difference exist between electrified and non-electrified households in the range of energy sources that they employ to meet their basic needs. Those with electricity all reported that they used this source either for lighting, cooking or heating, though it is apparent that other sources such as candles, paraffin, firewood and gas continue to be relied upon in at least a fifth of cases. Conversely, in the absence of a domestic connection, non-electrified households rely primarily on candles, firewood and with more nominal shares reporting the use of coal and gas. The use of solar power is used by approximately a tenth of electrified and non-electrified households. Dry cell batteries are used by almost a third (31%) of non-electrified households-mostly to run appliances such as radios. Car batteries or generators hardly feature for electrified and non-electrified households alike, being reported in fewer than 7% of cases. Socio-economic differences continue to play a role in domestic energy use with candles, firewood and paraffin present in more than 70% of low income households whilst almost near universal access is noted in medium and high income households.

While one may not expect considerable **year-on-year changes** in this pattern of energy use, it is important to compare the extent of stability and change in domestic energy consumption patterns between 2011 and 2012. During this period, electricity usage has remained the same, but the use of candles and paraffin in both electrified and non-electrified households decreased. This is an encouraging sign, pointing to the diminishing use of hazardous energy sources and illustrating progress toward fulfilling development goals. However, somewhat concerning is the fact that firewood usage (especially among non-electrified households) has increased. Although this increase might be due to economic pressures and the fact that wood is often freely available, this is a trend that is concerning and should be monitored. In relation to gas, coal, dry cell and car batteries as well as generator usage little observable differences were noted. Encouraging however is the finding that, in line with the Department of Energy's long-term priorities, use of solar power appears to be increasing, rising from 4% of electrified households and 2% non-electrified households in 2011 to 9% in 2012.

In terms of **lighting**, households that have been electrified almost exclusively use electricity for lighting purposes (97%), with a marginal contingent specifying that they continue to rely on candles (1%). By contrast, three fifths of non-electrified households (59%) rely on candles as the main source of lighting, with paraffin accounting for the predominant energy source for this purpose in most of the remaining cases (36%). Other energy sources hardly feature, and no single option is mentioned in more than 2% of cases. These findings are broadly similar to 2011 findings, the only exception being that for non-electrified households the use of candles for lightning decreased from 67% in 2011 to 59% in 2012, with an accompanying increase in paraffin use from 26% to 36%.

Since **cooking** represents one of the most energy-intensive applications it is unsurprising that more than three-quarters (77%) of households in South Africa use electricity as the main energy source for cooking with only a tenth of households continue to depend on firewood as a main cooking source, with marginal shares reporting use of gas, solar electricity, paraffin and coal. For non-electrified households, firewood and paraffin predominate as the main energy source for cooking purposes (54% and 38% respectively). As with lighting, gas, coal, solar electricity and electricity from generators are used in a small percentage of households as the primary source to meet their cooking needs. Again these findings are broadly similar to 2011 findings, the only exception being that for non-electrified households the use of firewood for cooking increased from 40% in 2011 to 54% in 2012 and the use of paraffin decreased from 50% in 2011 to 38% in 2012. Given the recent increase in paraffin prices, this finding is not at all surprising and firewood is in all likelihood a compensation for higher paraffin prices. Although the decrease in the use of paraffin is positive, the increased use of firewood remains a concern.

Apart from cooking, another energy-intensive thermal application is **domestic space heating**. On aggregate, three fifths of South African households (60%) use an energy source to heat spaces and keep warm, with the remainder not using energy sources but opting mainly to wear warm clothing and to use blankets. When the main energy source for space heating was examined by electrification status, it was found that in electrified households, 45% primarily use electricity, with nominal shares reporting firewood, paraffin and other energy sources (7%, 4% and 5% respectively). A considerable share of electrified households (39%) use no energy source for heating, choosing instead to make use of blankets, warm clothing or nothing at all. In non-electrified households, firewood is the primary form of energy relied on for space heating, present in 29% of homes. The share using paraffin is 11%, with 'other sources' consisting mainly of coal (5%). More than half (53%) of non-electrified households do not make use of any energy source to stay warm – thus rather using blankets and warm clothing. In 2011 the percentage of non-electrified households not making use of any form of energy to heat rooms was only 36%. The increase in 2012 can again be a function of escalating energy costs.

In terms of **heating water for bathing purposes**, a large proportion (80%) of households is reliant on a single energy source with two thirds (66%) of households using some form of electrical appliance to heat water for this purpose. In electrified households, the most common appliance used to heat water for bathing is an electric geyser (31%) followed by and electric kettle (23%) or an electric kettle and stove (7%). Conversely, although the majority (79%) of non-electrified households also use a single source to heat up water for bathing, the sources are mostly exclusively firewood (46%) with about a quarter (27%) households also exclusively using paraffin. A combination of firewood and paraffin is used by 16% of non-electrified households.

With respect to energy choices and preferences for **heating water for purposes** other than bathing, the survey shows that 95% of South African households on average rely on a single energy source, with a small share (5%) characterised by multiple energy use. In the case of electrified households, 83% use some electrical appliance to heat water. In the case of non-electrified households, firewood is exclusively used in 52% of households followed by a further 38% that exclusively use paraffin.

In addition to multiple energy use, the study also focused on energy poverty and provides a profile of **energy poverty** among South African households using three different approaches: namely, the commonly-applied energy

poverty ratio based on household energy expenditure relative to income, a subjective approach, and an approach based on the energy (thermal) efficiency of households. The profile of energy poverty using the expenditure approach, compared with that generated by the subjective and thermal efficiency approaches provides differences in terms of both the overall incidence of energy poverty, as well as the identification of sub-groups as energy poor.

Using the energy expenditure approach, results show that more than two-fifths (43%) of all South African households are classified as energy poor. This result indicates a modest decline in energy poverty since 2011 when 47% of households were classified as energy poor. There is little variation based on electrification status, while material deprivation is clearly associated with energy poverty. Around a third (34%) of high living standard households are energy poor, compared with 38% of households with a low living standard and 50% of those with medium living standard. As for income status, nearly three-quarters (72%) of households in the poorest quintile are energy poor, compared to barely a fifth of households (18%) in the richest quintile. Slightly under half (48%) of households in rural traditional authority areas are energy poor compared with a slighter lower share (40%) in formal urban areas. Households in the Western Cape are less likely to be energy poor (27%) than those in the Eastern Cape (50%), Gauteng (49%) and KwaZulu-Natal (48%) provinces.

Using the **subjective approach**, results show that a quarter of households (26%) indicated that the amount of energy available was generally inadequate for its needs, a figure that has remained virtually unchanged since 2011 (25%). Slightly lower shares feel that the energy available for lighting is inadequate, mentioned by 23% in 2011 and 19% in 2012, while approximately a quarter of households in both years expressed the view that the energy available for cooking was inadequate for domestic needs. Slightly higher perceived inadequacy was observed in relation to the energy available to meet the requirements of heating rooms and keeping warm, though again this has shown a modest decline between the rounds of interviewing. For all four indicators, less than a quarter of households suggest that the energy available to them is more than adequate to accommodate their domestic energy requirements.

Using the low **income and low energy efficiency definition**, results show that 26% of households were energy poor in 2012. This represents a modest increase from 22% in 2011. Households that are non-electrified, and those with a lower living standard level and income status are predisposed towards being identified as energy poor. Households in rural traditional authority areas have a considerably higher incidence of energy poverty, while those in informal urban settlements and on rural farms are more inclined to be energy poor than those based in formal urban areas.

The majority (67%) of South Africans were **satisfied with electricity** provision in their neighbourhoods, with 20% being dissatisfied. The rest were neither satisfied nor dissatisfied (12%) or unsure (1%). In order to determine who was most likely to be satisfied or dissatisfied, an Electricity Satisfaction Index (ESI) was constructed. The average means score for the Electricity Satisfaction Index (ESI) out of a 100 is 63.8, indicating that satisfaction with electricity tends to lean towards the positive side. However, it is evident that satisfaction levels differ for the various socio-demographic groups and that satisfaction with electricity has an economic gradient. People who have a low living standard, who live on farms or in informal settlements or reside in the Free State tend to be much less satisfied with electricity than other groups. In contrast, whites, people residing in the Western Cape, Indians/Asians, people older than 60 years or people who have a high living standard are most satisfied with the provision of electricity.

In order to further the analysis about the provision of electricity in South Africa, an explicit question about the **quality of electricity** was included. Just over half (51%) rated the quality of electricity in their area as "very high" or "good". A further third (30%) rated the electricity as acceptable. The rest felt the quality was either poor (15%) or very poor (3%). The ranked mean scores from the Electricity Quality Index (EQI) indicate similar findings to the preceding issue about satisfaction with electricity provision in the neighbourhood. Although the mean EQI score of 60.1 out of a 100 indicates a positive skew, certain groups are generally much less satisfied with the quality of electricity than others. Again an economic gradient is notable, with people with a low living standard or those

residing on farms or in urban informal areas most likely to state that their electricity is of a poor quality. By contrast, Indians/Asians, whites, or people with a high living standard are much more likely to experience electricity of a very high or good quality.

South Africans generally feel they pay too much for electricity. More than a third (34%) of households felt that they pay "far too much" for what they receive, with another 38% saying they pay "too much". Just under a quarter (22%) felt they pay "about the right amount" for what they receive. Very few (3%) said they "pay too little" and 3% were uncertain. In order to determine who were most inclined to feel electricity prices are too high, an Electricity Pricing Index (EPI) was created. Free State residents, people living in urban informal areas, youngsters aged between 16-19 years, people living in Limpopo and black Africans were least inclined than other groups to rate the price of electricity as too high. On the other hand, Indians/Asians, whites, Coloureds and residents from the Western and Eastern Cape as well as those with a high living standard were much more inclined to rate the price of electricity as too high.

In order to gauge how South Africans handled the last electricity price increase, they were asked to indicate which of the following **strategies they employed to deal with the last price increase**. The options were (a) continue to use the same level of electricity and pay the extra amount for it (b) reduce the amount of electricity used (c) use other energy sources such as paraffin, gas, coal, wood or candles (d) other strategies. The strategy employed by most South Africans in the past year to cope with the rising electricity costs was to reduce the amount of electricity used. Almost half of South Africans (48%) employed this strategy. A further 26% continue to use the same level of electricity and pay the extra amount for it. Under a quarter of South Africans (22%) had to use other energy sources to cope with increasing electricity prices, thus encouraging energy switching and energy diversification. This trend was similar to the 2011 trend; however, in 2012 notably more households were embarking on strategies to reduce the amount of electricity used.

A question about **electricity price increases** in the future revealed that 45% of South Africans would reduce the amount of electricity used, 31% would revert to energy switching or multiple energy use, 20% would continue to use the same levels of energy, "if electricity prices were increased tomorrow". These results clearly show that future energy price increases will have a bearing on the types of energies used and would encourage more energy switching. Further analysis revealed that it was mostly households with a medium and high living standard that stated they would reduce the amount of energy used. Energy switching was the preferred strategy for households with a low living standard and households on farms. This trend was very similar to trends found in the 2011 survey.

In the 2011 study, respondents were given a list of **energy-saving measures** and asked to indicate if they were aware of the specific measures and, if so, whether they actually implemented them. These questions were repeated in the 2012 study and very encouraging results are noted, with awareness as well as implementing increasing significantly between the two years. Messages pertaining to energy saving strategies have therefore definitely impacted on more households in 2012 and have on average increased awareness by 10%. Consistent with 2011 levels, the energy-saving measures that households are most aware of are the switching off of lights when leaving the house (89%), followed by switching off appliances (81%) and using energy-saving light bulbs (76%). Fewer people (37%) were aware that the installation of a solar water heater rather than an electric geyser would result in energy saving and only (28%) were aware that the insulation of geysers and hot pipes would lead to energy saving. The energy-saving measure that households utilise most is switching off of lights when leaving the house. Seven in ten households that are aware of this measure actually use this energy saving measure. The national campaign of distributing and marketing energy saving light bulbs has also had an impact, with almost 70% of all people aware of this energy saving measure actually embarking on it. Large proportions of people (60%) also clothed themselves in warm clothes or blankets and switched off appliances at the walls order to save electricity.

An Energy Awareness Index (EAI) was created and it was found that education played a critical role in predicting or determining awareness levels of energy saving measures. People with a tertiary education were almost three times more likely to be aware of energy saving measures than people with no schooling. A socio-economic gradient was also noted; people with a low living standard were much less likely to be aware of energy saving measures than people with a high living standard.

The 2012 national results indicate that there is strong opposition to **illegal connections** with nine in ten people (86%) indicated that it is always wrong to steal electrical cables. A further 6% had a conditional response, saying that it was almost always wrong. Insignificant proportions (3%) said it was not wrong at all. However, **protesting about energy services** (price and access) was a much more acceptable activity and considered to be "not wrong at all" by almost half of the population. Just under half (49%) of people felt it was not wrong at all to protest about the price of electricity, with a fifth (20%) of respondents stating that it was "wrong only sometimes". Just over a quarter (29%) was of the opinion that it was mostly wrong to protest about the price of electricity. The rest (3%) were undecided (stating "Don't know"). Similarly, a large proportion of South Africans (44%) felt that it was acceptable to protest about access to electricity. Slightly more than a fifth (22%) conditionally accepted protest action about access to electricity, stating that "it was wrong only sometimes". Conversely, 12% said it was almost always wrong and 20% said it was always wrong. A small percentage (2%) did not have an opinion about the matter.

In terms of **policy preferences of government priorities**, three-quarters of all adult South Africans stated that the priority of the Department should be to keep electricity prices low. Economic considerations outweighed other priorities by a considerable margin. A further priority, shared by just over half of South Africans (51%), was that the Department should help poor households by giving more free electricity. The third priority, mentioned by 46% of the population, was that the Department should ensure that load-shedding and power cuts are minimised. These were the top three priorities listed by South African people.

In choosing **future sources for electricity generation**, South Africans are clear that economic imperatives are the most important, hence the response of 31%: "It does not matter which source, as long as it is the cheapest". Having said this, a sizeable 24% of South Africans also support renewable energy sources, such as solar, wind and water, with a further 14% explicitly placing emphasis on sources that are not damaging to the environment. Economic and environmental considerations are thus important to South Africans when considering future energy sources. Less than a tenth supported other energy sources such as coal and oil (8%), natural gas (6%), nuclear power (7%) and fuels made from crops (2%).

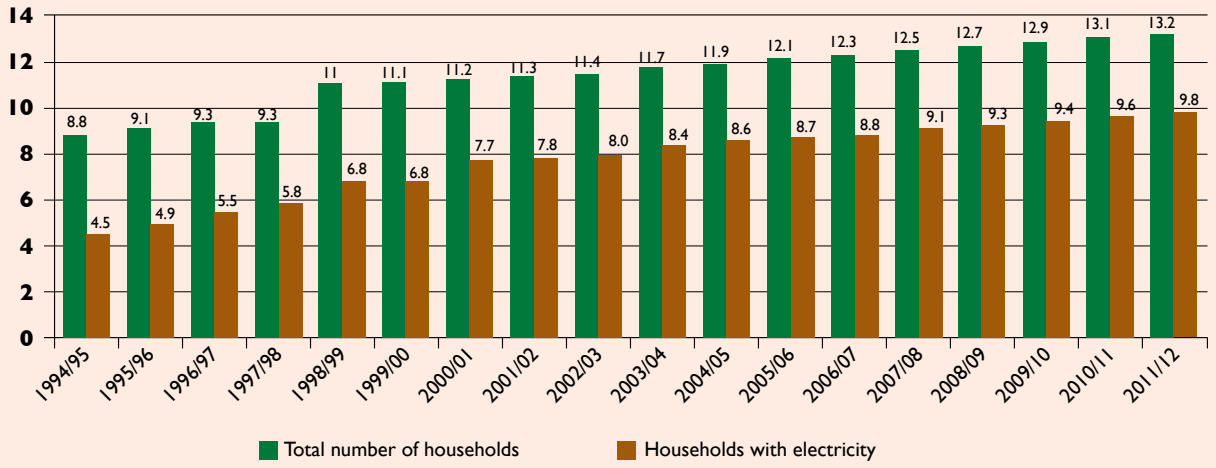
The most preferred **government policy interventions** at a national level were for government to give an amount of free energy per month to all households (79%); to spend money to replace electric geysers with solar geysers (78%); and on campaigns encouraging people to use less energy (73%). Fewer people (38%) were in favour of the option of taxing households who use a lot of energy.

1. Overview

1.1. Progress on Electricity Provision

By most measures, South Africa's electricity programme is remarkable. Before 1990 only a third of South Africans had access to electricity but a decade later this figure had doubled and around two-thirds of South Africans had electricity (Bekker, Eberhard, Gaunt & Marquard, 2008). This remarkable turnaround was achieved by policy and institutional shifts that occurred as a result of the election of the new democratic government in 1994. One of the biggest challenges the newly elected government had to deal with was the inequalities created by apartheid policies which benefitted a small minority and left the majority of people neglected. The government was committed to providing the poor with basic services such as water and energy. Modern energy sources, such as electricity was seen as one of the main components of socio-economic development and prioritised as a basic service. Despite these commitments and the number of connections doubling from between 1994 and 2003, and subsequent progress, the national backlog (with growth) in March 2012 was still at approximately 3.4 million households (Figure 1). When disaggregated, this represents 1.2 million households in informal settlements and 2.2 million households in formal settlements.

Figure 1: Total Number of Households and Total Number of Electrified Households in South Africa (Millions)



Source: DoE March 2012

There are still several challenges hindering the progress of the Integrated National Electrification Programme (INEP). In 2011 the Department of Energy commented on the progress of the INEP and conceded that the biggest chunks that had not been electrified were in Kwazulu-Natal, the Eastern Cape and Gauteng. In total the backlog of un-electrified households was 3,388,156. In the Eastern Cape the biggest backlog was in the formal settlement sector, however in Gauteng it was in the informal sector. The challenges that they were faced with included un-electrifiable informal settlements and terrain/topography that was characterised by scattered settlements typical of KwaZulu-Natal (DoE, 2011).

Another issue hindering the speed of connections is the household growth factor. Since 1994, the numbers of households supplied had increased, which continue to challenge universal access, since the backlogs as well as the new developments need to be serviced. All of these factors challenged the attainment of universal energy access and it was these challenges that saw government conceding that it would take another 25 years before universal access to energy could be achieved in view of the pace of progress (Integrated National Electrification Programme, 2007). In aligning strategic objectives with the National Development Plan (NDP), the Department of Energy is committed to universal access by 2025. Universal access will be achieved by both grid technologies and non-grid technologies.

At the United Nations Millennium Summit in September 2000, world leaders placed development at the heart of the global agenda by adopting the Millennium Development Goals (MDGs). The MDGs provide concrete, time-bound objectives for dramatically reducing extreme poverty in its many dimensions by 2015 income poverty, hunger, disease, exclusion, and lack of infrastructure and shelter while promoting gender equality, education, health, and environmental sustainability. Although none of the MDG refers to energy explicitly, improved energy services including modern cooking fuels and expanded access to electricity are necessary for meeting all the goals. For instance, cooking with coal, firewood, crop residues or dung is associated with significantly higher child mortality rates, diminishing maternal health and general disease burden from smoke (Modi, McDade, Lallement & Saghir, 2006).

The use of solid fuels (coal, firewood and dung) has been traced by various national surveys in South Africa. As is evident from the table below, these independent surveys are fairly consistent in their reporting, showing reliable evidence that the use of solid fuels for cooking has been decreasing steadily since 1996. In 1996 the use of solid fuels for cooking was common among a quarter of the population (28%) but in 2011 this had dropped significantly to 14%. Census 2011 figures further reveal that, although the use of solid fuels for cooking have declined, it is still fairly common in certain provinces such as Limpopo (44%), Mpumalanga (22%), Eastern Cape and KwaZulu-Natal (both 20%).

Table 2: Proportion of Population Using Solid Fuel as Primary Energy: Cooking

Data Source	Year	SA	WC	EC	NC	FS	KZN	NW	GP	MP	LP
General Household Survey	2002	22.9	5.3	38.3	15.1	17.1	24.7	21.8	3.3	38.9	60.8
	2003	22.1	3.6	37.2	13.7	15.4	25.4	19.2	3.4	36.4	60.2
	2004	21.0	2.8	35.1	16.2	15.5	22.8	18.0	3.0	38.9	57.3
	2005	18.2	1.6	26.4	12.8	10.7	21.8	13.4	2.7	37.9	53.3
	2006	16.7	1.4	25.6	11.2	10.4	20.6	12.1	2.0	34.7	47.3
	2007	16.5	1.1	22.0	13.0	9.3	20.8	11.9	2.9	32.6	49.7
	2008	18.2	1.1	26.8	14.4	8.6	23.8	16.4	2.8	34.2	51.1
	2009	17.0	1.2	24.1	11.1	7.8	22.9	14.4	2.1	34.3	49.4
	2010	15.7	1.3	21.7	11.2	6.4	21.7	14.5	1.7	29.6	47
	2011	14.4	1.8	20.1	11.6	5.4	19.3	10.8	1.9	26.8	44.9
Census	1996	27.8	4.6	42.7	24.1	17.9	33.7	25.8	5.4	48.6	65.2
	2001	24.2	3.4	38.5	20.6	14.9	30.8	21.7	3.7	43.6	60.7
Community Survey	2007	16.7	0.9	28.5	10.3	5.5	23.3	12.7	1.2	29.7	50.4
Census	2011	13.5	1.4	20.4	10.0	4.6	19.8	10.7	1.0	22.4	44

Source: General Household Survey (2002-2011); Census (1996:2011); Community Survey (2011)

As was the case with cooking, the use of solid fuels for heating has also declined significantly over two decades. In 1996 more than a third (37%) of the population reported using solid fuels for heating. Since then this figure has decreased and the latest census figures reveal that only 18% of the total population are currently using solid fuels for heating. As was the case with cooking, certain provinces are more reliant on solid fuels for heating than other provinces. The use of solid fuels for heating is most prevalent Limpopo (39%), Eastern Cape (29%), Mpumalanga (24%), KwaZulu-Natal (23%) and the Northern Cape (21%).

Table 3: Proportion of Population Using Solid Fuel as Primary: Heating

Data Source	Year	SA	WC	EC	NC	FS	KZN	NW	GT	MP	LP
General Household Survey	2002	29.1	11.0	47.3	28.4	30.2	28.0	34.8	8.3	46.3	60.5
	2003	28.1	10.3	46.3	27.2	26.9	27.8	31.1	9.3	38.2	61.4
	2004	27.9	10.3	44.8	29.6	28.1	27.7	32.6	7.9	47.4	57.3
	2005	23.9	4.4	35.3	23.7	22.1	26.1	21.0	7.9	42.4	56.2
	2006	23.9	6.8	36.2	28.6	21.8	25.4	22.4	8.7	41.3	51.3
	2007	23.2	5.7	34.9	28.3	19.3	25.8	20.8	9.2	38.8	49.5
	2008	25.6	4.4	37.9	32.2	20.8	29.6	27.9	9.3	41.3	56.1
	2009	22.9	7.5	33.2	25.2	19.5	27.2	24.1	7.9	35.2	49.5
	2010	23.0	8.4	38.1	29.9	16.7	25.0	20.9	7.2	36.3	52
	2011	20.8	7.9	31.2	35.7	14.6	21.3	20.8	7.0	32.3	49.9
Census	1996	37.3	9.1	49.1	41.1	36.2	42.0	44.6	17.1	58.5	68.3
	2001	31.9	7.6	44.1	35.9	30.5	37.3	34.1	13.8	50.4	42.7
Community Survey	2007	24.3	4.0	37.4	25.8	20.0	30.2	23.7	7.1	42.7	54.4
Census	2011	17.6	5.2	29.1	20.7	12.3	23.0	17.1	5.7	24.3	39.3

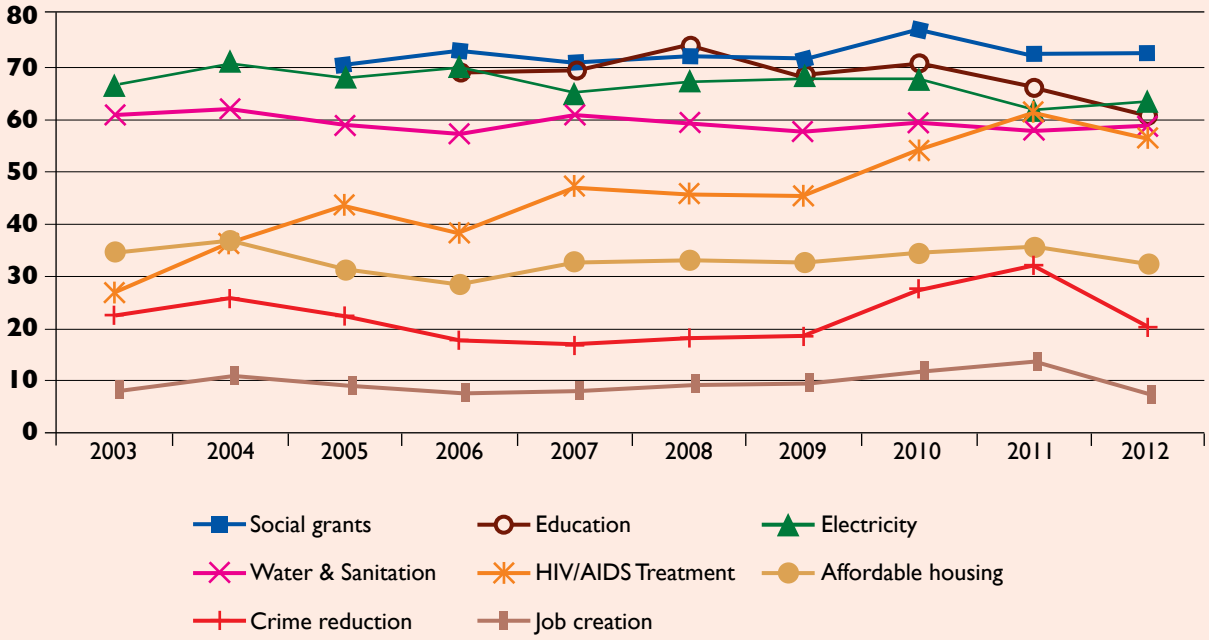
Source: General Household Survey (2002-2011); Census (1996:2011): Community Survey (2011)

The two tables above, reveal that, nationally, approximately 14% of the population still use solid fuels for cooking and 18% for heating. This shows a significant decline in the use of solid fuels and provides evidence of rapid progress since 1996 in energy transition in South Africa and augers well towards progress on the MDGs.

1.2. Satisfaction with Electricity Provision

Despite delays with universal access, the Department of Energy as the provider of electricity is generally hailed as successful by South Africans. The South African Social Attitudes Survey (SASAS) has been monitoring satisfaction of key services in the country since 2003 and results show that South Africans are relatively satisfied with the provision of electricity (see Figure 2). The provision of electricity to households is rated second highest, second only to the provision of social grants. Since 2003, levels of satisfaction with the provision of electricity have been moving in a narrow band of between 60%-70% of South Africans. Although the satisfaction level declined from 67% in 2010 to 61% in 2011, it has started to rise again and in 2012 the level was at 63%. Despite this drop, satisfaction with electricity provision to households is rated very high as compared to other key service delivery mandates.

Figure 2: Level of Satisfaction with Different Areas of Government Performance, 2003 – 2012 (% Satisfied or Very Satisfied)



Source: SASAS 2003-2012

The importance of satisfaction with service delivery becomes apparent when the article of Magidmisha, Roberts, Gordon and Struwig (2011) is considered. The authors determined that satisfaction or dissatisfaction with service delivery influences political attitudes. People who are dissatisfied with service delivery are generally less satisfied with the way democracy is working in South Africa. They also found that discontent with service delivery has begun to erode public confidence in political institutions and leaders. Given the attention devoted to service delivery protests in recent years, they also examined the relationship between service perceptions and political behaviour. Fortunately the finding was that discontent with service delivery has not yet translated into clearly discernible patterns of political action such as participating in mass demonstrations. Despite this, the danger is that prolonged dissatisfaction with services will eventually explode into public protests.

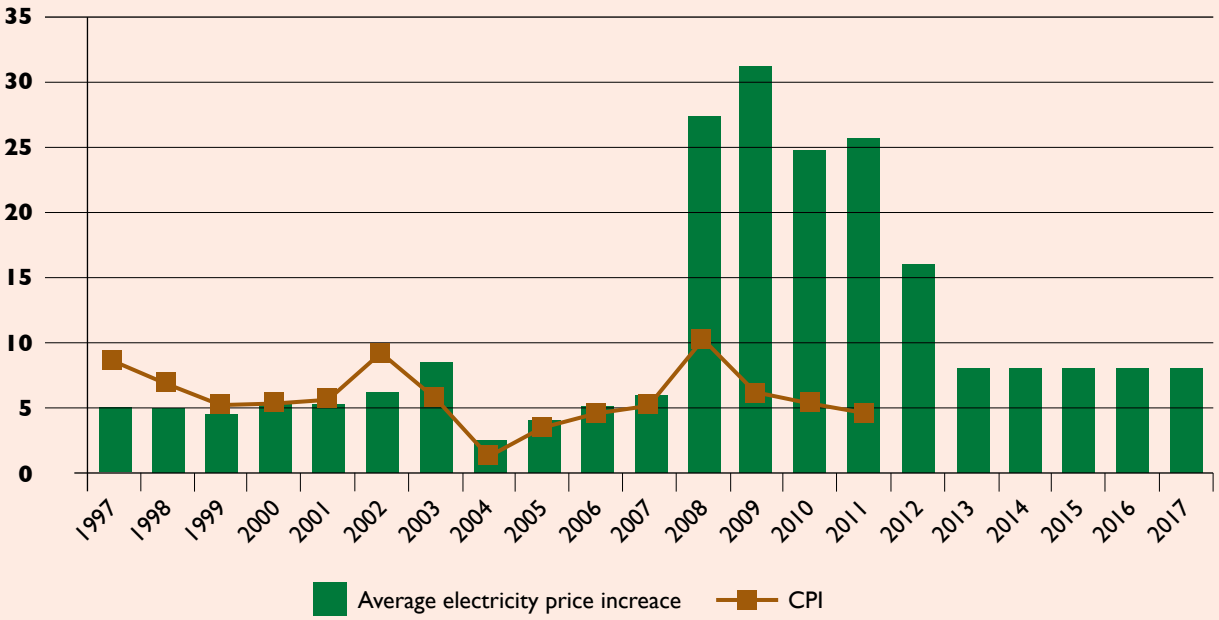
Johan Burger from the Institute for Security Studies described service delivery protests as fairly limited (Burger, 2009). However, he maintained that should the situation of poor service delivery be allowed to continue over a prolonged period it would have the potential to develop into a fully-fledged revolt. This statement seems to have been true, since only two years later South Africa was named "the protest capital of the world" (Rodrigues, 2010) having one of the highest rates of public protest in the world with the number of protests in 2010, 2011 and 2012 reaching an all-time high. In line with commentary, results from the 2011 and 2012 survey showed that two-thirds of South Africans felt that it was not wrong at all (44%) or wrong only sometimes (22%) to protest about access to electricity. People felt even stronger about protesting against the price of electricity with almost three-quarters (70%) of people in both the 2011 and 2012 survey stating that it is not wrong to protest over the price of electricity. These issues are interrogated further in the report.

1.3. Pricing of Electricity

Apart from the quality of services, cost factors also play a crucial role when it comes to accessibility and satisfaction. One of the key mandates of the Department of Energy is to ensure the secure and sustainable provision of energy to all. Critical for sustained provision of energy (especially to poorer households) is the cost factor. Up to 2008,

electricity prices in South Africa were among the lowest in the world, but after collapses of the national grid, it was evident that electricity prices had to be increased substantially to prevent a total breakdown of the national electricity supply system. In order to compensate for the historically low energy prices, the National Energy Regulator South Africa (NERSA) had to increase electricity prices and in 2008 electricity prices escalated dramatically with an average increase of 28% in 2008 and 31% in 2009.

Figure 3: Electricity Price Increase and GDP



Source: NERSA 2013

In 2010 NERSA approved an average tariff increase of 25.5% over the next three years, using a Multi-Year Price Determination (MYPD 2) system. This became extremely burdensome to the consumer, to the extent that President Zuma in his State of the Nation Address in 2012 requested a moderation of the rate of electricity increases in South African and pleaded with Eskom to revise its request for the 2012/13 fiscal year. This was subsequently reduced to 16%. Despite these increases, ESKOM still needed additional funds for its capital expenditure and supply side projects. ESKOM then introduced the MYPD 3 proposal which extends over a period of 5 years- from 1 April 2013-31 March 2018. In this proposal ESKOM asked for a 16% annual increase over the five years, with 13% going to ESKOM and 3% to introduce Independent Power Producers (IPPs). This new proposal from Nersa for 16% increases over a 5 year period was not well received by the public. During the time of writing of this report, various organisations such as COSATU, SACP, SANCO, YCL and TAC made it clear that they did not agree with this increase, that it was not conducive to poverty alleviation and that it did not consider the impact on the poor. These organisations also made it clear that they wanted to mobilise their members to protest against these increases. Gauteng Congress of SA Trade Unions secretary Dumisani Dakile told reporters in Johannesburg on 28 January 2013 "…that the demonstrations that have happened so far is just the beginning of massive campaigns against Eskom and Nersa in the province of Gauteng." After several public hearings as well as threats from various unions and interest groups, Nersa announced that the MYPD 3 electricity increases would be 8% per annum and not the requested 16%. This obviously brought relieve to already overstretched consumers who were approaching an affordability tipping point.

At this point it must be reiterated that the inadequate supply of electricity to the population has had the worst effects on the poor who are unable to afford price increases of electricity. In the 2011 survey, it was found that 47% of South Africans are energy poor (thus spending more than 10% of their net household income on energy). More alarming however was that 74% of the South Africans in the poorest quintile were energy poor (DoE, 2012). It is

therefore not surprising that irate citizens are campaigning and holding the government responsible for the hardships they endure, when their electricity is disconnected owing to their inability to pay for electricity usage.

1.4. Assisting the Poor with Electricity Provision

Having said this, it is important to acknowledge the efforts from government to assist the poor with electricity and energy. In this respect, government has a Free Basic Electricity (FBE) policy whereby it provides 50-60 kWh of electricity per month free to all poor South African households (DME 2003). The FBE is provided on the understanding that people cannot live without energy, as it is a basic necessity needed for many tasks such as lighting, cooking, heating and cooling.

In addition to the FBE policy, the Department of Minerals and Energy also introduced a Free Basic Alternative Energy (FBAE) policy as a parallel intervention strategy specifically aimed at servicing indigent households (i.e. those who suffer from energy poverty) in un-electrified areas. Subsidised alternative sources of energy include paraffin, liquefied petroleum gas, coal, and bio-ethanol gel (FBAE, 2007). In assessing energy policies for a sustainable South Africa, Winkler (2006) found that alternative energy sources such as this generated one-third of the energy consumed by the residential sector.

Another policy that has been implemented to assist poorer households is the 2008 Electricity Pricing Policy which introduces an Inclining Block Tariff (IBT) structure for billed consumers. In essence this implies that the more kWh a household uses, the higher the average charged price. These are effectively punitive charges which benefit lower usage customers and deter electricity wastage.

Table 4: Average % Electricity Price Increase 2010-2013.

Monthly level	2010/11		2011/12			2012/13
	c/hWh	% increase	c/hWh	% increase	c/hWh	% increase
Block 1 (<50 kWh)	54.70	10.59	57.65	5.4	60.85	5.5
Block 2 (51-350 kWh)	58.48	5.2	66.66	13.23	75.09	13.5
Block 3 (351-600kWh)	76.35	21.95	95.05	25.8	120.93	25.9
Block 4 (> 600kWh)	83.74	35.82	105.35	25.8	132.63	25.9
Average residential tariff	60.60		68.83		78.62	

Source: Nersa: Media statement 24 February 2010

Although there are many policies in place which assist the poor in accessing sustainable energy, the poor still suffers a lack of basic energy, are energy poor and are resorting to less healthy methods of energy supply owing to affordability. All of these issues will be discussed in the report.

1.5. Future Energy Needs

In common with many countries throughout the world, South Africa is presently grappling with the twin policy challenges of addressing climate change and ensuring that the future energy needs of the country are adequately met. It is increasingly apparent that this mounting concern with respect to climate change and energy security has influenced the direction and nature of energy policy in South Africa in recent years, with nuclear power being recast as low-carbon technology. From an international perspective, South Africa has rather high levels of greenhouse gas (GHG) emissions, a situation that is informed by the country's energy-intensive economy that is overwhelmingly dependent on coal (Winkler & Marquand, 2009). Fossil fuels dominate the energy sector, with coal providing 75% of the fossil fuel demand and accounting for more than 90% of electricity generation (DEAT, 2009: 3). In response, the government has committed to reducing its GHG emissions by 34% by 2020 and 43% by 2025, a decision that

has salient implications for the energy sector. The International Energy Agency has defined energy security as 'the uninterrupted physical availability of energy at a price which is affordable, while respecting environmental concerns' (IEA, 2001). Bearing this in mind, an over-reliance on coal, coupled with environmental considerations and a need for a developmental approach in securing the energy requirements for all South Africans has resulted in a strong energy policy emphasis on diversifying primary energy sources in coming decades.

The 1998 White Paper on Energy Policy in response listed the securing of energy supply through diversity as one of five core policy objectives. A decade later, this priority is again reflected in the 2008 National Energy Act, which aims, inter alia, to 'ensure uninterrupted supply of energy' and 'promote diversity of supply of energy and its sources' (DoE, 2008). This approach is found in the Department of Energy's Integrated Electricity Resource Plan (IRP) for 2010-2030 (DoE, 2011), which was promulgated by Cabinet in March 2011 and outlines the preferred scenario in relation to medium- to long-term options for increasing the electricity supply and managing demand over a 20-year period between 2010 and 2030. It is premised on estimates that electricity consumption over the interval will increase by three-quarters from 260 terawatt hours (TWh) in 2010 to 454 terawatt hours by 2030. Similarly, peak electricity demand is predicted to increase from 39 gigawatts (GW) to 68GW over the two decades. The Policy-Adjusted IRP 2010 scenario proposes a reduction in the share of coal in the country's electricity generation and a corresponding increase in the share represented by low-carbon technologies.

Through the IRP, the government makes a strong commitment to the future of renewable energy (Table 5). The envisaged energy generation mix by 2030 is expected to consist of 46% coal, 13% nuclear, 5% hydro (9% if pumped storage is added), 11% gas-fired power, 10% wind, and 11% solar (9% PV power and 1% CSP).

Table 5: Current Generation Capacity, New Electricity Generation Capacity and Envisaged Total by 2030

	Total generating capacity in 2010		**New (uncommitted) capacity options from 2010-30**		**Total generating capacity in 2030**	
	MW	**%**	**MW**	**%**	**MW**	**%**
Coal	34 821	74	6 250	15	41 071	46
Open Cycle Gas Turbine (OCGT)	3 420	7	3 910	9	7 330	8
Closed Cycle Gas Turbine (CCGT)	0	0	2 370	6	2 370	3
Pumped storage hydroelectricity	2 912	6	0	0	2 912	3
Nuclear	1 800	4	9 600	23	11 400	13
Hydro	2 150	5	2 609	6	4 759	5
Wind	800	2	8 400	20	9 200	10
Concentrated Solar Power (CSP)	200	0	1 000	2	1 200	1
Photo-voltaic (PV)	0	0	8 400	20	8 400	9
Other	890	2	0	0	890	1
Total	**46 993**	**100**	**42 539**	**100**	**89 532**	**100**

Source: DoE (2011) Integrated Resource Plan for Electricity, 2010-2030

In this report we also report on the public's view regarding alternative energy sources and policy preferences in terms of the various energy sources.

1.6. Energy Saving

As demand for electricity increased, and the national power grid became under pressure, public campaigns to promote energy awareness increased. In a bid to decrease electricity usage, Eskom embarked on campaigns to educate society about the importance of saving energy whenever possible. The latest drive for energy-saving tips, dubbed the "49 Million Campaign," was launched by Deputy President, Kgalema Motlanthe, in March 2011. It calls upon all 49 million South Africans to embrace energy-saving as a culture and to join the global movement towards ensuring a sustainable future (website of the 49 Million Campaign). These strategies are important, targeting the demand side of the dilemma as a short-term response, whilst supply side improvements are simultaneously pursued on a more long-term basis. This report also determined public awareness with regards to attitudes and behaviour regarding energy saving.

2. Introduction

The overall objective of this survey was to gather information about energy- related behaviour and attitudes in South Africa. This survey is similar to the baseline survey conducted in 2011 and it is envisaged that this project will become part of the annual South African Social Attitudes Survey (SASAS) series, gathering longitudinal data on energy related attitudes and behaviour. Longitudinal data will provide a long-term account of energy related behaviour in South Africa, and indicate changes over time in order to guide policy and planning for energy provision towards the residential sector.

2.1. Primary Study Objectives

The primary objective of the study was to gather information on energy-related behaviour and perceptions in South Africa. More specifically, the survey intended to:

- Determine levels of access
- Explore single and multiple energy use in South Africa
- Explore levels of energy poverty
- Explore satisfaction with electricity provisions, perceptions about the quality of electricity and pricing of electricity
- Explore views on electricity-saving strategies
- Explore views on policy preferences of current and future energy issues

The ultimate aim of the study is therefore to provide the Department of Energy with valuable empirical evidence that would assist the Department to deliver optimally on its mandate.

2.2. Structure of the Report

The first part of the report deals with the research methodology employed and discusses the research universe and how the sample was designed. It examines the survey protocols with regards to area, household and individual selection procedures. It gives a brief description of how the questionnaire was designed and the training that took place prior to the data collection. Procedures employed to ensure quality control are also discussed, together with data capturing and data cleaning measures. This is followed by a section on sample realisation and weighting of the data. The next section (Section 4) is the first section that discusses results and specifically deals with electrification status of households, detailing the number of households in South Africa with and without electricity. Section 5 deals with energy consumption and poverty. It discusses the energy sources that households generally use and then minutiae the main energy sources for lighting, cooking and heating. It details single and multiple energy use, which gives an assessment of the variety of energy sources that households use for lighting, cooking and heating. This discussion is followed by a section on energy poverty, making use of three definitions of energy poverty: namely, energy poverty as a percentage of spending (more than 10% of income); subjective energy poverty and energy poverty due to thermal inefficiency. Section 6 discusses satisfaction with the provision of electricity, the quality of electricity and the pricing of electricity. It also discusses strategies that households employ to cope with increasing electricity prices. Section 7 deals with energy saving, more specifically awareness of various energy-saving measures and also whether households undertake any of the energy-saving measures. Section 8 is a section on civic actions that might impact on electricity provision. We interrogate perceptions about illegal connections, protest actions about the price of electricity and access to electricity. The last section of the report deals with policy issues and interrogates people's perceptions about what government's priorities should be in supplying energy to the people, what sources of energy supply should be considered for future supply and which government policies should be implemented to ensure that the amount of energy used is reduced. The report ends with a last section on conclusions and recommendations.

3. Research Methodology

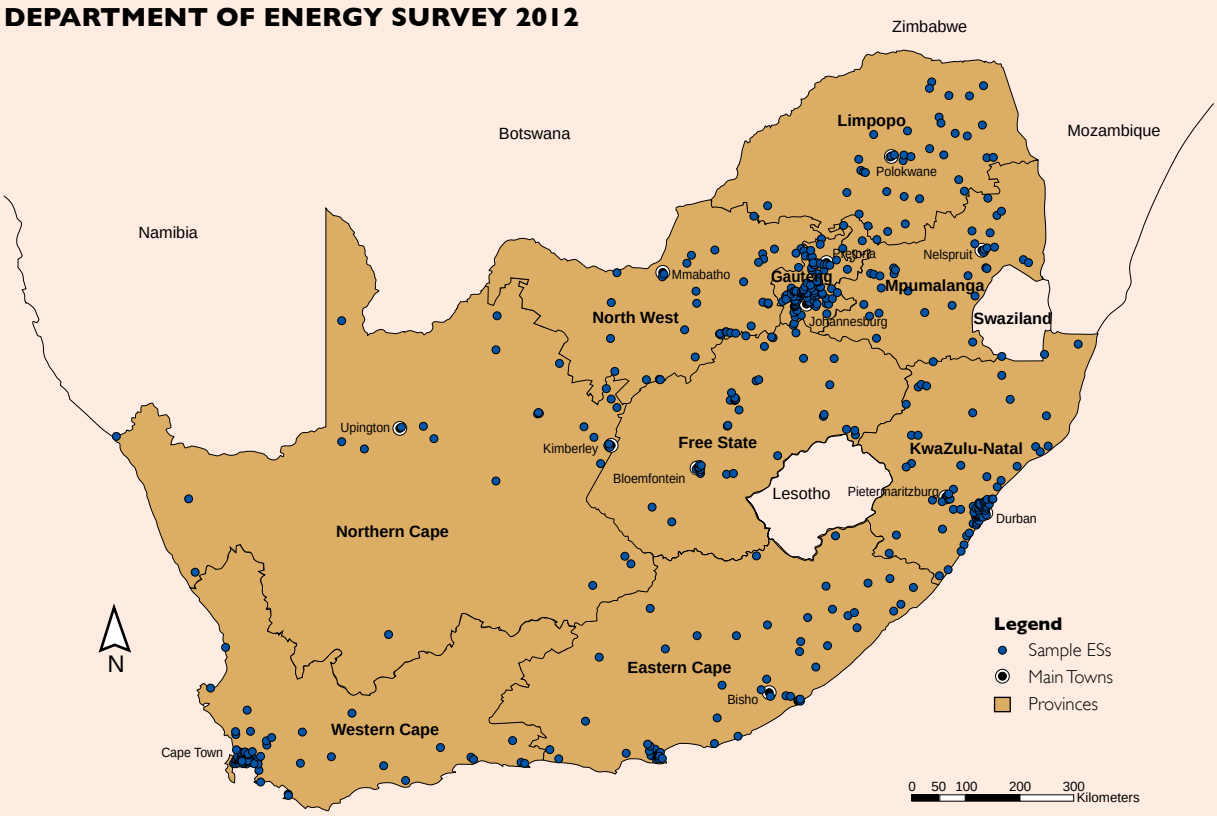
3.1. The Research Universe

The target population for the survey was individuals aged 16 and older who live in South Africa. Specifically, the target population comprised people living in households, hostels and other structures. People living in special institutions such as hospitals and prisons were excluded from the sample. The inclusion of people from these institutions would have compromised the random selection procedure. Also, past experience has shown that access to people in these institutions is extremely difficult, since obtaining permission can be cumbersome and complex.

3.2. The Sample Design

In order to achieve a national representative sample, the sample was designed to be representative of households as well as people living in South Africa, 16 years and older regardless of population group, class, residential status etc. A complex sample design was used that included stratification and multi-stage sampling procedures. The explicit stratification variables that were used in the sample were provinces, urban/rural population and households in different types of areas. To ensure that the sample was also representative in terms of the ethnic and cultural diversity of South Africa, the HSRC's geo-demographic categories, which have been developed from Statistics South Africa (Stats SA) census data 2001 (updated in 2007 using the Community Survey), were used as the implicit stratification variable. These geo-demographic categories reflect the diversity of the South African population based on their rural/urban, income, education, "ethnicity" and geographic characteristics.

Figure 4: A Graphical Representation of 500 Selected Enumeration Areas



Enumerator areas (EAs) from the 2001 Census formed the primary sampling unit (PSU). Five hundred EAs were selected throughout South Africa. Within each PSU or EA, a total of seven visiting points or households were selected for interviewing, using random sampling. A total of 3500 visiting points or households were thus sampled for this study. A graphical representation of the 500 selected EAs is presented in Figure 4.

3.3. Navigation to the Selected Areas

Once the sample was selected, a navigational toolkit was developed to assist the field teams in finding the correct areas. This kit assisted the supervisors and fieldworkers to locate the exact EA where the interviews were to take place. Each navigational kit included:

- Route descriptions, to assist the teams to navigate their way into the selected enumerator areas.
- Maps that, using aerial photographs as a base, identified the exact geographic location of the enumerator areas sampled throughout the country.
- More detailed maps that identified the exact area, pinpointing street names and places of interest such as schools, clinics, hospitals etc. selected by the office-based sampling team, within the EAs where respondents were interviewed (Figure 5).

Figure 5: An Example of an EA Map Used to Assist the Field Teams to Navigate to the Correct Areas

3.4. Data Collection Protocol

The HSRC subscribes to a strict internal Code of Ethics and this research project underwent a formal review by the HSRC Research Ethics Committee before being implemented. The project was conducted in a confidential manner and information was only discussed with designated representatives and participants. At all times confidentiality of information was adhered to.

The following general protocol guidelines for data gathering were implemented:

- Fieldworkers and supervisors were required to notify the relevant local authorities that they would be working in the specific area. The purpose was to assist with their own safety and to reassure respondents, especially the elderly or suspicious, that the survey was official.
- Supervisors were advised to inform the iNkosi or iNduna in a rural traditional authority area, whilst in urban formal or urban informal areas a visit to the local police and, if possible, the local councillor was done prior to commencing work in the area.
- Supervisors were further advised that farms should be entered with caution and that they should report to the local AgriSA offices before doing so. Field supervisors were issued with 'Farm letters' which contained information on the purpose of the study and contact details in case they had queries.
- Consent forms needed to be completed upon successfully finishing each interview. While verbal consent was to be secured from the respondent before beginning with the interview, a written consent form had to be signed afterwards.
- Fieldworkers were issued with name tags and letters of introduction to be used in the field.
- The introduction letter was translated into different languages.
- Fieldworkers and supervisors had to present their identity cards when introducing themselves.

3.5. Introduction of the Project to the Communities

Prior to starting the actual interviewing process, supervisors were instructed to visit the local police stations, iNdunas, chiefs or other role players in the various areas to ensure that the authorities were aware of the project and to inform the communities of their intent. Official letters describing the project and its duration and relevant ethical issues were distributed to the authorities. This was done not only as a form of research and ethical protocol, but also to ensure the safety of the field teams as well as to ensure buy-in from communities included in the survey.

3.6. Selecting a Household and Individual

After driving through the EA and introducing the project to the local authorities, supervisors had to identify the selected households. The selected households were pre-selected (randomly) in the office by the GIS technician and were clearly marked on the aerial maps with a coloured dot. Once the selected household had been identified, a household member needed to be selected randomly as a respondent. This household member (respondent) needed to be 16 years or older. For the purpose of this survey, the KISH grid was used to randomly select the respondent in the household. (See Kish Grid on Page iii of the Questionnaire – Appendix A).

3.7. The Questionnaire

The first survey on energy related behaviour and attitudes was undertaken in 2011. Since the intention of this project is longitudinal, the 2012 questionnaire had to be similar. Only a few changes were therefore made to the 2012 questionnaire. These involved eliminating questions on Free Basic Electricity (FBE) while adding questions on policy issues. All of these changes were discussed and made in collaboration with Department of Energy. These questions were piloted in urban, peri-urban and rural areas. Subsequent to the pilot, feedback was given to the Department of Energy and a final questionnaire was designed. (Appendix A). A training manual was also developed that explained difficult concepts in the questionnaire. The questionnaire was translated into six languages - namely, isiZulu, isiXhosa, Tshivenda, Xitsonga, Setswana and Afrikaans. Fieldworkers were issued with hard copies of the translated templates to ensure consistency of translations for the various languages.

3.8. Training

A two-day training session was held in the various provinces. The main training session took place in Pretoria and covered the following provinces: namely, Gauteng, Limpopo, Mpumalanga and North West. All relevant remarks and instructions discussed during the training session were included in the training manual. Other training sessions were held in East London, Durban, Kimberley and Western Cape.

The training session included sessions on selection and sampling of households; fieldwork operating procedures; research protocol; and ethical considerations. The questionnaire was discussed in detail. As far as possible, the training was designed to be participatory, practical and interactive, and gave fieldworkers the opportunity to seek clarification on all issues pertaining to the survey. A training manual was also developed as part of the training toolkit.

The fieldwork commenced in October 2012 and ended in December 2012. However, due to low response rates, some field teams were send back into the field in January 2013. A network of locally-based fieldwork supervisors in all parts of the country assisted in data collection. A total of 166 fieldworkers, 33 sub-supervisors and 11 supervisors were employed by the HSRC as freelance employees for a period of six weeks. These fieldworkers and supervisors had a thorough understanding of the local areas where they were deployed and could speak the local languages.

3.9. Quality Control

The Department of Energy and HSRC researchers conducted random visits to selected areas and worked with the fieldworkers for a period of time, to ensure that they adhered to ethical research practices and that they understood the intent of the questions in the questionnaire. Department of Energy officials and HSRC researchers also made sure that the fieldworkers correctly selected the identified households and respondents in the household. The researchers also checked on procedures followed in administering the research instrument. Field back checks were also conducted in eight of the nine provinces. Telephonic back checks were done on 15% of the total sample.

3.10. Data Capturing and Cleaning

The data-capturing function was outsourced to an external company. The process was carefully monitored by the Data Managers within the Research Use and Impact Assessment Unit of the HSRC. The HSRC required 100% verification of the data from the data-capturing company. This meant that all variables were captured twice to ensure 100% accuracy. After receiving the data, the Data Managers embarked on a data-cleaning exercise. Data were checked and edited for logical consistency, for permitted ranges, for reliability on derived variables and for filter instructions. After the data-cleaning exercise, the analytical team received the realisation rates of the survey. As can be seen from Table 6 below, a realisation rate of 72% was achieved. This realisation rate is lower than the 2011 realisation figures (86%) due to a stricter methodology that was followed in identifying households. In the 2012 survey, households were pre-selected by GIS technicians using aerial maps and field teams were not allowed to select households randomly in the area.

Table 6: Sample Realisation

	Number of replaced EAs	Ideal sample (N Households)	Realised sample (N Households)	% Realisation
Eastern Cape	0	427	328	77
Free State	1	252	198	79
Gauteng	1	728	436	60
KwaZulu-Natal	1	588	586	100
Limpopo	1	287	201	70
Mpumalanga	4	259	207	80
North West	0	280	162	58
Northern Cape	0	182	147	81
Western Cape	1	497	253	51
Total	**9**	**3500**	**2518**	**72%**

3.11 Data Weighting

The final data set was given to the statistician for benchmarking and weighting purposes. Benchmarks and weights were calculated using the 2011 mid-year estimates published by StatsSA. Since the purpose of the study was to determine energy use and behaviour in households, the data were weighted up to represent households in South Africa. However, some of the questions were not aimed at households but rather aimed at assessing attitudes and behaviours of individuals, and therefore the data were also weighted to represent the adult (16 years and older) population of South Africa. A total of 2518 households were interviewed during this study. When weighted, this represents a total of 35 669 776 adult South Africans and 14 450 162 households in South Africa. The final data set (unweighted and weighted) is disaggregated below by key demographic variables.

Table 7: Sample Weighted to the Adult Population (16 Years and Older) and Households in South Africa

	Number of interviews (Unweighted)	Percent (Unweighted)	Number of adult South Africans (Weighted)	% of adult South Africans (Weighted)	Number of Households (Weighted)	Percent of Households (Weighted)
Total	2518	100	35 669 776	100	14 450 162	100
Gender						
Male	1021	40.5	17049052	47.8		
Female	1497	59.5	18620723	52.2		
Age						
16-19 years	189	7.5	3762810	10.6		
20-29 years	548	21.8	10644446	29.9		
30-39 years	515	20.5	7747286	21.7		
40-49 years	449	17.9	4977226	14.0		
50-59 years	374	14.9	4355907	12.2		
60-69 years	280	11.1	2757121	7.7		
70+ years	160	6.4	1390643	3.9		
Population Group						
Black African	1578	62.7	25949827	72.8	9 289 030	64.3
Coloured	395	15.7	3907911	11.0	1 700 416	11.8
Indian or Asian	224	8.9	1225106	3.4	687 396	4.8
White	321	12.7	4586932	12.9	2 773 319	19.2

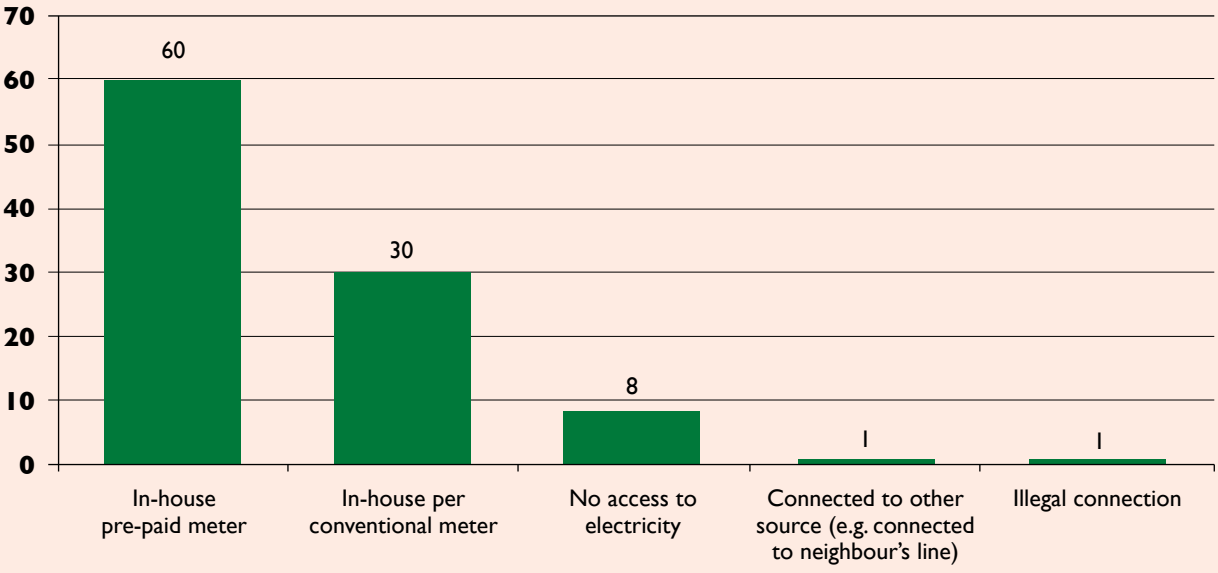
	Number of interviews (Unweighted)	Percent (Unweighted)	Number of adult South Africans (Weighted)	% of adult South Africans (Weighted)	Number of Households (Weighted)	Percent of Households (Weighted)
Living Standard Level						
Low	200	8.8	2331268	7.2	824546	6.3
Medium	1130	49.8	16864583	52.4	6 222 715	47.9
High	939	41.4	13010287	40.4	5 938 307	45.7
Geographic location						
Urban, formal	1552	61.6	20496890	57.5	8 603 041	59.5
Urban, informal	223	8.9	3309047	9.3	1 103 229	7.6
Rural trad. auth. areas	536	21.3	9485012	26.6	3 460 356	23.9
Farms	207	8.2	2378826	6.7	1 283 536	8.9
Province						
Western Cape	253	10.0	4258801	11.9	1 634 000	11.3
Eastern Cape	328	13.0	4242371	11.9	1 687 385	11.7
Northern Cape	147	5.8	778203	2.2	301 405	2.1
Free State	198	7.9	1892271	5.3	823 316	5.7
KwaZulu-Natal	586	23.3	6757364	18.9	2 539 429	17.6
North West	162	6.4	2424871	6.8	1 062 015	7.3
Gauteng	436	17.3	9183009	25.7	3 909 022	27.1
Mpumalanga	207	8.2	2691813	7.5	175 488	7.4
Limpopo	201	8.0	3441072	9.6	1 418 102	9.8

4. Access to Energy

Access to electricity is generally seen as an important step in socio-economic development (Prasad, 2006) and many countries, including South Africa are aiming at universal access. However, despite the huge successes and achievements of the electrification programme in South Africa, universal access has not yet been achieved. The General Household Survey (2011) found that 83% of households in South Africa have been electrified whilst the Census 2011 showed a figure of 85%. These figures are fairly consistent and it can readily be assumed that over 80% of all households in South Africa are electrified. In the 2013/2014 performance plan from the Department of Energy, it was conceded that South Africa should have an adequate supply of electricity and liquid fuels by 2025 and that at least 95% of the population should have access to grid and non-grid electricity by then.

In this energy related behaviour and perception survey, household members were asked if they have access to electricity in their households. In this survey, 90% of households indicated that they have access to electricity. Access is mainly in the form of an in-house pre-paid meter (60%) or an in- house convention meter (30%). Just under a tenth (8%) of individuals indicated that they have no access to electricity. This electrification figure is slightly higher than the 2011 Census and General Household Survey. Large proportions of these un-electrified households were found in Eastern Cape (19%) and KwaZulu- Natal (15%) and this finding is consistent with the national figures which indicate that these provinces have the biggest backlog. One percent of households indicated that they are connected to some other source for which they either pay or do not pay. Speculations about the existence of illegal connections are rife but in this survey only 1% of households reported having an illegal connection. This is very consistent with 2011 findings where 2% illegal connections were reported. Although there might be some underreporting (since this is not a socially desirable response), households using illegal connections to gain access to electricity is not common. According to this finding approximately 144 501 households in South Africa therefore have an illegal electricity connection with most of these illegal connections found in informal settlements. These illegal connections pose a danger and can be fatal.

Figure 6: Access to Electricity (Household Percent)



Source: SASAS Energy related behaviour and perception survey (2012)

The high percentage of households that gain access to electricity via a pre-paid meter is not surprising. During the 1980s, the majority of households had conventional metering systems, but due to payment boycotts and difficulties in collecting arrears, a pre-paid metering system was introduced and promoted, inter alia, as part of the "Electricity for All" campaign. This campaign was successful, with the result that the majority of electrified households in South

Africa currently use a pre-paid metering system. Poor households also receive a non-interchangeable voucher or token loaded with free basic units of 50kWh per month on their pre-paid. When the free units have been used up, they need to buy additional units. A finding from a study by Annecke (2005) revealed that this amount was not enough for poorer households and they had to make several transactions because they cannot afford to buy enough electricity for one month. The same study also found that Khayelitsha respondents using pre-paid often had to 'skip a week' without electricity due to affordability.

Table 8: Access to Electricity by Select Socio-Demographic Attributes (Percentage)

	In-house pre-paid meter	In-house conventional meter	No access to electricity	Connected to other source- pay for	Connected to other source- do not pay for	Illegal connection	Uncertain/ Don't know
South Africa	60	30	8	1	0	1	0
Population group							
Black African	70	17	11	1	0	1	0
Coloured	68	19	11	0	0	0	1
Indian Asian	42	57	0	0	0	0	1
White	27	72	0	1	0	0	0
Living Standard level							
Low	17	3	78	0	1	0	1
Medium	76	15	6	2	0	1	0
High	51	49	0	0	0	0	0
Geographic location							
Urban formal	57	40	1	1	0	0	0
Urban Informal	66	11	17	2	1	3	0
Rural, traditional authority areas	77	7	15	0	0	0	0
Farms	29	38	30	2	1	0	1
Province							
Western Cape	68	23	7	1	1	0	0
Eastern Cape	66	14	19	1	0	0	0
Northern Cape	77	8	10	1	1	0	3
Free State	69	29	2	0	0	0	0
KwaZulu-Natal	55	27	15	2	0	0	0
North West	59	34	7	1	0	0	0
Gauteng	42	52	4	0	0	1	0
Mpumalanga	71	16	10	2	1	1	0
Limpopo	85	12	3	0	0	0	0

Source: SASAS Energy related behaviour and perception survey (2012)

Since pre-paid meters were installed in the 1990s, and promoted as part of the 'Electricity for All' campaign, it is not surprising to find pre-paid meters mostly in black (70%) and Coloured (68%) households or households with a medium living standard (76%). Pre-paid meters also dominate in households in rural traditional authority areas (77%) and in urban informal areas (66%). Since many white and Indian residential areas were built and serviced prior to 1990, the majority of white and Indian households (72% and 57% respectively) have in-house conventional meters. Furthermore, as could be expected, the highest proportion of non-electrified households is among households with a low living standard (78%). The highest proportion of illegal connections is found in urban informal settlements.

5. Household Energy Consumption and Poverty

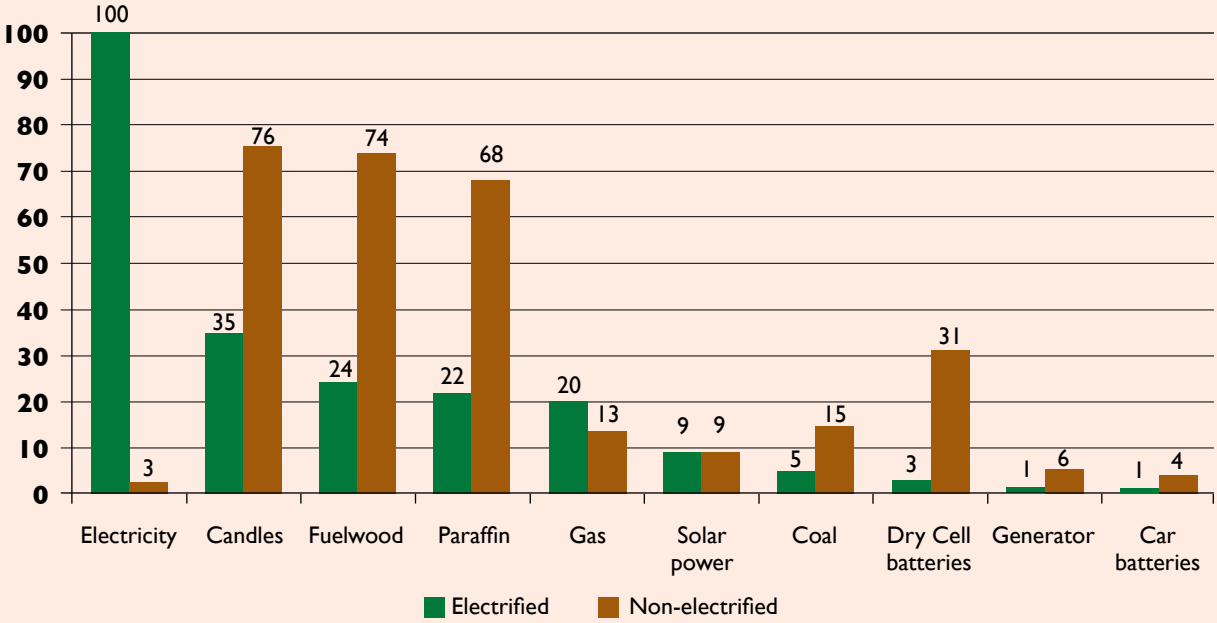
The Department of Energy's Integrated Electricity Resource Plan (IRP) for 2010 -2030 (DoE, 2011) was promulgated by Cabinet in March 2011. It outlines the preferred scenario in relation to medium- to long-term options for increasing the electricity supply and managing demand over a 20-year period between 2010 and 2030. It is premised on estimates that electricity consumption over the interval will increase by three-quarters from 260 terawatt hours (TWh) in 2010 to 454 terawatt hours by 2030. Similarly, peak electricity demand is predicted to increase from 39 gigawatts (GW) to 68GW over the two decades. The Policy-Adjusted IRP 2010 scenario proposes a reduction in the share of coal in the country's electricity generation and a corresponding increase in the share represented by low-carbon technologies. The IRP acknowledges the twin challenges of energy security and climate change and how these need to be accounted for and inform the choices that government and citizens make in relation to energy consumption and the energy mix in coming years. In such a policy context, it is important to understand current energy use patterns, and to this end this section of the report examines and profiles energy consumption and patterns of energy poverty among South African households.

5.1. Household Energy Sources

There has emerged a relatively consistent pattern of evidence from energy use studies conducted during the last two decades which suggests that South African households, most especially those exhibiting higher levels of material deprivation, tend to rely on multiple energy sources in order to ensure that their day-to-day energy requirements are adequately met. Importantly, this phenomenon has been shown to characterise households, irrespective of their electrification status. This contradicts prevailing energy transition theories and the 'energy ladder' model, which have typically assumed a straightforward, uni-directional shift from traditional to modern energies and appliances once households are provided with an electrical connection. This suggests unique energy usage patterns and tells a South African story which is distinctive.

From Figure 7, it is evident that in late 2012 considerable patterns of difference continued to exist between electrified and non-electrified households in the range of energy sources relied upon to meet their basic needs. Those with electricity all reported that they used this source either for lighting, cooking or heating, although it is apparent that other sources such as candles, paraffin, firewood and gas continue to be relied upon in at least a fifth of cases. Conversely, in the absence of a domestic connection, non-electrified households rely primarily on candles, paraffin and firewood, with more nominal shares reporting the use of coal and gas. Dry cell batteries are appreciably more common in non-electrified relative to electrified households (31% versus 3%), due predominantly to their use for operating appliances. The use of car batteries or generators remains highly circumscribed for electrified and non-electrified households alike, being reported in fewer than 6% of cases. Solar systems are present in nearly a tenth of electrified and non-electrified households.

Figure 7: Use of Energy Sources Among South African Households, by Electrification Status (Percent Using)

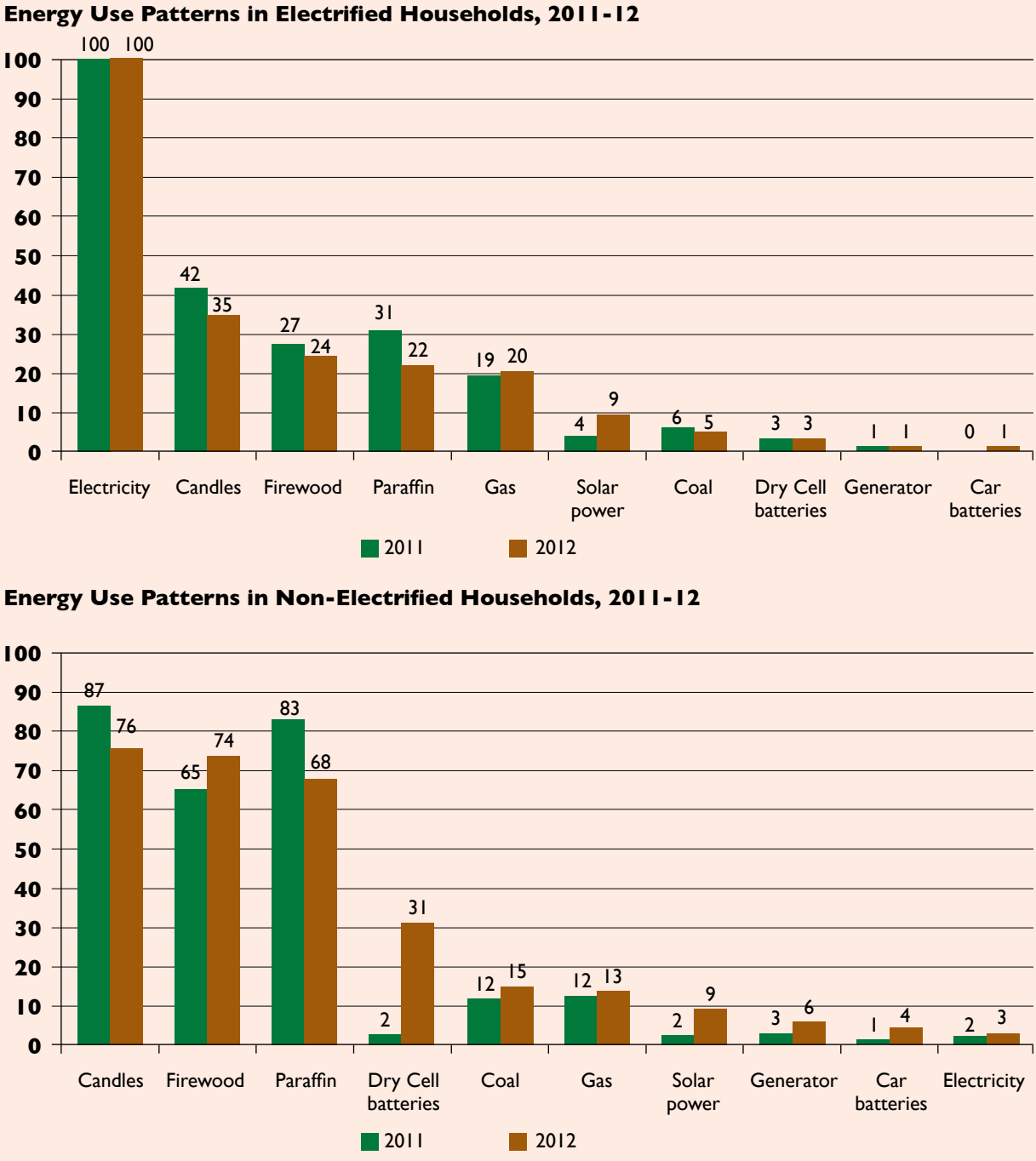


Source: SASAS Energy related behaviour and perception survey (2012)

While one may not expect considerable year-on-year changes in this pattern of energy use, in a context where the prices of certain types of fuel have been rising notably and new renewable sources are becoming increasingly available, it is important to examine the extent of stability and change in domestic energy consumption patterns. In Figure 8, the use of different energy sources in 2011 and 2012 is presented separately based on electrification status. Among electrified households, electricity usage has remained at universal levels, though candle and paraffin use seem to have declined in the year between survey rounds (by 7% and 9% respectively). Firewood usage varied more modestly, with little observable difference in relation to gas, coal, dry cell and car batteries as well as generator usage. In line with the Department of Energy's long-term priorities, use of solar power appears to be increasing, rising from 4% of electrified households in 2011 to 9% in 2012.

Among non-electrified households, the use of candles and paraffin also exhibiting a declining year-on-year trend, falling 11% and 15% respectively. Firewood usage however seems to have risen, from 65% in 2011 to 74% in 2012. The level of reliance on electricity, gas, coal, generators and car batteries to fulfil domestic energy needs remains relatively unchanged, with fluctuations ranging between 1% and 3%. The large disparity between 2011 and 2012 in respect of dry cell batteries is attributable to the fact that energy sources for the running of appliances was not asked for in the 2011 survey round, but included in 2012.

Figure 8: Use of Energy Sources Among South African Households, by Electrification Status 2011-2012 (Percent Using)



Source: SASAS Energy related behaviour and perception survey (2011; 2012)

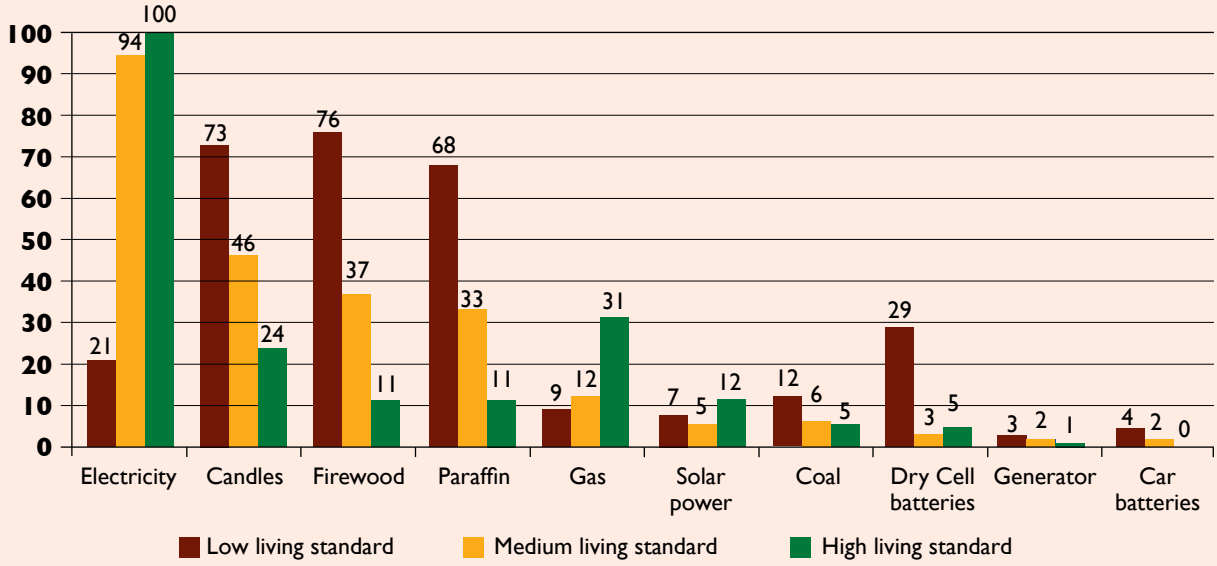
In discussing multiple energy use, it is important to consider the different end-uses or purposes for which households are employing energy sources, for lighting, space heating, cooking, heating water, and the powering of appliances (radios, hi-fis, televisions, etc.). For electrified households, the relatively widespread use of candles (35% of cases) is probably part of an energy substitution strategy in which candles are relied on to light homes in instances of electricity service interruptions or if the household exhausts its budgeted expenditure in the case of prepaid electricity meters. Furthermore, just under a quarter (24%) of electrified households indicate that they use firewood and slightly more than a fifth (22%) use paraffin, most likely for cooking and possibly for lighting, too, in the case of paraffin.

These statistics point starkly to the existence of barriers to energy-switching, a topic that is discussed in depth later in the report. In non-electrified households, the use of candles (76%), firewood (74%) and paraffin (68%) remains pronounced, obviously for lighting, cooking and heating. A fuller analysis of energy sources used for different end-uses and how it varies according to location and other household characteristics will be provided later in this section of the report.

5.1.1. Living Standard Differences

With regard to socioeconomic differences in this pattern of domestic energy use, Figure 9 reveals that marginally more than a fifth (21%) of households with low living standards make use of electricity, compared with near-universal usage among medium and high living standards (94% and 100% respectively). By contrast, candles, firewood and paraffin are each present in more than two-thirds of low living standard households, and between a third and a half of medium living standard households. From a multiple energy use perspective, it is also important to highlight that even those with a high living standard rely on a range of energy sources other than electricity to meet their energy needs, albeit to a lesser degree in most instances than those with greater material disadvantage.

Figure 9: Use of Energy Sources for Any Purpose, by Living Standard Level (Percent Using)



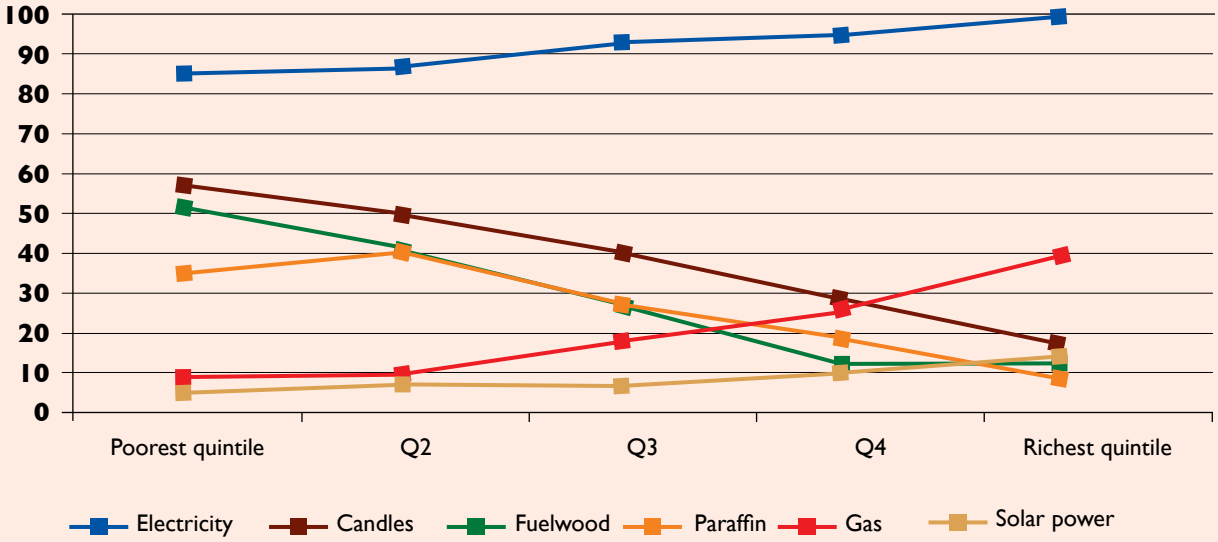
Source: SASAS Energy related behaviour and perception survey (2012)

Table 9: Use of Energy Sources for Any Purpose, by Living Standard Level (Cell Percent, Multiple Response Table)

	Low living standard		Medium living standard		High living standard	
	2011	2012	2011	2012	2011	2012
Electricity	28	21	93	94	100	100
Candles	84	73	53	46	25	24
Firewood	74	76	35	37	12	11
Paraffin	71	68	42	33	15	11
Gas	10	9	13	12	28	31
Solar power	3	7	3	5	4	12
Coal	11	12	8	6	4	5
Dry cell batteries	0	29	3	3	5	5
Generator	1	3	1	2	3	1
Car batteries	0	4	0	2	0	0

Source: SASAS Energy related behaviour and perception survey (2011; 2012)

Figure 10: Use of Select Energy Sources, by Quintiles of Per Capita Monthly Income (Percent Using)



Source: SASAS Energy related behaviour and perception survey (2012)

5.1.2. Geographic Differences

Another well-established trait of energy consumption patterns in the country pertains to the salience of the geographic location of households. Traditionally, three factors have proven especially significant: namely, rural-urban location, climatic conditions and the associated space heating requirements in winter months, and proximity to the country's coalfields (North West, Gauteng, Free State, Mpumalanga, Limpopo and northern KwaZulu-Natal) (Eberhard and Van Horen, 1995). The extent to which such factors emerge as important in the 2012 survey is discussed below.

In Table 10, the statistics on multiple energy use are further disaggregated by the geographic location of the sampled households. The purpose of the table is to illustrate all energy sources used by households. Households could therefore report various energy sources and therefore the percentages do not sum up to 100%.

Rural households are clearly substantially more reliant on biomass resources, especially firewood, than those residing in small towns and metropolitan cities. Just under two-thirds (65%) of households in rural traditional authority areas and 52% of rural farm dwellers were using firewood as an energy source, compared to only 11% of households in formal urban areas and 17% in informal settlements. Other forms of non-commercial biomass resources such as dung and crop residue hardly feature at all in domestic energy consumption patterns.

Table 10: Households Reporting Use of Energy Source, by Geographic Location and Province (Cell Percent, Multiple Response Table)

	Electricity	Candles	Firewood	Paraffin	Gas	Solar power	Coal	Dry cell batteries	Generator	Car batteries	Unweighted N
South Africa	92	38	28	26	20	9	6	6	1	1	2518
Geographic location											
Urban formal	99	26	11	18	24	11	4	4	1	1	1552
Urban informal	83	38	17	47	7	7	13	16	1	2	223
Rural trad. auth. areas	84	66	65	33	11	8	8	6	1	1	536
Farms	72	42	52	36	26	7	11	8	5	1	207
Province											
Western Cape	93	3	10	16	25	6	1	3	1	1	253
Eastern Cape	81	28	34	50	17	8	4	4	2	0	328
Northern Cape	89	45	47	15	16	8	8	9	2	0	147
Free State	98	38	16	52	27	9	3	5	2	1	198
KwaZulu-Natal	85	39	31	24	16	13	8	7	2	1	586
North-West	95	67	41	33	24	12	8	4	3	8	162
Gauteng	96	28	11	18	21	10	6	6	1	0	436
Mpumalanga	90	55	29	21	22	7	12	9	2	0	207
Limpopo	97	80	80	18	12	7	6	5	2	0	201

Source: SASAS Energy related behaviour and perception survey (2012)

Candles and paraffin appear to be fairly common in both rural and urban households, though to different degrees. Candles are employed by two-thirds (66%) of rural traditional authority households and by 42% of rural farm households. They are also present in over a third (38%) of the households in informal settlements, though paraffin is a more common energy source than candles, being used in 47% of informal settlement households. There is near-universal usage of paraffin among non-electrified households in informal settlements. This is in spite of the rapid rise in the price of paraffin alongside petrol costs in recent years. Paraffin is used in around a third of households in rural traditional authority areas and rural farms (33% and 36% respectively). The domestic use of gas is reported by a fifth of surveyed households, and tends to have a greater presence on rural farms and in formal urban areas, most especially higher income electrified households, relative to informal settlements and rural traditional authority areas. On aggregate, no other energy source had a prevalence exceeding 10%, including batteries, coal, solar system and generator electricity. Worth reiterating is an earlier finding that solar power increased from 3% in 2011 to 9% in 2012.

Notable variation in the profile of energy consumption patterns also emerges when one examines energy sources by province (Table 10). In Limpopo, North West and Mpumalanga relatively high electricity usage (97%, 95% and 90% respectively) coexists with notable shares using candles and firewood. In Mpumalanga, the prevalence of coal, at 12%,

remains the highest of any of the nine provinces and stands at twice the national average (6%). This is a reflection of the proximity to some of the country's major coalfields which are situated around towns in Mpumalanga, i.e. Ermelo, Witbank and Secunda. In KwaZulu-Natal and Eastern Cape, the provinces with relatively lower electrification rates (85% and 81%), a broader range of energy sources are being used. In the Eastern Cape, firewood usage is above average, while paraffin is found in half of homes (a figure that exceeds the average by more than 24 percentage points). In Gauteng and the Western Cape, traditional non-commercial energy sources are used in a small share of households and electricity remains the dominant energy source that is used by households in these two provinces. Above-average use of gas as a domestic energy source is evident in the Free State (27%), Western Cape (25%), and North West (24%) in particular, and to a lesser extent in Mpumalanga (22%) and Gauteng (21%).

5.2. Main Use of Energy Sources

The preceding analysis provides an overview of the different energy sources that South African households employed, irrespective of purpose, in late 2012. We now direct attention to the main energy source that is being used for the various domestic end-uses: namely, lighting, cooking, space heating, water heating and appliances.

5.2.1. Main Energy Source for Lighting

As Table 11 convincingly demonstrates, households that have been electrified almost exclusively use electricity for lighting purposes (97%), with a marginal contingent specifying that they continue to rely on candles (1%). By contrast, almost three-fifths of non-electrified households (59%) rely on candles as the main source of lighting, with paraffin being the predominant energy source for this purpose in most of the remaining cases (36%). Other energy sources hardly feature, and no single option is mentioned in more than three percent of cases.

As one would intuitively expect and consistent with findings in 2011, there is discernible variation in the energy sources used for lighting, based on levels of material deprivation. Households characterised by low living standards are more likely to approximate the pattern evident among non-electrified households, given the probability of lower levels of access to mains electricity for the disadvantaged. By contrast, households with a medium or high living standard rely almost entirely on electricity (92% and 98% respectively), with nominal shares (less than 5%) dependent on other sources for their lighting requirements. This pattern is again present when examining energy use patterns by income quintiles.

These class-based differences remain relatively consistent when one examines the results for rural-urban location and province (Table 11). In formal urban areas, electricity is again almost exclusively used for lighting homes (96%), while in informal urban settlements, rural traditional authority areas and rural farms, candles and paraffin are relatively more common, due to the lower shares reporting access to electricity from the mains. The use of paraffin and candles for lighting is most common on rural farms (15% and 16% respectively). It is worth mentioning that the use of energy sources such as paraffin and candles in the household pose significant health risks, in that they have the potential to cause accidents that result in injury or death - for instance, the poisoning of children who drink fluid fuels or when a large block of shacks is razed after a paraffin stove triggers a fire in a single shack (Howells et al., 2006).

Electricity is generally viewed as the cleanest energy source for households, thereby reducing health risks, but also bringing other gains such as providing a more efficient lighting source for children to perform homework tasks. At the provincial level, electricity is used by more than 80% of households as the main source of energy for lighting in eight of the nine provinces, with the figure increasing to more than 90% of households in Western Cape, Free State, North West, Gauteng and Limpopo. The Eastern Cape is the only province where the use of electricity for lighting is below the 80% threshold (at 79%) and it is also only in the Eastern Cape where more than a tenth of households (13%) use paraffin for lighting, regardless of electrification status. In KwaZulu-Natal and the Northern Cape approximately

a tenth (12% and 9% respectively) of sampled households rely on candles for lighting, representing an important supplementary source of lighting in these provinces

Table 11: Main Energy Source Used for Lighting, by Socioeconomic Characteristics (Cell Percent, Row Percent)

	Electricity	Candles	Paraffin	Dry cell batteries	Gas	Solar system	Car Batteries	Generator	Total	Base N
South Africa	89	6	3	1	1	0	0	0	100	2484
Electrification status										
Electrified	97	1	0	1	0	0	0	0	100	2227
Non-electrified	1	59	36	0	2	1	0	0	100	244
Living standard level										
Low	18	45	35	0	1	1	0	0	100	195
Medium	92	4	2	1	0	0	0	0	100	1117
High	98	0	0	1	1	0	0	0	100	936
Per capita income quintiles										
Poorest quintile	81	10	7	2	0	0	0	0	100	421
Quintile 2	84	8	6	1	0	1	0	0	100	453
Quintile 3	91	5	2	1	1	0	0	0	100	539
Quintile 4	93	4	2	0	0	0	0	0	100	528
Richest quintile	97	1	0	0	1	1	0	0	100	500
Geographic location										
Urban formal	96	1	1	1	1	0	0	0	100	1537
Urban informal	78	12	7	1	1	0	0	0	100	218
Rural trad. auth. areas	83	11	5	1	0	1	0	0	100	528
Farms	67	16	15	0	0	1	0	0	100	201
Province										
Western Cape	92	0	6	1	1	0	0	0	100	251
Eastern Cape	79	7	13	0	1	0	0	0	100	324
Northern Cape	84	9	1	2	1	3	0	0	100	142
Free State	91	2	4	2	1	1	0	0	100	197
KwaZulu-Natal	83	12	2	2	0	1	0	0	100	578
North-West	93	6	0	0	0	0	0	0	100	161
Gauteng	93	3	1	1	1	0	0	0	100	428
Mpumalanga	88	9	2	1	0	0	0	0	100	205
Limpopo	96	2	1	1	0	0	0	0	100	198
Dwelling type										
Formal dwelling or brick structure	94	3	1	1	0	0	0	0	100	2008
Traditional dwelling or hut	59	23	17	0	0	1	0	0	100	179
Informal dwelling or shack	68	17	13	0	1	0	0	0	100	233

Source: SASAS Energy related behaviour and perception survey (2012)

5.2.2. Main Energy Source for Cooking

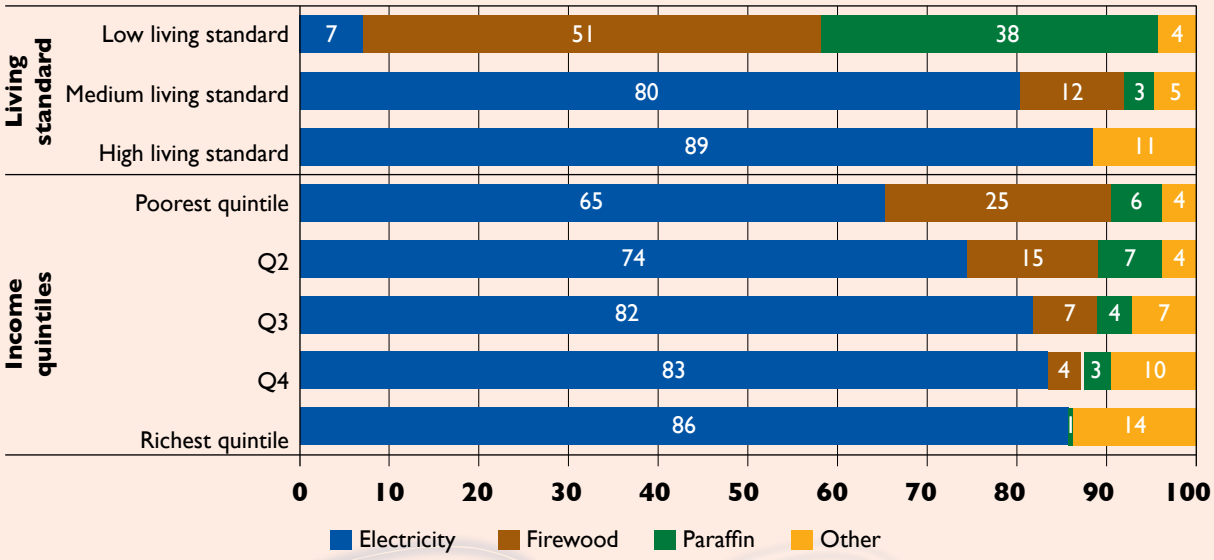
Cooking represents one of the most energy-intensive applications (Howells et al, 2006) and, as such, it is unsurprising that slightly more than three-quarters (77%) of households use electricity as the main energy source for cooking (Table 12). Previous research has shown that the usage of electricity for cooking has been increasing, but at a slower rate than for lighting and media uses (Bekker et al, 2008). A complex set of factors is said to govern the decision not to adopt electricity for thermal applications once a household has been electrified, ranging from cultural inertia to change to the perceived lack of affordability of electricity (White et al, 1997; Sebitosi and Pillay, 2005; Bekker et al, 2008). Nonetheless, the 2012 statistics show that only around a tenth (10%) of electrified households continue to depend on firewood as a main cooking source, with marginal shares reporting gas, solar electricity, paraffin and coal. For non-electrified households, firewood and paraffin predominate as the main energy source for cooking purposes (54% and 38% respectively). Again, gas, coal, solar electricity and electricity from generators are used in a small percentage of households as the primary source to meet their cooking needs. It is worth mentioning that the small percentages relying on solar electricity and gas for their cooking needs, irrespective of electrification status, is likely to be a function of access rather than domestic energy preferences. The Department of Energy's solar electricity initiatives remain in their relative infancy and it is envisaged that the share of households reporting these energy sources for end-uses such as cooking will increases as the programmes are taken to scale in the future.

Table 12: Main Energy Source Used for Cooking, by Electrification Status (Cell Percent, Multiple Response Table)

	Electricity	Firewood	Paraffin	Gas	Solar System	Coal	Generator	Other	Total	Base N
South Africa	77	10	4	5	3	1	0	0	100	2470
Electrified	84	6	1	5	3	1	0	0	100	2214
Non-electrified	1	54	38	5	0	2	0	0	100	244

Source: SASAS Energy related behaviour and perception survey (2012)

Figure 11: Main Energy Source for Cooking, by Living Standard Level and Quintiles of Per Capita Monthly Income (Percent Using)



Source: SASAS Energy related behaviour and perception survey (2012)

The socioeconomic gradient of difference in terms of main energy source for cooking is quite stark, especially when one examines the patterns by living standard measure and income level (Figure 11). Households with a low living standard and ranking among the poorest income quintiles are considerably more inclined to report the use of firewood and paraffin relative to better-off households. This suggests the existence of barriers or practices among poorer households that inhibit a fuller transition from firewood to electricity for this end use.

As for geographic variation, 90% of households in the Free State use electricity for cooking, while the figure exceeds 80% in North West, Gauteng and the Western Cape (Table 13). Only in Limpopo and the Eastern Cape is the share of households using electricity for cooking purposes below the national average. Firewood is relied on in a majority of provinces as the second most common main energy source for cooking. The case of Limpopo is somewhat atypical in that more than two-fifths (44%) of households use wood as the main energy source for cooking compared to 49% using electricity. In Mpumalanga, Northern Cape, Eastern Cape and KwaZulu-Natal firewood are used by at least a tenth or more of households as the main energy source for cooking.

Table 13: Main Energy Source Used for Cooking, by Socioeconomic Characteristics (Cell Percent, Multiple Response Table)

	Electricity	Firewood	Paraffin	Gas	Solar System	Coal	Generator	Other	Total	Base N
South Africa	77	10	4	5	3	1	0	0	100	2470
Geographic location										
Urban formal	88	0	1	6	4	0	0	0	100	1528
Urban informal	72	3	21	3	1	0	0	0	100	215
Rural trad. auth. Areas	59	33	4	3	1	0	0	0	100	524
Farms	64	20	8	2	2	5	0	0	100	203
Province										
Western Cape	81	5	1	12	1	0	0	0	100	251
Eastern Cape	71	13	11	1	3	1	0	0	100	320
Northern Cape	79	11	1	6	0	2	0	0	100	142
Free State	90	1	4	3	2	0	0	0	100	196
KwaZulu-Natal	77	13	4	4	3	0	0	0	100	575
North-West	85	5	3	2	1	4	0	0	100	160
Gauteng	84	0	4	6	5	0	1	0	100	422
Mpumalanga	79	10	6	2	1	1	0	0	100	206
Limpopo	49	44	0	4	3	0	0	0	100	198
Dwelling type										
Formal dwelling or brick structure	82	8	2	5	2	1	0	0	100	1996
Traditional dwelling or hut	44	40	12	4	1	0	0	0	100	178
Informal dwelling or shack	62	6	24	4	1	3	0	0	100	233

Source: SASAS Energy related behaviour and perception survey (2012)

Paraffin is used as the primary source for cooking in around a tenth of households (11%) in the Eastern Cape while gas features as the second most frequent energy source for cooking in the Western Cape and Gauteng

An equally significant variation in main cooking energy patterns is found when disaggregating by type of location. In formal urban areas, electricity has become the energy source of choice for cooking, being used in 88% of cases. In informal urban settlements, almost three quarters are using electricity (72%), but a sizeable 21% rely on paraffin. This reflects the distinction between electrified and non-electrified households in informal settlements, with the former opting to use electricity whereas the latter, left with constrained choices in the absence of electricity, are dependent on paraffin to meet their cooking requirements. In rural traditional authority areas, 59% of households use electricity for cooking, with a third (33%) using firewood and very few households reporting other energy sources for cooking purposes. On rural farms, around two thirds (64%) use electricity for their cooking needs, with a fifth (20%) using wood and less than a tenth (8%) relying on paraffin.

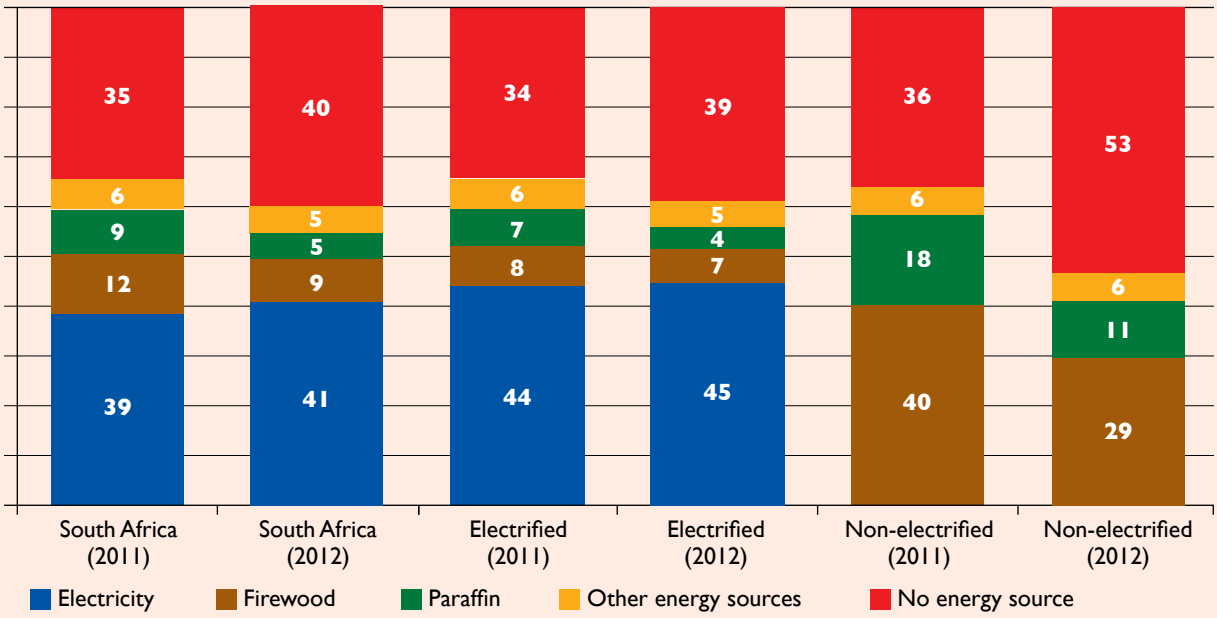
5.2.3. Main Energy Source for Heating Spaces and Keeping Warm

Apart from cooking, another energy-intensive thermal application is domestic space heating. On aggregate, three-fifths of South African households (60%) use an energy source to heat spaces and keep warm, while the rest do not use energy sources but opt mainly to wear warm clothing and use blankets (Table 14). More specifically, around two-fifths (41%) use electricity as the main source for space heating, while 9% use firewood and 5% paraffin. Coal, gas and other sources are mentioned in less than 5% of cases in general.

Examining the main energy source for space heating by electrification status (Figure 12), we find that in electrified households 45% primarily use electricity, with nominal shares reporting firewood, paraffin and other energy sources (7%, 4% and 5% respectively). A considerable share of electrified households (39%) use no energy source for heating, choosing instead to make use of blankets, warm clothing or nothing at all. In non-electrified households, firewood is the primary form of energy relied on for space heating, present in just more than a quarter (29%) of homes. The share using paraffin is double the national average (11%), with 'other sources' consisting mainly of coal (5%).

Those with a low living standard exhibit a very similar pattern as non-electrified households in terms of main energy source used for space heating. A marginal 3% use electricity, while 33% employ firewood and 14% paraffin (Table 14), while 47% use no energy source. Higher electricity usage (37%) for space heating is evident in households classified with a medium living standard, with wood and paraffin serving as the primary source for heating in around a tenth of cases (12% and 7% in turn) and a similar share again indicating no energy source (40%). For households with high living standards, half (50%) use electricity for space heating, with other energy sources hardly featuring. Two fifths reportedly use no energy source, with an even split between warm clothing and blankets (21% and 18% respectively). A similar positive association is discernible in relation to income status and electricity usage for heating purposes. Poor households have a greater likelihood of using wood and paraffin for space heating, while the top two income quintiles in particular are more inclined towards electricity usage for this end-use. Fairly similar levels of 'no energy source' are present across the income distribution.

Figure 12: Main Energy Source for Heating Spaces and Keeping Warm in 2011 and 2012, by Electrification Status (Percent Using)



Source: SASAS Energy related behaviour and perception survey (2011; 2012)

At a provincial level, more than a quarter (29%) of households in Limpopo relies on firewood for heating, with this energy source also being used by 15% of households in Mpumalanga and the Northern Cape (Table 14). In Eastern Cape and the Free State, paraffin is particularly more common relative to the national average and other provinces, being present in a fifth of households in the Free State. Coal continues to be more commonly used than average for heating in Mpumalanga (8%), again reflecting closeness to coalfields.

Table 14: Main Energy Source Used for Heating Rooms and Keeping Warm, by Electrification Status, Living Standard and Location (Row Percent)

	Energy source								No energy source							
	Electricity	Firewood	Paraffin	Coal	Gas	Dry cell batteries	Solar System	Generator	Warm clothing	Blankets	Hot water bottle	Other	None of the above	(Don't know)	Total	Base N
South Africa	41	9	5	2	3	1	0	0	20	18	0	0	2	0	100	2451
Electrification status																
Electrified	45	7	4	1	3	1	0	0	20	17	0	0	2	0	100	2193
Non-electrified	1	29	11	5	0	0	0	0	21	28	0	0	4	0	100	246
Living standard level																
Low	3	33	14	3	0	0	1	0	19	23	0	0	5	0	100	197
Medium	37	12	7	2	1	1	0	0	20	18	1	0	2	0	100	1110
High	50	1	1	1	5	1	0	0	21	18	0	0	1	0	100	915
Per capita income quintiles																
Poorest quintile	28	22	7	3	0	0	0	0	21	16	0	0	3	0	100	419
Quintile 2	34	11	6	3	2	1	0	0	25	17	0	0	1	0	100	448
Quintile 3	40	8	5	2	1	0	0	0	21	21	1	0	2	0	100	532
Quintile 4	46	3	4	0	1	1	0	0	17	26	1	0	1	0	100	523
Richest quintile	53	1	1	1	10	2	0	0	17	11	1	0	3	0	100	491
Geographic location																
Urban formal	51	1	3	2	4	1	0	0	18	17	0	0	2	0	100	1508
Urban informal	28	6	15	4	1	1	0	1	29	11	2	0	3	0	100	218
Rural trad auth areas	25	25	6	1	0	1	0	0	24	17	0	0	1	0	100	521
Farms	31	18	2	3	0	0	0	0	13	31	0	0	1	0	100	204
Province																
Western Cape	39	1	4	0	0	3	0	0	14	36	1	0	2	0	100	251
Eastern Cape	26	11	14	2	1	0	0	0	19	25	0	0	1	0	100	316
Northern Cape	26	15	2	2	1	0	0	0	26	17	1	0	9	0	100	141
Free State	45	12	20	0	5	2	0	0	5	11	1	0	0	0	100	197
KwaZulu-Natal	43	10	2	1	1	1	0	0	25	15	1	0	1	0	100	564
North West	45	6	0	4	1	1	1	0	7	32	0	0	3	0	100	156
Gauteng	52	1	2	2	7	0	0	0	25	8	0	0	3	0	100	419
Mpumalanga	48	15	2	8	1	0	0	0	12	14	0	1	0	0	100	207
Limpopo	21	29	2	0	0	1	0	0	31	15	1	0	1	0	100	200

Source: SASAS Energy related behaviour and perception survey (2012)

As with other end-uses, the energy use patterns for heating exhibit distinct location differences. Equal shares of households in rural traditional authority areas (25%) use electricity and wood as the main source of heating, while other non-energy sources such as blankets are used in around two-fifths of cases (42%). On rural farms, electricity is somewhat more prevalent than wood (31% versus 18%), with paraffin again playing a very subsidiary role (2%). Non-energy sources are used by 45% of households. For households in formal urban areas, electric heating is more common (51%), with very little reliance on other energy sources. Non-energy sources (blankets, warm clothing) are used mainly for space heating in 35% of cases. Those situated in urban informal areas are most likely to use electricity

(28%) or paraffin (15%) for heating while only 6% use wood, which is a reflection of the limited availability of biomass in many informal settlements. More than two-fifths (42%) does not use an energy source for keeping warm but uses blankets, warm clothing or hot water bottles.

Among electrified households, there is a discernible class gradient in fuel use for space heating (results not shown). Those with higher living standards tend to reporting considerably higher usage of electricity and gas than electrified household with lower living standards, but also hot water bottles. Conversely, electrified households with lower living standards are more greatly predisposed towards reporting the use of paraffin and firewood for heating rooms and keeping warm. There is also some evidence of a class gradient among non-electrified households, with poorer households again more inclined to be using firewood and paraffin.

5.2.4. Main Energy Source for Operating Appliances

The 2011 survey of domestic energy attitudes and behaviour did not include questions about the use of different energy sources for the operating of appliances. In the 2012 survey, respondents were asked about the energy sources used to run four domestic appliances, specifically (i) a radio or hi-fi, (ii) a television, (iii) a refrigerator, and (iv) an iron. The analysis is performed only on those households reporting that they possess the appliance in question, which affects samples sizes when conducting subgroup analysis. In some instances, the number of cases for particular categories is small (below 200), which means that the margin of error increases. It was ultimately decided to present the tables since they nonetheless offer important insight into the different sources of energy households rely on to run basic domestic appliances. The reader is cautioned that in cases when the base numbers are small (indicated in each table by an asterisk), the results need to be treated judiciously.

Another consideration in examining and interpreting the energy use patterns for running the aforementioned appliances is that the data collected ultimately provided hardly any instances where multiple fuels were collected – fewer than 20 households reported using more than one energy source for each of the four appliances. While to some degree this may reflect a social reality whereby households rely on one predominant energy source to power appliances, fieldwork checks demonstrated that certain enumerators may have interpreted the question as requiring a single main energy source rather than a capturing of all sources. For this reason, we have focused our analysis on those reporting the main energy source employed and omitted the nominal set of cases where multiple sources are listed.

From Table 15, it is readily apparent that electricity is by a considerable margin the predominant energy source for powering radios and hi-fis (93%), with small shares of households relying on dry cell batteries (4%), solar system (2%), and car batteries (1%). Among non-electrified households and those with a low living standard, dry cell batteries are the main energy source employed, with a higher than average reported usage of solar system and car batteries too. In the lowest three income quintiles, the use of dry cell batteries is above average but less pronounced. Although electricity remains the primary energy source for radios and hi-fis in informal settlements and rural farms, at least a tenth of households (13% and 11% respectively) make use of dry cell batteries. Provincially, electricity usage ranges from 84% in North West to 98% in the Western Cape. Households in the Eastern Cape, KwaZulu-Natal and Mpumalanga are most likely to be using dry cell batteries for this appliance (8% in the first two instances and 6% in the latter), with car battery usage most prevalent in North West (10%). Finally, formal dwellings almost universally power radios/hi-fis with electricity (96%), compared to approximately two-thirds of traditional or informal structures.

Table 15: Main Energy Source Used for Operating a Radio/Hi-Fi, by Socioeconomic Characteristics (Row Percent)

	Electricity	Dry cell batteries	Solar system	Car batteries	Generator	Other	Total	Base N
South Africa	93	4	2	1	0	0	100	1754
Electrification status								
Electrified	97	1	1	1	0	0	100	1654
Non-electrified	7	75	10	5	1	2	100	91*
Living standard level								
Low	29	58	8	5	0	0	100	96*
Medium	95	2	1	2	0	0	100	726
High	98	0	2	0	0	0	100	780
Per capita income quintiles								
Poorest quintile	88	6	4	0	0	1	100	224
Quintile 2	90	8	1	1	0	0	100	278
Quintile 3	93	6	1	0	0	0	100	371
Quintile 4	93	3	1	4	0	0	100	416
Richest quintile	98	0	2	0	0	0	100	430
Geographic location								
Urban formal	97	1	1	1	0	0	100	1210
Urban informal	86	13	1	0	0	0	100	129*
Rural trad. auth. areas	86	9	4	0	0	0	100	302
Farms	85	11	1	2	0	1	100	113*
Province								
Western Cape	98	1	1	0	0	0	100	222
Eastern Cape	89	8	2	1	1	0	100	177*
Northern Cape	95	3	1	0	0	1	100	82*
Free State	97	3	0	0	0	0	100	155*
KwaZulu-Natal	88	8	3	1	0	0	100	436
North-West	84	3	3	10	0	0	100	122*
Gauteng	96	3	1	0	0	0	100	304
Mpumalanga	91	6	2	0	0	1	100	127*
Limpopo	97	1	1	0	0	0	100	129*
Dwelling type								
Formal dwelling or brick structure	96	2	1	0	0	0	100	1513
Traditional dwelling or hut	66	22	8	4	0	0	100	77*
Informal dwelling or shack	67	20	1	12	1	0	100	120*

Source: SASAS Energy related behaviour and perception survey (2012)

Note: Analysis is restricted to those households reporting possession of the appliance. An asterisk (*) implies that caution needs to exercised in interpretation due to the relatively small set of cases involved.

Turning to television sets, Table 16 provides a similar aggregate picture, with 97% of households possessing this appliance stating that they use electricity. The only other discernible source is the use of a solar system, which was mentioned in 2% of cases. At the disaggregate level, for those non-electrified households operating televisions, the most common energy source was a solar system, followed by car batteries and a generator. Among households with a low living standard, nearly half indicated that they depend mainly on electricity, with notable shares reporting solar system and car batteries. Although these patterns are based on a very small number of cases, they are interesting, especially in the suggestion that the operating of a television represents a salient purpose for which solar energy is being used.

Table 16: Main Energy Source Used for Operating a Television, by Socioeconomic Characteristics (Row Percent)

	Electricity	Solar system	Dry cell batteries	Car batteries	Generator	Other	Total	Base N
South Africa	97	2	0	0	0	0	100	2138
Electrification status								
Electrified	99	1	0	0	0	0	100	2090
Non-electrified	8	44	3	23	20	2	100	38*
Living standard level								
Low	47	24	4	20	6	0	100	35*
Medium	98	1	0	0	0	0	100	996
High	98	2	0	0	0	0	100	930
Per capita income quintiles								
Poorest quintile	96	3	0	0	1	0	100	318
Quintile 2	97	2	0	0	0	0	100	373
Quintile 3	98	1	0	0	0	0	100	442
Quintile 4	98	1	0	0	0	0	100	471
Richest quintile	98	2	0	0	0	0	100	496
Geographic location								
Urban formal	99	1	0	0	0	0	100	1468
Urban informal	97	0	0	2	0	0	100	164*
Rural trad. auth. areas	95	4	0	1	0	0	100	390
Farms	92	4	1	1	3	0	100	116*
Province								
Western Cape	98	1	0	1	0	0	100	241
Eastern Cape	99	1	0	0	0	0	100	238
Northern Cape	98	1	0	0	1	0	100	113*
Free State	98	1	1	0	0	0	100	181*
KwaZulu-Natal	94	4	0	1	0	0	100	514
North-West	94	5	0	0	0	0	100	142*
Gauteng	99	1	0	0	0	0	100	387
Mpumalanga	96	2	0	0	2	0	100	156*
Limpopo	99	1	0	0	0	0	100	166*
Dwelling type								
Formal dwelling or brick structure	98	2	0	0	0	0	100	1854
Traditional dwelling or hut	89	6	0	4	0	0	100	90*
Informal dwelling or shack	94	1	1	2	2	1	100	143*

Source: SASAS Energy related behaviour and perception survey (2012)

Note: Analysis is restricted to those households reporting possession of the appliance. An asterisk (*) implies that caution needs to exercised in interpretation due to the relatively small set of cases involved.

The reliance on a solar home system (SHS) for operating a television is also higher than average among households in the poorest income quintile, rural areas, in KwaZulu-Natal and North West, though in all cases it was mentioned as a predominant source by fewer than five percent. While bearing in mind that the use of electricity for running televisions in most instances remains near universal levels, car batteries are more common than average in informal urban settlements and among households constructed of traditional or informal materials, while generators are more likely than average to be mentioned on rural farms, in Mpumalanga and among households built of informal materials.

Table 17: Main Energy Source Used for Operating Refrigerators, by Socioeconomic Characteristics (Row Percent)

	Electricity	Solar system	Gas	Paraffin	Generator	Total	Base N
South Africa	98	1	1	0	0	100	2041
Electrification status							
Electrified	99	1	0	0	0	100	2009
Non-electrified	16	2	72	5	5	100	21*
Living standard level							
Low	64	0	19	17	0	100	18*
Medium	98	0	1	0	0	100	926
High	98	2	0	0	0	100	935
Per capita income quintiles							
Poorest quintile	98	1	1	0	0	100	275
Quintile 2	99	0	1	0	0	100	345
Quintile 3	98	1	0	0	0	100	429
Quintile 4	98	1	0	0	0	100	456
Richest quintile	98	2	0	0	0	100	498
Geographic location							
Urban formal	99	1	0	0	0	100	1445
Urban informal	97	0	1	1	1	100	137*
Rural trad. auth. areas	97	1	2	0	0	100	357
Farms	96	4	0	0	0	100	102*
Province							
Western Cape	98	1	1	0	0	100	237
Eastern Cape	100	0	0	0	0	100	202
Northern Cape	98	1	0	0	0	100	109*
Free State	99	1	0	0	0	100	170*
KwaZulu-Natal	97	1	2	0	0	100	488
North-West	95	5	0	0	0	100	135*
Gauteng	99	1	0	0	0	100	377
Mpumalanga	98	2	0	0	0	100	156*
Limpopo	100	0	0	0	0	100	167*
Dwelling type							
Formal dwelling or brick structure	99	1	0	0	0	100	1818
Traditional dwelling or hut	91	0	7	2	0	100	65*
Informal dwelling or shack	96	1	1	1	1	100	112*

Source: SASAS Energy related behaviour and perception survey (2012)

Note: Analysis is restricted to those households reporting possession of the appliance. An asterisk (*) implies that caution needs to exercised in interpretation due to the relatively small set of cases involved.

Refrigerators are relatively energy intensive appliances, despite the energy savings that have been brought on by the introduction of efficient models of electric refrigerator in recent years. In South Africa, by late 2012 an estimated 95% of households with this appliance relied on electricity to operate it (Table 17). In non-electrified households, gas refrigerators appear to be more common than average, with electricity, gas and solar home system used by modest shares. However these figures need to be interpreted with caution to the small number of cases involved. Among households with a low living standard, electricity was reportedly used by nearly two-thirds, with the balance fairly evenly split between the use of gas and paraffin operated refrigerators. The use of solar home system was more commonly used for refrigeration in North West province and on rural farms, though in both cases this represented only around five percent of households.

With regard to the domestic use of irons, 95% of households with this appliance depend primarily on electricity (Table 18), with negligible shares (1% each) registering the use of firewood, paraffin, coal and a solar home system. Again, non-electrified households and households with low living standards differ the most from the national average. In the case of the former, the main energy source used for irons is firewood, followed by paraffin and coal, while in the latter instance virtually equivalent shares rely on electricity, firewood, paraffin and coal. Again we must treat the figures with caution due to potential bias because of the small number of cases involved. Firewood is also more prevalent than average among households built of traditional materials, in KwaZulu-Natal, in rural areas and among the poorest quintiles, whereas paraffin tends to be widely employed in informal settlements and for households built of informal and traditional materials, in the Eastern Cape and Mpumalanga, as well as the poorest income quintiles. Fitting this pattern, coal usage tends to be more widespread (though still relatively circumscribed) among poorer, rurally based households constructed with traditional materials.

Table 18: Main Energy Source Used for Operating Irons, by Socioeconomic Characteristics (Row Percent)

	Electricity	Firewood	Paraffin	Coal	Solar system	Gas	Generator	Total	Base N
South Africa	95	1	1	1	1	0	0	100	2218
Electrification status									
Electrified	98	0	0	0	1	0	0	100	2112
Non-electrified	3	36	29	26	2	2	0	100	95*
Living standard level									
Low	25	23	24	26	2	0	0	100	84*
Medium	96	1	1	1	0	0	0	100	1000
High	98	0	0	0	2	0	0	100	935
Per capita income quintiles									
Poorest quintile	90	4	2	3	1	0	0	100	355
Quintile 2	91	3	3	2	0	0	0	100	393
Quintile 3	96	1	1	0	1	0	0	100	458
Quintile 4	97	0	1	0	1	0	0	100	474
Richest quintile	97	0	0	0	2	0	0	100	499
Geographic location									
Urban formal	98	0	0	0	1	0	0	100	1477
Urban informal	89	2	8	0	1	0	0	100	171*
Rural trad. auth. areas	89	4	2	4	1	0	0	100	442
Farms	87	5	2	3	3	0	0	100	128*
Province									
Western Cape	99	0	0	0	1	0	0	100	214
Eastern Cape	92	1	5	2	0	0	0	100	251
Northern Cape	98	0	1	0	1	0	0	100	117*
Free State	99	1	0	0	1	0	0	100	190*
KwaZulu-Natal	87	6	0	5	1	1	0	100	549
North-West	92	0	2	1	5	0	0	100	150*
Gauteng	98	0	1	0	1	0	0	100	399
Mpumalanga	92	2	3	1	2	0	0	100	175*
Limpopo	100	0	0	0	0	0	0	100	173*
Dwelling type									
Formal dwelling or brick structure	97	1	1	0	1	0	0	100	1893
Traditional dwelling or hut	70	10	5	13	1	0	0	100	114*
Informal dwelling or shack	84	3	10	2	0	0	0	100	156*

Source: SASAS Energy related behaviour and perception survey (2012)

Note: Analysis is restricted to those households reporting possession of the appliance. An asterisk (*) implies that caution needs to exercised in interpretation due to the relatively small set of cases involved.

5.3. A Closer Examination of Multiple Energy Use

Earlier in this section of the report, it was shown that multiple energy use remains an enduring feature of the energy consumption patterns of both electrified and non-electrified households in South Africa. This issue will now be further examined by providing a more detailed assessment of the variety of energy sources that households are using for the three different end-uses included in the survey.

5.3.1. Lighting

With respect to energy choice and preferences for lighting homes, the survey shows that 57% of South African households on average rely on a single energy source, with a large share (43%) characterised by multiple energy use (Table 19). Half (51%) use electricity to meet all their lighting requirements, with small shares depending solely on candles (4%) and paraffin (2%). As one might anticipate, the main energy mix used for lighting is a combination of electricity and candles (24%), while relatively small shares rely on paraffin, candles and electricity (4%) or paraffin and electricity (4%). No other combination exceeds 5% of cases.

Electrified households are most likely to be exclusively using electricity for their domestic lighting needs (57%), while just over a quarter (27%) use a combination of electricity and candles, the latter forming a critical secondary source in times of interruption of service, whether for technical reasons or due to cut-offs for reasons such as prepaid vouchers running out or non-payment. As with the national results, a minority of electrified households report the use of paraffin, candles and electricity (4%) or paraffin and electricity (4%) as the energy combinations used in lighting their homes. Non-electrified households rely foremost on candles (43%) for lighting purposes. The combined use of paraffin and candles occurs in a further 22% of cases, while paraffin is used as a single energy source in 18% of non-electrified households.

In terms of class-based differences, households with a low- or medium-living standard tend to exhibit a greater reliance on multiple energy sources than those with a high living standard (Table 19). Households with a low standard of living primarily employ paraffin (30%) for lighting, while a further 24% use both candles and paraffin. About 15% uses solely electricity and a tenth (10%) use a mix of electricity and candles. Among households with medium living standards, there is a considerably higher share using electricity as the sole source for lighting (42%), with an almost equally high share (34%) using both electricity and candles. Paraffin is used most in combination with other energy sources, with 6% using it together with candles and electricity and 6% in combination with electricity only. Finally, more than three-fifths (69%) of high living standard households use electricity only for lighting, with 18% using electricity and candles, with a significantly lower presence of paraffin and a modestly higher than average use of gas combinations alongside electricity.

Table 19: Energy Choice for Lighting, by Electrification Status and Living Standard (Column Percent)

Multiple energy sources for lighting	South Africa	Electrified	Non-electrified	Low	Medium	High
Single energy use	**57**	**57**	**63**	**49**	**47**	**69**
Paraffin only	2	0	18	15	1	0
Gas only	0	0	1	0	0	0
Candles only	4	1	43	30	3	0
Solar system only	0	0	0	1	0	0
Electricity only	51	56	1	2	42	68
Dry cell batteries only	0	0	0	0	0	0
Generator only	0	0	0	0	0	0
Other source only	0	0	0	0	0	0
Multiple energy use	**43**	**43**	**37**	**51**	**53**	**31**
Candles & electricity	24	27	0	10	34	18
Paraffin, candles & electricity	4	4	0	2	6	2
Paraffin & electricity	4	4	0	5	6	2
Paraffin & candles	2	0	22	24	1	0
Gas & electricity	3	3	0	0	2	3
Gas, candles & electricity	1	1	0	0	1	1
Paraffin, gas & electricity	0	0	0	0	0	0
Paraffin, gas, candles & electricity	0	0	0	0	0	0
Other energy combinations	4	3	14	10	2	6
Total	**100**	**100**	**100**	**100**	**100**	**100**

Source: SASAS Energy related behaviour and perception survey (2012)

In the Western Cape, Eastern Cape, Northern Cape, KwaZulu- Natal and Gauteng more than half of households are reliant on a single source of energy for lighting purposes, most of which is accounted for by the use of electricity (Table 20). Comparatively very low levels of single energy use are observed in Limpopo (19%), North West (24%), Free State (40%) and Mpumalanga (49%). This is related to lower use of electricity by households in these provinces as a sole source for lighting.

Multiple energy use is above average for households in six provinces: namely, in descending rank order, Limpopo, North West, Free State, Mpumalanga and Northern Cape. In all of these provinces, the most common multiple energy source combination is candles and electricity. In the Free State and Eastern Cape, a higher than average share was reported for the paraffin and electricity mix.

Table 20: Energy Choice for Lighting, by Province (Column Percent)

Multiple energy sources for lighting	WC	EC	NC	FS	KZN	NW	GP	MP	LP
Single energy use	**89**	**62**	**51**	**40**	**63**	**24**	**68**	**49**	**19**
Paraffin only	5	6	0	0	0	0	1	0	0
Gas only	1	0	1	1	0	0	0	0	0
Candles only	0	5	6	0	9	5	2	7	4
Solar system only	0	0	1	0	0	0	0	0	0
Electricity only	83	51	43	39	52	19	65	41	14
Dry cell batteries only	1	0	0	0	0	0	0	1	0
Generator only	0	0	0	0	0	0	0	0	0
Other source only	0	0	0	0	0	0	0	0	0
Multiple energy use	**11**	**38**	**49**	**60**	**37**	**76**	**32**	**51**	**81**
Candles & electricity	2	6	33	28	16	49	21	32	68
Paraffin, candles & electricity	1	7	1	5	7	4	2	4	3
Paraffin & electricity	2	12	1	13	3	4	2	1	1
Paraffin & candles	0	7	1	1	2	3	1	3	1
Gas & electricity	1	2	1	3	2	7	3	3	2
Gas, candles & electricity	0	1	1	3	1	3	1	1	0
Paraffin, gas & electricity	0	0	0	1	0	0	0	0	1
Paraffin, gas, candles & electricity	0	1	0	0	0	0	0	2	1
Other energy combinations	4	2	12	7	5	6	3	5	5
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Source: SASAS Energy related behaviour and perception survey (2012)

Turning to type of geographic location, we find that urban areas are more likely to report a single energy source for domestic lighting needs, particularly in formal urban areas (67%), while households based in rural, traditional authority areas and on rural farms tend to demonstrate a substantially greater reliance on multiple energy combinations (65% and 50% respectively). Households in formal urban areas are most likely to use electricity as the sole energy source for lighting (65%) or electricity together with candles (19%) (Table 21). In informal urban settlements the most common option for lighting is again the exclusive use of electricity (50%). Notable secondary categories are electricity and candles (15%) and paraffin, candles and electricity (8%).

Table 21: Energy Choice for Lighting, by Geographic Location (Column Percent)

Multiple energy sources for lighting	Urban formal	Urban informal	Rural, traditional authority areas	Farms
Single energy use	**67**	**63**	**35**	**50**
Paraffin only	0	4	1	9
Gas only	0	0	0	0
Candles only	1	8	9	12
Solar system only	0	0	0	0
Electricity only	65	50	24	29
Dry cell batteries only	0	1	0	0
Generator only	0	0	0	0
Other source only	0	0	0	0
Multiple energy use	**33**	**37**	**65**	**50**
Candles & electricity	19	15	41	19
Paraffin, candles & electricity	2	8	7	3
Paraffin & electricity	3	5	5	6
Paraffin & candles	0	3	5	5
Gas & electricity	2	2	1	8
Gas, candles & electricity	1	1	1	2
Paraffin, gas & electricity	0	0	0	0
Paraffin, gas, candles & electricity	0	0	1	0
Other energy combinations	4	3	4	6
Total	**100**	**100**	**100**	**100**

Source: SASAS Energy related behaviour and perception survey (2012)

In rural traditional authority areas, two-fifths (41%) use a combination of electricity and candles, representing the largest share of households. The single use of electricity is present in only 24% of households, while 9% only use candles. Other notable multiple sources are paraffin, candles and electricity (7%). A broadly similar pattern is observed in relation to rural farm households, with 29% exclusively using electricity and 19% using candles and electricity in combination. Larger than average shares only use candles (12%) or paraffin (9%) for lighting.

5.3.2. Cooking

For cooking, three fifths of South African households (60%) employ a single energy to meet their daily needs, which is comprised mainly of the use of electricity (47%) with nominal shares using wood, paraffin, gas or solar only (Table 22). Of the remaining 40% that use a range of energy sources to fulfil their domestic cooking requirements, electricity and firewood, gas and electricity, as well as electricity and paraffin, are the three most common mixes of sources (each representing about a tenth of households). The energy choices for cooking amongst electrified households is virtually identical to the national average, with the predominance of the single use of electricity at 51%, with combinations of electricity together with wood, gas or paraffin assuming a subsidiary but nonetheless noteworthy role. Although the balance between single and multiple energy use for cooking among non-electrified households does not differ radically from that of electrified households, there are sizeable discrepancies in terms of the specific sources and combinations that are relied upon. More than a third (37%) of non-electrified households solely use firewood for cooking and almost a quarter (23%) solely uses paraffin. A sizeable 24%- use a mix of these two sources.

Table 22: Energy Choice for Cooking, by Electrification Status and Living Standard (Column Percent)

Multiple energy sources for cooking	South Africa	Electrified	Non-electrified	Low	Medium	High
Single energy use	**60**	**60**	**66**	**58**	**54**	**66**
Electricity only	47	51	1	2	41	61
Firewood only	6	4	37	34	7	0
Paraffin only	2	0	23	21	2	0
Gas only	2	2	3	0	2	3
Solar system only	2	2	0	0	1	2
Coal only	0	0	2	1	1	0
Other source only	0	0	0	0	0	0
Multiple energy use	**40**	**40**	**34**	**42**	**46**	**34**
Firewood & electricity	10	11	0	2	15	6
Gas & electricity	10	10	0	0	5	17
Paraffin & electricity	9	10	0	4	15	5
Paraffin, firewood & electricity	2	3	0	2	4	0
Paraffin & firewood	2	0	24	25	1	0
Paraffin, gas & electricity	1	1	0	0	1	1
Gas, firewood & electricity	1	1	0	0	1	1
Coal & electricity	1	1	0	0	1	0
Paraffin & gas	0	0	3	4	0	0
Paraffin, gas & firewood	0	0	2	2	0	0
Other energy combinations	4	4	5	3	4	4
Total	**100**	**100**	**100**	**100**	**100**	**100**

Source: SASAS Energy related behaviour and perception survey (2012)

The differences between electrified and non-electrified households in terms of the energy mix used for cooking are again evident when comparing energy-use patterns by household living standard level. Only 2% of households with a low living standard employ electricity exclusively, relative to 41% among those with a medium living standard and 61% for those with a high living standard. For households with a low living standard, the most common trend is to only cook with firewood (34%) or use a combination of paraffin and firewood (25%). In more than a fifth of these households (21%) cooking is done exclusively using paraffin. Among medium living standard households, apart from the previously mentioned single electricity use, a further third (30%) use electricity combined with either firewood or paraffin. While more than three-fifths (61%) of those with a high living standard only use electricity, an additional 17% cook with gas and electricity.

Table 23: Energy Choice for Cooking, by Province (Column Percent)

Multiple energy sources for cooking	WC	EC	NC	FS	KZN	NW	GP	MP	LP
Single energy use	**74**	**59**	**49**	**48**	**63**	**34**	**72**	**51**	**43**
Electricity only	63	46	41	47	48	23	60	41	11
Firewood only	5	5	3	0	9	4	0	6	31
Paraffin only	0	5	1	0	2	1	4	2	0
Gas only	6	1	3	0	3	0	3	0	1
Solar system only	0	2	0	1	2	1	5	1	0
Coal only	0	1	2	0	0	4	0	1	0
Other source only	0	0	0	0	0	0	0	0	0
Multiple energy use	**26**	**41**	**51**	**52**	**37**	**66**	**28**	**49**	**57**
Firewood & electricity	3	3	28	2	7	15	6	14	32
Gas & electricity	14	4	3	17	8	12	9	17	5
Paraffin & electricity	2	12	3	27	9	20	8	3	5
Paraffin, firewood & electricity	0	8	0	0	4	6	1	0	1
Paraffin & firewood	0	9	1	2	4	2	0	2	3
Paraffin, gas & electricity	2	1	0	0	0	1	0	2	1
Gas, firewood & electricity	0	1	2	0	0	4	0	2	1
Coal & electricity	0	0	1	1	0	1	1	1	0
Paraffin & gas	1	1	0	0	1	0	0	0	0
Paraffin, gas & firewood	0	0	3	0	0	0	0	0	0
Other energy combinations	3	2	8	2	4	6	2	7	10
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Source: SASAS Energy related behaviour and perception survey (2012)

In five of the nine provinces there is a greater share of households reporting single energy use for cooking than multiple energy use: namely, Western Cape, Gauteng, KwaZulu-Natal, Eastern Cape and Mpumalanga, an attribute that is again directly related to the share reporting exclusive use of electricity for this purpose (Table 23). In all provinces, except Limpopo, electricity as a single source makes up the biggest share as the energy choice for cooking. In both Western Cape and Gauteng more than three-fifths (63% and 60% respectively) rely on electricity only for cooking. In the Eastern Cape the single use of electricity remains the most highly ranked option, but paraffin in combination with electricity and/or firewood make up a sizeable 29%. In the Free State, the single use of electricity also remains the most highly ranked option (48%), followed by electricity with paraffin (27%) and electricity with gas (17%). The same applies to Mpumalanga, with 51% using only electricity but almost a fifth (17%) using gas and electricity and 14% firewood and electricity. In the Northern Cape 49% exclusively use electricity but more than a quarter (28%) also use a combination of electricity and firewood. In the North West, large shares (34%) use only electricity or a combination of electricity and paraffin (20%). The combination of electricity and firewood is reported by 14% of households in this province, with gas and electricity by another tenth (12%). Limpopo is the only province where a form of multiple energy use is the main choice for cooking. In the case of Limpopo, 32% of households use a mix of electricity and firewood, with a third (31%) using wood only and 11% electricity only. Therefore, in this province it would seem that wood has not been displaced by electricity as the preferred energy source for cooking, with wood continuing to be used alongside electricity.

Table 24: Energy Choice for Cooking, by Geographic Location (Column Percent)

Multiple energy sources for cooking	Urban formal	Urban informal	Rural, traditional authority areas	Farms
Single energy use	**68**	**66**	**45**	**47**
Electricity only	60	50	21	22
Firewood only	0	1	20	16
Paraffin only	1	14	2	3
Gas only	3	1	1	0
Solar system only	3	1	1	1
Coal only	0	0	0	5
Other source only	0	0	0	0
Multiple energy use	**32**	**34**	**55**	**53**
Firewood & electricity	6	5	21	9
Gas & electricity	11	3	4	19
Paraffin & electricity	9	13	10	7
Paraffin, firewood & electricity	1	4	6	2
Paraffin & firewood	0	2	6	7
Paraffin, gas & electricity	1	0	1	0
Gas, firewood & electricity	1	0	1	1
Coal & electricity	1	1	0	0
Paraffin & gas	0	1	1	0
Paraffin, gas & firewood	0	1	0	0
Other energy combinations	3	4	5	6
Total	**100**	**100**	**100**	**100**

Source: SASAS Energy related behaviour and perception survey (2012)

With respect to type of geographic location, there is a strong rural-urban divide in the balance between single and multiple energy use (Table 24). Two-thirds or more of households in formal urban areas or informal settlements use a single source for cooking, while multiple energy use is the norm in rural, traditional authority areas and on rural farms. In formal urban areas, households are predisposed towards the single use of electricity (60%), with a tenth using either electricity with gas (11%) or electricity with paraffin (9%). In informal settlements half (50%) use only electricity for cooking, while 14% use only paraffin and 13% a mix of electricity and paraffin. In rural traditional authority areas electricity only, or electricity with wood combined is the predominant energy option for cooking (21% respectively) followed by the use of firewood (20%). Finally, on rural farms, electricity as well as electricity with gas are the two dominant options, both present in approximately a fifth of cases (22% and 19% in turn), with smaller shares reported for firewood only (16%) and wood with electricity (9%).

5.3.3. Heating Spaces and Keeping Warm

In terms of space heating, a greater proportion (61%) of households are reliant on a single energy use than is the case with lighting and cooking (Table 25). Nonetheless, households are moderately less reliant on electricity (43%) than is the case with the other two end-uses. Open fires are still used by 11% of households, while the use of paraffin solely for heating purposes is found in under a tenth of households (4%). Less than a fifth (18%) of households employs multiple energy sources for space heating, while 21% of households reported that they used no specific energy source for heating, opting instead either to wrap themselves up with warm clothing and blankets or to do without. Electrified households are marginally more inclined than average to use electricity only for heating (47%) and depend less on wood and paraffin exclusively. Little discernible difference can be found between electrified households and the national picture in terms of the share reporting multiple energy use and no energy source. Non-electrified

households are most likely to use firewood only as the energy source for heating rooms (39%), with a further 11% solely reliant upon paraffin. The main multiple energy use reported is the combination of paraffin and wood (7%), while almost a third (30%) use no energy source, instead choosing to keep warm with warm clothes and blankets.

When comparing households with low, medium or high living standards, we again see an increasing switch towards electricity for space heating. Households with low living standards are most likely to use wood only to heat rooms (44%), with paraffin used in 12% of cases and a mix of wood and paraffin in 7% of households. A fifth (21%) of these households uses no energy source. A third of households (34%) with medium living standards use electricity exclusively, with 15% using firewood. Just under a quarter (23%) reports no energy use. As for high living standard households, more than half (57%) use electricity only, 7% use electricity with gas, and 21% report no energy use.

Table 25: Energy Choice for Heating Rooms and Keeping Warm, by Electrification Status and Living Standard (Column Percent)

Multiple energy sources for heating	South Africa	Electrified	Non-electrified	Low	Medium	High
Single energy use	**61**	**62**	**54**	**61**	**57**	**64**
Electricity only	43	47	1	1	34	57
Firewood only	11	8	39	44	15	1
Paraffin only	4	3	11	12	5	1
Gas only	2	2	0	0	1	3
Coal only	1	1	3	3	1	1
Dry cell batteries only	1	1	0	0	0	1
Solar system only	0	0	0	0	0	0
Generator only	0	0	0	0	0	0
Multiple energy use	**18**	**18**	**16**	**18**	**20**	**15**
Paraffin & electricity	4	5	0	1	8	1
Firewood & electricity	3	3	0	1	5	1
Gas & electricity	3	3	0	0	1	7
Paraffin & firewood	1	1	7	7	1	0
Paraffin, firewood & electricity	1	1	0	2	2	0
Paraffin, gas & electricity	0	0	0	0	0	0
Coal & electricity	1	1	0	0	1	1
Other energy combinations	4	3	8	7	3	4
No energy source used for space heating and keeping warm	**21**	**20**	**30**	**21**	**23**	**21**
Blankets, warm clothing & hot water bottles	19	19	27	16	21	19
None of the above	2	2	4	5	2	1
Total	**100**	**100**	**100**	**100**	**100**	**100**

Source: SASAS Energy related behaviour and perception survey (2012)

At the provincial level of analysis, at least 60% of households in four of the nine provinces (Mpumalanga, Gauteng, Limpopo and the Free State) use a single energy source for space heating, with Eastern Cape following closely behind (Table 26). In all the provinces except Limpopo, electricity is the main exclusive energy source used for heating. In Limpopo the fuel that dominate is wood (42%). Electricity dominates as the single energy used among households in the Western Cape, with a large share of households also using no energy source for heating (41%). Similarly, in the Eastern Cape electricity dominate as a single source (31%) but with larger shares using firewood and paraffin only (13% respectively). All other sources or combinations of sources constitute less than 10%. The Northern Cape,

KwaZulu Natal and North West exhibit similar energy choices for heating rooms, with electricity dominating (29%; 44% and 32% respectively) followed by firewood (16%; 10%; 14%). The use of firewood and electricity combined constitute larger than average shares in these three provinces (9%; 6%; 8%) as does the use of no energy source (36%; 25%; 28%). In the Free State 37% of households use only electricity to heat up their rooms, 11% only use paraffin and 10% only use firewood. Almost a fifth (18%) use both electricity and paraffin. In Gauteng electricity dominate with more than half (58%) of households only using electricity to heat rooms. In Mpumalanga almost half (49%) of the households only use electricity with another 15% who only use firewood. Just under a tenth (7%) of households in this province use coal. Limpopo is the only province where electricity does not dominate as a single source to heat rooms. In Limpopo, the majority of households (42%) use only firewood to heat up their rooms, followed by 21% households who use electricity only.

Table 26: Energy Choice for Heating Rooms and Keeping Warm, by Province (Column Percent)

Multiple energy sources for heating	WC	EC	NC	FS	KZN	NW	GP	MP	LP
Single energy use	**49**	**59**	**50**	**61**	**56**	**48**	**69**	**74**	**67**
Electricity only	45	31	29	37	44	32	58	49	21
Firewood only	0	13	16	10	10	14	1	15	42
Paraffin only	3	13	2	11	1	0	2	2	2
Gas only	0	1	0	1	0	1	5	1	0
Coal only	0	1	3	0	0	1	1	7	1
Dry cell batteries only	0	0	0	0	0	0	2	0	0
Solar system only	0	0	0	0	0	1	0	0	1
Generator only	0	0	0	0	0	0	0	0	0
Multiple energy use	**10**	**32**	**14**	**36**	**20**	**24**	**13**	**12**	**9**
Paraffin & electricity	5	7	1	18	5	7	1	0	1
Firewood & electricity	1	1	9	1	6	8	1	3	4
Gas & electricity	1	8	1	7	1	3	5	3	2
Paraffin & firewood	0	7	0	1	1	0	0	0	0
Paraffin, firewood & electricity	0	6	0	0	2	2	0	0	1
Paraffin, gas & electricity	0	0	0	1	0	0	0	0	0
Coal & electricity	0	0	0	2	1	1	3	2	0
Other energy combinations	3	4	3	6	5	3	4	5	3
No energy source used for space heating and keeping warm	**41**	**8**	**36**	**3**	**25**	**28**	**18**	**14**	**24**
Blankets, warm clothing & hot water bottles	39	7	27	3	24	26	15	13	22
None of the above	2	1	9	0	1	2	3	0	2
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Source: SASAS Energy related behaviour and perception survey (2012)

From Table 27, it is evident that single energy use is more prevalent in formal urban areas relative to other locations, due to the fact that more than half of households (56%) in these areas use only electricity to heat rooms. A further 22% of households in formal urban areas use multiple energy sources, with the highest shares reportedly using either electricity with paraffin (8%) or electricity with gas (5%). Around a fifth (19%) uses no energy source. In households based in informal urban settlements, the single use of electricity still accounts for the largest share of responses (24%), which is equal to the share indicating that no energy source is employed for space heating. Paraffin is also more common, either exclusively (16%) or coupled with electricity (10%). In rural, traditional authority areas and on rural farms alike, the single use of firewood for space heating predominates, followed by the exclusive use of

electricity. Multiple energy sources are used in a third of cases, while no energy sources are used in around 15% of rural households.

Table 27: Energy Choice for Heating Rooms and Keeping Warm, by Geographic Location (Column Percent)

Multiple energy sources for heating	Urban formal	Urban informal	Rural, traditional authority areas	Farms
Single energy use	**63**	**57**	**60**	**54**
Electricity only	56	27	22	23
Firewood only	1	6	32	25
Paraffin only	2	14	4	3
Gas only	2	1	0	0
Coal only	1	2	1	3
Dry cell batteries only	0	7	0	0
Solar system only	0	1	0	0
Generator only	0	0	0	0
Multiple energy use	**16**	**24**	**20**	**16**
Paraffin & electricity	5	7	3	1
Firewood & electricity	2	2	6	4
Gas & electricity	5	1	1	2
Paraffin & firewood	0	1	4	1
Paraffin, firewood & electricity	0	1	3	1
Paraffin, gas & electricity	0	0	0	0
Coal & electricity	1	6	0	1
Other energy combinations	4	7	3	5
No energy source used for space heating and keeping warm	**21**	**19**	**20**	**30**
Blankets, warm clothing & hot water bottles	18	16	19	28
None of the above	2	3	1	2
Total	**100**	**100**	**100**	**100**

Source: SASAS Energy related behaviour and perception survey (2012)

5.3.4. Heating Water for Bathing

In terms of heating water for bathing purposes, a large proportion (80%) of households is reliant on a single energy source with two thirds (66%) of households using some form of electrical appliance to heat water for this purpose. In electrified households, the most common appliance used to heat water for bathing is an electric geyser (31%) followed by and electric kettle (23%) or an electric kettle and stove (7%). Conversely, although the majority (79%) of non-electrified households also use a single source to heat up water for bathing, the source is mostly exclusively firewood (46%) with a quarter (27%) households also exclusively using paraffin. A combination of firewood and paraffin is used by 16% of non-electrified households. Although the use of solar geysers currently remains relatively circumscribed (1% of households), this is an indicator that will be monitored in successive rounds of data collection. Initiatives focused on providing solar geysers to households, including the replacement of existing electric geysers, are still largely in their initial stages, and as such the expectation is that their usage in households is likely to rise incrementally in coming years in line with energy policy in the country.

Table 28: Energy Choice for Heating Water for Bathing Purposes, by Electrification Status and Living Standard (Column Percent)

Multiple energy sources for heating water for bathing purposes	South Africa	Electrified	Non-electrified	Low	Medium	High
Single energy use	**80**	**80**	**79**	**68**	**73**	**88**
Electric geyser only	29	31	0	0	6	56
Electric kettle only	21	23	1	2	36	10
Electric stove or hotplate only	3	3	0	0	6	1
Electric geyser & kettle only	5	5	0	0	2	9
Electric kettle & stove/hotplate only	6	7	0	0	9	5
Electric geyser, kettle & stove/hotplate	2	2	0	0	2	3
Other combination of electric appliance	0	0	0	0	0	1
Firewood only	8	4	46	40	9	0
Paraffin only	3	0	27	24	2	0
Gas only	1	1	1	0	1	1
Coal only	0	0	3	1	0	0
Solar geyser only	1	1	0	0	1	1
Other source only	1	1	0	0	0	1
Multiple energy use	**20**	**20**	**21**	**32**	**27**	**12**
Firewood & electric kettle	4	5	0	1	8	1
Paraffin & firewood	2	0	16	20	0	0
Paraffin & electric kettle	2	2	0	1	3	0
Firewood & electric stove/hotplate	1	1	0	1	2	0
Firewood, electric kettle & stove/ hotplate	1	1	0	0	2	0
Paraffin, electric kettle & stove/hotplate	1	1	0	0	2	0
Paraffin, firewood & electric kettle	1	1	0	1	1	0
Gas & electric geyser	1	2	0	0	1	2
Gas & electric kettle	1	1	0	0	1	0
Solar geyser & electric kettle	0	0	0	0	0	0
Solar geyser & electric geyser	1	1	0	0	0	1
Paraffin & electric stove/hotplate	0	0	0	0	1	0
Paraffin, firewood & electric stove/hot	0	0	0	0	1	0
Gas, electric kettle & stove/hotplate	0	0	0	0	0	0
Other energy combinations	5	5	5	7	4	5
Total	**100**	**100**	**100**	**100**	**100**	**100**

Source: SASAS Energy related behaviour and perception survey (2012)

When comparing households with low, medium or high living standards, we see that households with a low living standard tend to make use of firewood (40%), paraffin (24%) and a combination of firewood and paraffin (20%). Amongst households with a medium living standard, electrical appliances are mostly used to heat water, with an electric kettle dominating (36%) followed by an electric kettle/ stove combined (9%) and an electric geyser or electric stove/hotplate (6% each). In these households, firewood is exclusively used as the only energy source for bathing in about a tenth (9%) of households and in combination with other sources (electric kettle, electric stove/ hotplate) in about 13% of cases. In households with a high living standard, single energy use dominates even more, with almost nine out of ten households using a single source to heat up water for bathing. Among these households, more than half (56%) use a geyser to warm up water for bathing purposes with a further 10% using a kettle.

Table 29: Energy Choice for Heating Water for Bathing Purposes, by Province (Column Percent)

Multiple energy sources for heating water for bathing purposes	WC	EC	NC	FS	KZN	NW	GP	MP	LP
Single energy use	**94**	**73**	**75**	**86**	**74**	**63**	**91**	**75**	**63**
Electric geyser only	40	22	11	22	19	19	49	17	12
Electric kettle only	24	20	36	34	14	18	21	32	14
Electric stove or hotplate only	4	1	2	11	4	5	1	3	1
Electric geyser & kettle only	7	3	1	12	4	4	7	5	1
Electric kettle & stove/hotplate only	6	6	9	4	13	6	5	2	1
Electric geyser, kettle & stove/hotplate	3	4	1	1	4	3	1	0	0
Other combination of electric appliance	0	0	1	2	0	0	0	0	0
Firewood only	5	7	7	0	12	7	0	5	32
Paraffin only	0	7	0	1	1	1	3	8	0
Gas only	2	1	2	1	1	0	1	0	0
Coal only	0	1	2	0	0	0	0	2	0
Solar geyser only	2	2	2	0	1	1	1	1	1
Other source only	1	0	0	0	0	0	2	0	0
Multiple energy use	**6**	**27**	**25**	**14**	**26**	**37**	**9**	**25**	**37**
Firewood & electric kettle	0	1	10	0	3	15	1	8	17
Paraffin & firewood	0	6	1	2	3	2	0	0	1
Paraffin & electric kettle	2	3	1	5	1	7	1	1	2
Firewood & electric stove/hotplate	0	1	4	0	1	1	0	0	3
Firewood, electric kettle & stove/hotplate	0	1	1	0	2	1	0	1	3
Paraffin, electric kettle & stove/hotplate	0	2	0	0	4	0	0	0	0
Paraffin, firewood & electric kettle	0	3	0	0	1	1	0	0	0
Gas & electric geyser	0	0	0	1	0	0	2	8	1
Gas & electric kettle	0	0	0	0	1	4	0	1	0
Solar geyser & electric kettle	0	1	1	0	1	0	1	0	0
Solar geyser & electric geyser	1	0	0	0	0	1	1	0	0
Paraffin & electric stove/hotplate	0	1	0	0	1	0	0	0	1
Paraffin, firewood & electric stove/hotplate	0	2	0	0	1	0	0	0	0
Gas, electric kettle & stove/hotplate	0	0	0	0	1	1	0	1	0
Other energy combinations	3	7	6	4	6	3	3	5	9
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Source: SASAS Energy related behaviour and perception survey (2012)

More than eight in ten households (84%) in the Western Cape, Free State, and Gauteng exclusively use some form of electricity to heat water for bathing purposes. In the case of Western Cape and Gauteng electric geysers dominate (40% and 49% respectively) with around a quarter (24% and 21%) using an electric kettle. In the Free State the use of an electric kettle dominates – used by more than a third (34%) of all households, followed by an electric geyser (22%); electric geyser and kettle (12%); and an electric stove or hotplate (11%).

In the Eastern Cape, just more than half (56%) make use of some form of electricity with the single use of a geyser (22%) and a kettle (20%) dominating. Almost a tenth (7%) of households in the Eastern Cape exclusively makes use of firewood with a further 7% also exclusively making use of paraffin. More than a quarter of households in this province make use of a combination of fuels. In the Northern Cape, more than three-fifths (61%) of households use some form of electricity as a single source to heat up water for bathing with the use of a kettle dominating at 36%,

followed by a geyser (11%). As was the case in the Eastern Cape, firewood is exclusively used by almost a tenth (7%) of households and a quarter uses a combination of energy sources to heat up water, most notably firewood and a kettle (10%).

In KwaZulu-Natal and North West similar proportions use some form of electricity as a single source to heat up water for bathing (58% and 55% respectively). In both of these provinces the use of geysers dominates (at 19% each) and the exclusive use of firewood is also high (12% and 7% respectively). The use of more than one source to heat up water is higher than average for North West (37%) with the combination of firewood and an electric kettle dominating at 15%. In Mpumalanga almost three-fifths (59%) make use of a single electrical appliance to heat water for bathing. In this province a kettle is used most frequently (32%) followed by a geyser (17%). Furthermore, almost a tenth (8%) of households only makes use of paraffin to heat water while another 5% exclusively use firewood.

Limpopo differs from the other provinces in that firewood dominates as an energy source for heating water for bathing with less than a third using any type of electrical appliance to heat water for bathing. The single energy source used most in Limpopo for this purpose is firewood (32%), followed by an electric kettle (14%) and a geyser (12%). This finding suggests the existence of barriers in Limpopo that hinder switching to electricity as a preferred way of heating water for bathing.

Table 30: Energy Choice for Heating Water for Bathing Purposes, by Geographic Location (Column Percent)

Multiple energy sources for heating water for bathing purposes	Urban formal	Urban informal	Rural, traditional authority areas	Farms
Single energy use	**87**	**79**	**60**	**81**
Electric geyser only	43	16	1	19
Electric kettle only	20	35	20	14
Electric stove or hotplate only	2	3	3	10
Electric geyser & kettle only	8	0	0	5
Electric kettle & stove/hotplate only	6	8	7	3
Electric geyser, kettle & stove/hotplate	3	0	1	4
Other combination of electric appliance	0	0	0	0
Firewood only	0	2	24	17
Paraffin only	1	14	2	5
Gas only	1	0	0	1
Coal only	0	0	0	2
Solar geyser only	1	0	1	1
Other source only	1	0	0	0
Multiple energy use	**13**	**21**	**40**	**19**
Firewood & electric kettle	1	3	12	6
Paraffin & firewood	0	2	4	5
Paraffin & electric kettle	2	3	3	0
Firewood & electric stove/hotplate	0	1	2	1
Firewood, electric kettle & stove/hotplate	0	0	3	2
Paraffin, electric kettle & stove/hotplate	1	2	1	0
Paraffin, firewood & electric kettle	0	2	2	1
Gas & electric geyser	2	0	0	0
Gas & electric kettle	0	2	1	0
Solar geyser & electric kettle	1	1	0	0
Solar geyser & electric geyser	1	0	0	0
Paraffin & electric stove/hotplate	0	0	1	0
Paraffin, firewood & electric stove/hot	0	0	1	0
Gas, electric kettle & stove/hotplate	0	0	0	1
Other energy combinations	3	4	9	4
Total	**100**	**100**	**100**	**100**

Source: SASAS Energy related behaviour and perception survey (2012)

From Table 30 it is evident that single energy use is more prevalent in formal urban areas relative to other locations, substantiated by the fact that almost five in ten (43%) households in these areas use an electric geyser to heat water, followed by a fifth (20%) using an electric kettle. No other energy source or combination of sources constitutes more than 10% in urban formal areas. Single energy use is also a reality in urban informal households with the use of an electric kettle dominating (35%) followed by an electric geysers (16%). The use of paraffin as a single source to heat water for bathing is also significantly higher in urban informal areas than in any other geographic area (at 14%). In rural traditional areas multiple energy use is more common with 40% of all households in these areas using a combination of sources to heat water for bathing. However, wood remains the single most dominant energy source, with a quarter (24%) of households in these areas only using wood to heat water for bathing purposes followed by an electric kettle (20%). On rural farms the use of a single source to heat water for bathing is common (81%) with a variety of sources used. Almost a fifth (19%) of households on farms use electric geysers only, followed by firewood (17%), electric kettles (14%) and an electric stove or hotplate (10%).

Among electrified households, those in formal urban areas were most like to report the use of electric geysers as the predominant source for heating water for bathing (44%), while the use of an electric kettle was most common in informal urban settlements (42%) (results not shown). In rural traditional authority areas, electric kettles are the most reported source (24%) followed by firewood (17%) or a combination of the two (15%). For electrified rural farm households, electric geysers, electric kettles and electric stoves or hotplates were the three main sources used for heating bath water (26%, 19% and 15% respectively). For non-electrified households, those in formal or informal urban areas mostly rely on paraffin (both 75%), while firewood is most common in rural traditional authority areas and rural farms (64% and 53% respectively).

5.3.5. Heating Water for Other Purposes

With respect to energy choices and preferences for heating water for purposes other than bathing, the survey shows that 95% of South African households on average rely on a single energy source, with a small share (5%) characterised by multiple energy use (Table 31). Considerable effort will be required in coming years to ensure that there is increasing diversification in the energy sources employed to heat water for general purposes. Given the emphasis of South African energy policy on the proliferation of renewable energy sources and technologies, it is somewhat concerning that households almost exclusively rely on electricity to heat water, especially recognising the current excessive demand on the national electricity grid.

In the case of electrified households, 83% use some electrical appliance to heat water. In the case of non-electrified households, firewood is exclusively used in 52% of households followed by a further 38% that exclusively use paraffin. The pattern of energy use for non-electrified households is almost identical for households with a low living standard. It is also noted, that an increase in living standard results in fuel switching, that is from firewood and paraffin to electricity. As previously discussed, in spite of the low current reliance on solar geysers for the purpose of heating water (2%), their usage needs to be monitored in future due to the increasing policy and programmatic emphasis on the increasing uptake of this renewable technology.

Table 31: Energy Choice for Heating Water for Other Purposes, by Electrification Status and Living Standard (Column Percent)

Multiple energy sources for heating water for other purposes	South Africa	Electrified	Non-electrified	Low	Medium	High
Single energy use	**95**	**95**	**97**	**97**	**93**	**98**
Electric geyser only	21	23	0	1	5	42
Electric kettle only	40	43	1	5	54	32
Electric stove or hotplate only	6	6	0	0	11	1
Electric geyser & kettle only	6	6	0	0	0	11
Electric kettle & stove / hotplate only	4	4	0	0	5	4
Electric geyser, kettle & stove/ hotplate	1	1	0	0	1	2
Other combination of electric appliance	0	0	0	0	0	0
Firewood only	10	7	52	50	13	1
Paraffin only	4	1	38	39	3	0
Gas only	1	1	4	0	1	1
Coal only	0	0	3	1	0	0
Solar geyser only	2	2	0	0	1	3
Other source only	0	0	0	0	0	1
Multiple energy use	**5**	**5**	**3**	**3**	**7**	**2**
Firewood & electric kettle	1	1	0	0	3	0
Firewood & electric stove/hotplate	0	0	0	0	1	0
Solar geyser & electric geyser	0	0	0	0	0	1
Other energy combinations	3	3	3	3	3	2
Total	**100**	**100**	**100**	**100**	**100**	**100**

Source: SASAS Energy related behaviour and perception survey (2012)

In all provinces, except Gauteng and Limpopo, an electric kettle is used most often to heat water for purposes other than bathing. In Gauteng the use of an electric kettle is surpassed by the use of an electric geyser (45%) and in Limpopo it is surpassed by the use of firewood (39%). Larger than average shares of households in KwaZulu-Natal (16%) Eastern Cape (14%) and Northern Cape (11%) also use firewood. In addition, proportionally more households in the Eastern Cape (11%) and Mpumalanga (8%) use paraffin as a source for heating water.

Table 32: Energy Choice for Heating Water for Other Purposes, by Province (Column Percent)

Multiple energy sources for heating water for other purposes	WC	EC	NC	FS	KZN	NW	GP	MP	LP
Single energy use	**99**	**95**	**93**	**98**	**93**	**94**	**97**	**93**	**93**
Electric geyser only	13	6	11	28	10	18	45	17	9
Electric kettle only	52	42	48	45	37	50	28	52	38
Electric stove or hotplate only	4	6	7	14	10	10	2	4	3
Electric geyser & kettle only	13	10	1	3	2	1	9	0	0
Electric kettle & stove / hotplate only	6	4	8	1	9	2	2	0	2
Electric geyser, kettle & stove/ hotplate	2	1	0	2	3	0	1	0	0
Other combination of electric appliance	0	0	0	0	0	0	0	0	0
Firewood only	4	14	11	1	16	9	0	8	39
Paraffin only	1	11	0	1	4	2	4	8	0
Gas only	2	1	1	1	1	0	1	0	0
Coal only	0	1	2	0	0	0	0	2	0
Solar geyser only	3	1	3	1	2	1	2	1	1
Other source only	0	0	0	0	0	0	1	0	0
Multiple energy use	**1**	**5**	**7**	**2**	**7**	**6**	**3**	**7**	**7**
Firewood & electric kettle	0	1	2	0	1	3	1	1	4
Firewood & electric stove/hotplate	0	1	1	0	1	0	0	0	1
Solar geyser & electric geyser	0	0	0	0	0	0	1	0	0
Other energy combinations	1	3	4	2	4	3	1	6	2
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Source: SASAS Energy related behaviour and perception survey (2012)

In all geographical areas single fuel use dominates. In urban formal areas households predominantly use an electric kettle (41%) or an electric geyser (31%) or a combination of the two (10%) to heat water. In urban informal settlements a kettle is mostly used (49%), followed by paraffin (16%), an electric geyser (14%) or a stove or hotplate (6%). In rural traditional areas an electric kettle is commonly used by 37% of households, closely followed by firewood, used by almost a third of households (32%). On rural farms an electric kettle (33%), firewood (21%), electric geyser (20%) or paraffin (7%) is mostly used to heat water for other purposes than bathing.

Among electrified households, the predominant source for heating water for non-bathing purposes in all geographic locations is an electric kettle (ranging from 41% to 59%). In urban areas and rural farms, electric geysers form a notable secondary source (ranging from 17% to 31%), while in rural traditional authority areas, firewood serves as a key secondary source (26%). Among non-electrified households, those in formal or informal urban settings are primarily reliant on paraffin for heating water for non-bathing purposes (65% in formal urban; 83% in informal urban), while in rural areas firewood is the main source employed (64% in rural traditional authority areas; 70% on rural farms).

Table 33: Energy Choice for Heating Water for Other Purposes, by Geographic Location (Column Percent)

Multiple energy sources for heating water for other purposes	Urban formal	Urban informal	Rural, traditional authority areas	Farms
Single energy use	**97**	**93**	**92**	**97**
Electric geyser only	31	14	1	20
Electric kettle only	41	49	37	33
Electric stove or hotplate only	3	6	9	9
Electric geyser & kettle only	10	0	0	0
Electric kettle & stove / hotplate only	3	2	6	4
Electric geyser, kettle & stove/ hotplate	2	0	0	0
Other combination of electric appliance	0	0	0	0
Firewood only	1	4	32	21
Paraffin only	1	16	5	7
Gas only	1	1	0	0
Coal only	0	0	0	2
Solar geyser only	3	0	1	1
Other source only	1	0	0	0
Multiple energy use	**3**	**7**	**8**	**3**
Firewood & electric kettle	0	2	3	1
Firewood & electric stove/hotplate	0	0	1	1
Solar geyser & electric geyser	1	0	0	0
Other energy combinations	3	5	3	1
Total	**100**	**100**	**100**	**100**

Source: SASAS Energy related behaviour and perception survey (2012)

5.4. Energy Expenditure and Energy Poverty

In this section, we direct the focus away from energy consumption patterns per se to energy expenditure among the households included in the survey, as well as exploring the extent of energy poverty using several definitions. Consistant with the 2011 survey results (DoE, 2011) the emergent patterns demonstrate that in order to satisify basic energy needs, energy spending has come to represent a significant share in many household budets (Eberhard and Van Horen, 1995). Measuring energy poverty in the South African context is important in order to (i) understand the extent and depth of the challenge, (ii) monitor trends and better understand the determinants of change, and (iii) identify the attributes of those affected so that policy responses and interventions can be suitably designed, targeted and evaluated. However, there exists considerable conceptual debate internationally about which indicator is best able to capture the energy poverty phenomenon. For instance, in the United Kingdom, a country that has been concerned with this social problem for several decades, a recently completed independent review of energy poverty commissioned by the government identified seven different options for measuring fuel poverty, each with its own strengths and weaknesses (Hills 2011, 2012).

In the analysis of the 2011 survey data, energy poverty was explored using three approaches, namely: (i) an energy poverty ratio method based on household energy expenditure relative to income, (ii) a subjective measure of energy poverty, and (iii) an energy-inefficient dwelling approach. In this current report, the 2012 survey data will again be analysed using these measures. It is hoped that the evidence generated using these two annual rounds of data collection based on a multi-method approach will serve as the basis for a broader dialogue on the meaning and measurement of energy poverty in the country and the design of appropriate policy responses to address it.

5.4.1. Expenditure-Based Approach

Looking cross-nationally at available measurement research, the most commonly employed indicator of energy poverty focuses on the share of total household income or expenditure that is devoted to energy. In the mainstream literature, the threshold for determining energy poverty is between 10-15% of income spent on energy, in order to ensure domestic energy needs satisfactorily, with 10% being the norm (Boardman, 1991; Sefton, 2002; Lamech & O'Sullivan, 2002; Buzar, 2006; Fankhauser & Tepic, 2007). Households with energy expenditure exceeding this threshold are considered to be energy poor, and in consequence are likely to be confronted with difficult choices between meeting energy requirements on the one hand and sacrificing other important competing spending priorities on the other. As such, the indicator is often linked conceptually to the measurement of affordability (WHO, 2004).

As with the 2011 SASAS data analysis, for this report we classify a household as energy poor if more than 10% of its total monthly household income is devoted to energy expenditure. A version of this measure has been used to inform the energy poverty strategies of Northern Ireland and Great Britain. In constructing the measure for this report, there were certain measurement challenges that had to be overcome, most notably handling item non-response on the household income variable, which accounted for 20% of cases (26% in 2011). Ultimately, univariate imputation was conducted using the STATA application, which is a commonly-used simulation-based technique for handling missing data. Another issue is the choice of the 10% threshold as the basis for determining the energy poor. According to Statistics South Africa's 2005/06 Income and Expenditure Survey, expenditure on 'electricity, gas and other energy sources accounts for 2.4% of annual consumption expenditure on average for households in the country (Statistics South Africa, 2008:46). Therefore, assuming a 10% energy expenditure threshold for poor households seems a reasonable assumption, given that it is approximately four times the national average.

Table 34: Energy Expenditure as a Percentage of Total Monthly Household Income (Mean Scores)

	2012 Mean score	Oneway ANOVA results		Base N	2011 Mean
		Significance	Post-hoc Scheffe test		
South Africa	14	...	...	2378	14
Electrification status					
Electrified	14	n.s.	...	2136	14
Non-electrified	14			230	16
Living standard level					
Low living std.	14	**	• Medium > high	185	15
Medium living std.	16			1080	17
High living std.	11			914	10
Per capita income					
Poorest quintile	24	**	• Q1>Q2,Q3>Q4>Q5	349	27
Quintile 2	15			452	17
Quintile 3	13			538	14
Quintile 4	10			535	11
Richest quintile	7			504	6
Geographic location					
Urban formal	13	**	• Rural trad. auth. areas > urban formal	1462	13
Urban informal	15			210	16
Rural, traditional authority areas	16			510	16
Farms	13			196	12
Province					
Western Cape	9	**	• LP, FS, EC, KZN, GP > WC • LP < MP	249	11
Eastern Cape	15			310	16
Northern Cape	11			139	12
Free State	16			184	13
KwaZulu-Natal	15			564	13
North West	12			150	15
Gauteng	14			392	16
Mpumalanga	11			198	17
Limpopo	17			192	16
Dwelling type					
Formal dwelling or brick structure	13	**	• Informal dwelling > formal dwelling	1947	14
Traditional dwelling or hut	16			176	14
Informal dwelling or shack	16			218	17

*Note: n.s. indicates mean score differences are not statistically different. * indicates significance at the 5 percent level. ** indicates significance at the 1 percent level.*

Source: SASAS Energy related behaviour and perception survey (2011; 2012)

In Table 34, we present the mean share of income that households devote to energy expenditure and disaggregate these results by a range of socio-economic and geographic attributes. We also compare figures from the 2011 survey in the final column of the table. On average, in late 2012, South African households spent 14% of total monthly household income on energy needs. There is no statistically significant difference in the energy expenditure shares based on electrification status. However, we do note some significant differences based on material disadvantage. Households with medium living standards typically report higher energy expenditure shares than those with high living standards. There is a strong gradient based on quintiles of per capita household income, with those in the

poorest quintile possessing energy expenditure shares that are on average more than three times higher than those in the richest quintile (24% versus 7%). Households in rural, traditional authority areas are more likely to spend a greater share of income on meeting energy needs compared to those in formal urban areas. Provincially, households based in Limpopo, Free State, Eastern Cape, KwaZulu-Natal and Gauteng possess a significantly higher mean energy expenditure share (ranges from 14%-17%) relative to households in the Western Cape (mean=9%). Finally, those in informal dwellings or shacks also tend to report higher or a moderately higher energy expenditure share on average than formal urban areas. The pattern of results from the 2012 survey is broadly comparable with those from 2011. In both years, the average energy expenditure share is 14% at the national level, while the association between higher shares of domestic energy spending and material disadvantage is also a consistent finding across both rounds of the survey.

Having established which types of households are more likely to be spending considerable proportions of their material resources on securing domestic energy needs, we now turn attention to the energy poverty rate based on this expenditure approach. Specifically, we profile the share of households that are classified as energy poor using this definition (i.e. spending more than 10% of income on energy). The results presented in Table 35 show that more than two-fifths (43%) of all South African households are classified as energy poor, based on this indicator. Again, there is little variation based on electrification status, while material deprivation is clearly associated with energy poverty. Around a third (34%) of high living standard households are energy poor, compared with 38% of households with a low living standard and 50% of those with medium living standard. As for income status, nearly three-quarters (72%) of households in the poorest quintile are energy poor, compared to less than a fifth of households (18%) in the richest quintile. Slightly under half (48%) of households in rural traditional authority areas are energy poor compared with a slighter lower share (40%) in formal urban areas. Again, households in the Western Cape are less likely to be energy poor (27%) than those in the Eastern Cape, Gauteng and KwaZulu-Natal provinces.

Table 35: Energy Poverty Among South Africans, by Household Attributes (Percent)

	2012 Energy poverty rate (% spending more than 10% of net income on energy)	Oneway ANOVA results		Base N	2011 Energy poverty rate
		Significance	Post-hoc Scheffe test		
South Africa	43	...	...	2378	47
Electrification status					
Electrified	43	n.s.	...	2136	47
Non-electrified	44			230	47
Living standard level					
Low living std.	38	**	• Medium > high, low living standards	185	45
Medium living std.	50			1080	56
High living std.	34			914	31
Per capita income					
Poorest quintile	72	**	• All mean scores are significantly different	349	74
Quintile 2	53			452	65
Quintile 3	44			538	51
Quintile 4	32			535	38
Richest quintile	18			504	13
Geographic location					
Urban formal	40	**	• Urban informal > urban formal	1462	44
Urban informal	52			210	49
Rural, traditional authority areas	48			510	53
Farms	43			196	43
Province					
Western Cape	27	**	• EC, GP, KZN > WC	249	33
Eastern Cape	50			310	52
Northern Cape	40			139	42
Free State	43			184	43
KwaZulu-Natal	48			564	45
North West	32			150	48
Gauteng	49			392	51
Mpumalanga	36			198	55
Limpopo	44			192	52
Dwelling type					
Formal dwelling or brick structure	42	**	• Traditional dwelling > formal dwelling	1947	47
Traditional dwelling or hut	56			176	44
Informal dwelling or shack	45			218	50

*Note: n.s. indicates mean score differences are not statistically different. * indicates significance at the 5 percent level. ** indicates significance at the 1 percent level.*

Source: SASAS Energy related behaviour and perception survey (2011; 2012)

5.4.2. Subjective Approach

Apart from the conventional 10% ratio indicator outlined above, another possible way of examining and measuring energy poverty would be to rely on subjective indicators to survey questions concerning whether households are experiencing difficulty in affording the cost associated with meeting their basic energy requirements. Again we draw on measures that were initially designed for testing as part of the 2011 survey round, and which were replicated in the 2012 survey. In both instances, the classification of households and by extension individuals as energy poor was determined by the pattern of responses provided to four questions:

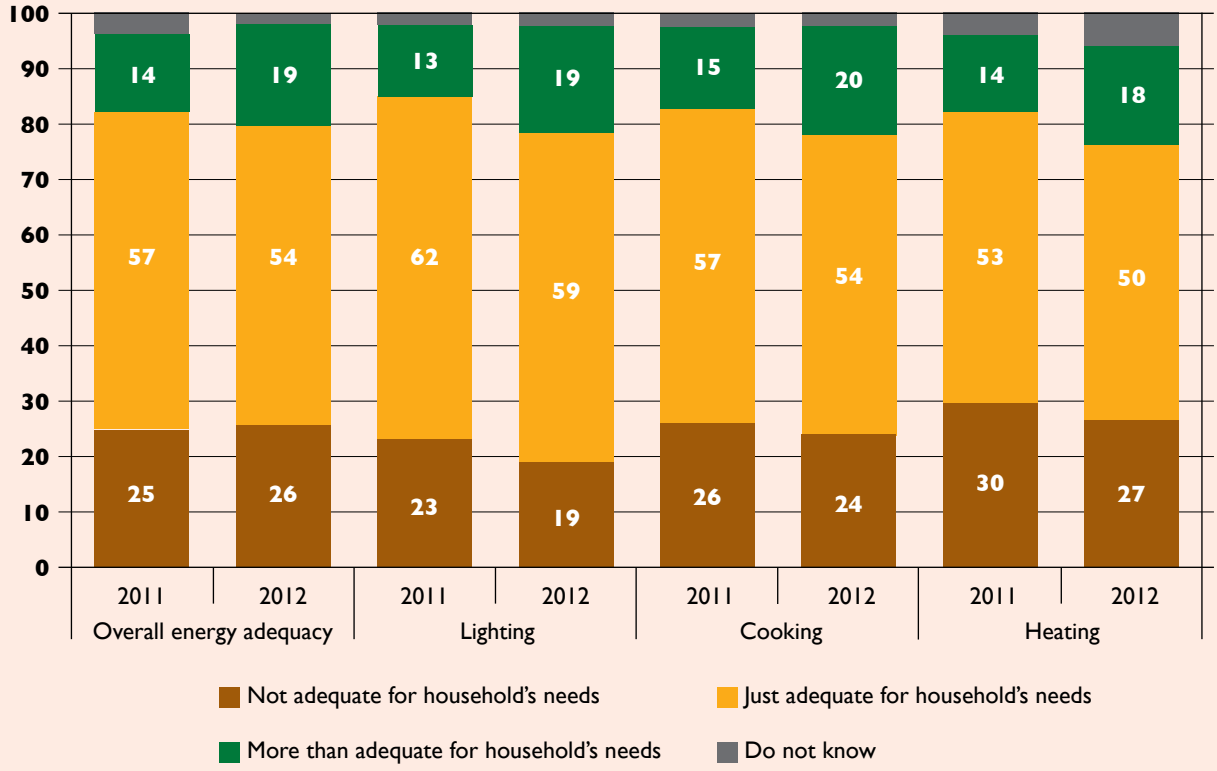
> Is the amount of energy your household has less than adequate, just adequate or more than adequate for your household's needs?
>
> And are the following inadequate, just adequate or more than adequate for your household's needs? ...
> ...the amount of energy for lighting?
> ...the amount of energy for cooking?
> ...the amount of energy for heating rooms and keeping warm?
>
> For each of the four items, the response codes were: 1=it is not adequate for your household's needs; 2=it is just adequate for your household's needs; 3=it is more than adequate to meet your household's needs.

The responses provided by each respondent were used to create a set of dummy variables, where 1=inadequate for household needs and 0=just or more than adequate for needs. These were then added together into a five-point summated scale ranging from 0 (adequate on all four items) to 4 (amount of energy deemed inadequate on all items). For the descriptive analysis presented in this section, we have classified anyone with a value of 1 or higher on the scale as energy poor and those with a value of 0 as energy secure.[1]

Before presenting the energy poverty estimates using this subjective measurement approach, it is important to examine the national frequency distributions on the constituent single indicators to examine perceptions of domestic energy adequacy and how stable these measures have been between 2011 and 2012. In Figure 13, the responses to the overall energy adequacy question as well as the three items on energy adequacy in relation to specific end uses is presented for the two rounds of surveying. Across all four measures and in both years, the modal response provided by households is that they are 'just getting by' in the provisioning for their domestic energy needs, ranging between 50 and 62% of cases. In 2012, a quarter of households (26%) indicated that the amount of energy available was generally inadequate for its needs, a figure that has remained virtually unchanged since 2011 (25%). Slightly lower shares feel that the energy available for lighting is inadequate, mentioned by 23% in 2011 and 19% in 2012, while approximately a quarter of households in both years expressed the view that the energy available for cooking was inadequate for domestic needs. Slightly higher perceived inadequacy was observed in relation to the energy available to meet the requirements of heating rooms and keeping warm, though again this has shown a modest decline between the rounds of interviewing. For all four indicators, less than a quarter of households suggest that the energy available to them is more than adequate to meet their domestic energy requirements.

[1] By considering the full 0-4 rating scale, as opposed to the collapsed version employed here, it would be possible to provide some additional insight into the depth of energy poverty by commenting on how consistently household respondents report that the amount of energy used in general and for different end-uses is inadequate for their needs. This is an area requiring follow-up investigation.

Figure 13: Subjective Domestic Energy Adequacy in 2011 and 2012 (Percent)



Source: SASAS Energy related behaviour and perception survey (2011; 2012)

For those specifying that the energy available for domestic needs was generally inadequate, a follow-up question enquired the main reason why this response had been provided. In both years, the foremost reason offered was the lack of financial resources to meet the cost to meet energy needs (Table 36). In 2011, more than three-quarters (77%) offered this explanation, though by 2012 this had declined to 68%, which is rather surprising given the rising costs of energy in the country. Those reporting that frequent electricity power cuts are the main reason why available energy is inadequate for their needs doubled from 7% to 14% in inter-survey period, while those reporting concerns about the load-limited electricity supply in their household rose from 4% to 9%. This change is largely attributable to a rising concern about the quality and nature of electricity supply. Firewood scarcity increased nominally from a low base, while gas and paraffin availability problems declined in importance.

Table 36: Principal Reason Offered for Perceived Inadequacy of Available Energy to Meet Domestic Requirements, 2011-12 (Column Percent)

Main reason why amount of energy is inadequate for household's needs	2011	2012
Not enough money to pay for the energy we need	77	68
There are many electricity power cuts in my area	7	14
The supply of electricity to my household is limited	4	9
Firewood is very scarce	2	4
Gas or paraffin not always available in the shops	6	2
Other reason	2	2
(Uncertain/Don't know)	1	2
Total	100	100
Base N	688	614

Source: SASAS Energy related behaviour and perception survey (2011; 2012)

A final behavioural question that was posed to households was how often they had reduced energy expenditure for lighting, cooking or space heating needs in the year prior to interview (Table 37). In 2011, a third of households reported that they had done this often or very often, and by 2012 this had risen marginally to 36% of households. It is important to draw attention the fact that those stating 'very often' as a response increased from 8% to 14% between the two annual survey rounds, suggesting that in an inflationary context, households are more regularly having to make tough decisions and reduce energy expenditure. Around two-fifths of households (38% in 2011; 40% in 2012) were either never or rarely compelled to scale back on energy related expenditure in the preceding year. Those households rating the available energy as inadequate for their domestic needs are more likely to have cut back on energy spending (44%) than those for whom it is just adequate or more than adequate (32% and 36% respectively). The implication of this is that gains in energy saving occurring in the domestic sector may be partially attributable to necessary sacrifices in consumption expenditure during difficult economic times rather than exclusively from behavioural responses to energy saving campaigns.

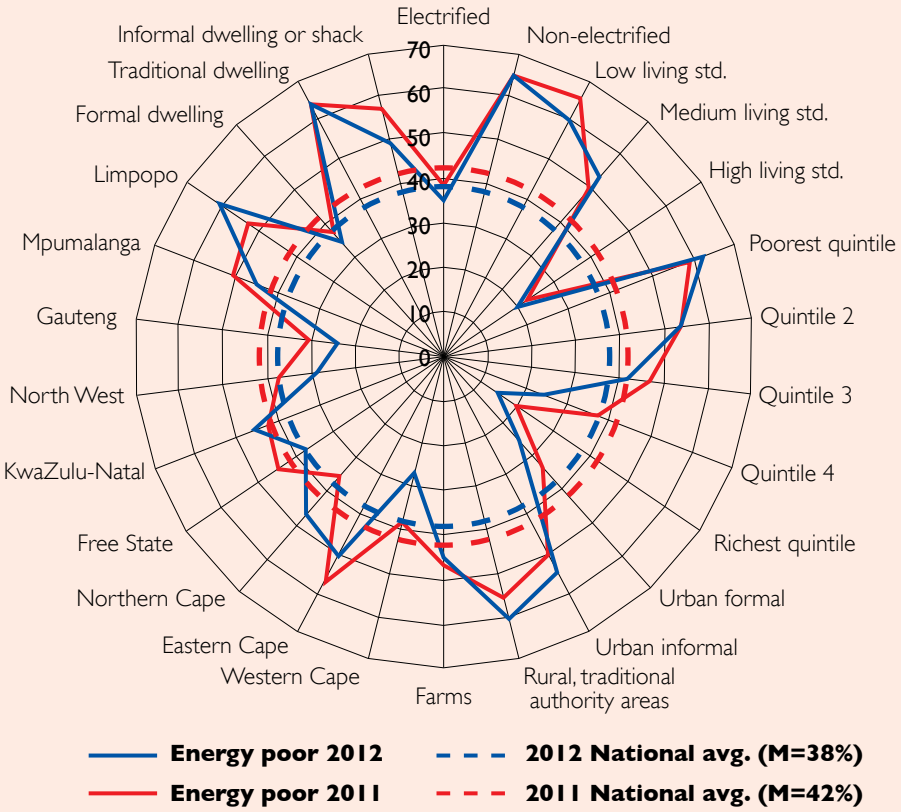
Table 37: Frequency of Households Reported Having to Reduce Energy Expenditure on Specific End Use in The Last 12 Months (Column Percent)

How often household has cut back on energy spending in last year	2011	2012
Very often	8	14
Often	24	22
Occasionally	27	22
Rarely	14	18
Never	24	22
(Do not know)	3	2
Total	100	100
Base N	2,981	2,500

Source: SASAS Energy related behaviour and perception survey (2011; 2012)

Returning to the subjective approach to measuring energy poverty, it becomes clear that non-electrified households rate much higher than electrified households on the subjective energy poverty scale (66% vs. 36%) and can therefore be considered as more energy poor than electrified households. A relationship between material disadvantage and subjective energy poverty is clearly evident when one examines the results by living standard level. For instance, people with a low living standard rate much higher on the subjective energy poverty scale (61%) than those with a medium (54%) or high living standard (20%), indicating that households with a low living standard are more energy poor. In terms of the spatial concentration of energy poverty, people residing in rural traditional authority areas have the highest energy poverty score (60%), followed by people residing in urban informal areas (55%), with the lowest recorded levels in formal urban areas (26%). Provincially, people from the Limpopo, Eastern Cape, Northern Cape and KwaZulu-Natal have the highest subjective energy poverty scores, while residents of the Western Cape and Gauteng are least energy poor using this approach.

Figure 14: Subjective Energy Poverty In 2011 and 2012, by Household Attributes (Percent)



Source: SASAS Energy related behaviour and perception survey (2011; 2012)

Figure 14 presents differences in the level of self-reported energy poverty across a select set of socio-demographic attributes in both 2011 and 2012. The results show that although there is discernible year-on-year variation in the extent to which respondents classify their households as energy poor, there is broad consistency in the distributional patterns that emerge. For instance, households that are non-electrified, have a low living standard level or are in the poorest income quintile, are constructed using traditional materials, and that are located in the Eastern Cape and Limpopo were most likely to be assessed as energy poor in both rounds of interviewing. Conversely, households with a high living standard or in the wealthiest income quintile, and situated in Gauteng or the Western Cape were characterised by the lowest levels of self-reported energy poverty.

Table 38: Subjective Energy Poverty Among South Africans in 2011 and 2012, by Household Attributes (Percent)

	2012 Mean subjective poverty score	Oneway ANOVA results		Base N	2011 Mean
		Significance	Post-hoc Scheffe test		
South Africa	0.38	...	...	2518	0.42
Electrification status					
Electrified	0.36	**	• Non-electrified > electrified	2247	0.39
Non-electrified	0.66			251	0.65
Living standard level					
Low living std.	0.61	**	• Low, medium > high	200	0.66
Medium living std.	0.54			1130	0.49
High living std.	0.20			939	0.22
Per capita income					
Poorest quintile	0.63	**	• All mean scores are significantly different	428	0.59
Quintile 2	0.53			460	0.54
Quintile 3	0.41			542	0.46
Quintile 4	0.23			536	0.37
Richest quintile	0.14			504	0.19
Geographic location					
Urban formal	0.26	**	• Rural trad auth > urban formal, Farms • Urban informal, Farms > urban formal	1552	0.33
Urban informal	0.55			223	0.50
Rural, traditional authority areas	0.60			536	0.55
Farms	0.45			207	0.47
Province					
Western Cape	0.27	**	• LP, EC, NC, KZN, MP > GP, WC • LP, EC > NW • LP > FS, KZN	253	0.38
Eastern Cape	0.51			328	0.57
Northern Cape	0.47			147	0.35
Free State	0.37			198	0.45
KwaZulu-Natal	0.46			586	0.42
North West	0.29			162	0.38
Gauteng	0.24			436	0.30
Mpumalanga	0.44			207	0.51
Limpopo	0.62			201	0.54
Dwelling type					
Formal dwelling or brick structure	0.35	**	• All mean scores are significantly different	2025	0.38
Traditional dwelling or hut	0.64			184	0.65
Informal dwelling or shack	0.50			238	0.58

*Note: n.s. indicates mean score differences are not statistically different. * indicates significance at the 5 percent level. ** indicates significance at the 1 percent level.*

Source: SASAS Energy related behaviour and perception survey (2011; 2012)

To determine whether the observed sub-group differences are statistically significant, Analysis of Variance (ANOVA) tests, together with post hoc Scheffe tests, were conducted. Table 38 confirms that differences in subjective energy poverty on the basis of electrification status, living standard level, income quintiles, geographic location, province and dwelling type are all significant at 95% confidence level. As anticipated, non-electrified households consistently report higher levels of energy poverty than electrified households.

There is a strong socio-economic gradient in levels of subjective energy poverty. Those with low or medium living standards are more likely to indicate they are energy poor compared to households with high living standards, while the level of self-rated energy poverty progressively declines as per capita income quintile increases. As for the spatial patterns of subjective energy poverty, those in rural traditional authority areas, informal urban settlements and on rural farms have significantly higher levels than households residing in formal urban areas. The highest provincial rate of self-reported energy poverty is evident among households in Limpopo, which is significantly higher than in Gauteng, Western Cape, North West and KwaZulu-Natal. The subjective energy poverty rate in the Eastern Cape (51%) is also significantly higher than in Gauteng, Western Cape and North West, while the level of energy poverty is also notably higher in Northern Cape, KwaZulu-Natal and Mpumalanga than Gauteng and Western Cape. Finally, we find that those residing in traditional dwellings tend to report higher self-reported energy poverty relative to those in informal dwellings, who in turn are more energy poor than residents of formal structures.

Table 39: Subjective Energy Poverty Compared to the Expenditure-Based Energy Poverty Among South African Households, 2011 and 2012 (Cell Percentages)

2012	**Expenditure-based approach**		
Subjective approach	**Not in energy poverty (%)**	**In energy poverty (%)**	**Total**
Not subjectively energy poor (%)	38	24	61
Subjectively energy poor (%)	19	20	39
Total	57	43	100
2011	**Expenditure-based approach**		
Subjective approach	**Not in energy poverty (%)**	**In energy poverty (%)**	**Total**
Not subjectively energy poor (%)	33	24	58
Subjectively energy poor (%)	20	23	43
Total	53	47	100

Source: SASAS Energy related behaviour and perception survey (2011; 2012)

The subjective approach is premised on a headcount measure that identifies the number of households as energy poor, which can be measured and monitored over time. The advantages of this method is its usefulness in cross-checking levels and trends in energy poverty determined by other measurement approaches, its focus on the problem where people themselves feel and acknowledge it as such, as well as its relative ease to administer without detailed questions on household income. Yet we find in the South African case that there is a considerable degree of variance in the households identified as energy poor, using this method relative to the previously discussed expenditure method. Item non-response also tends to be substantially lower in general for subjective questions such as those used in determining self-rated energy poverty than for the household income and energy expenditure measures that serve as the basis for the expenditure share method of determining energy poverty. As Table 39 shows, a considerable share of households (19% of all households in 2012 and 20% in 2011) are not designated as energy poor under the expenditure definition, but nonetheless self-report as energy poor. Similarly, we find that 24% of all households in both years are not subjectively energy poor, but are classified as energy poor using the expenditure approach.

The subjective approach may also be affected by misreporting due to the possible stigma associated with declaring oneself to be in poverty, concerns about robustness of results based on the use of different subjective measures and the choice of household respondent. For this reason, based on an evaluation of the relative strengths and weaknesses of the subjective method, the Hills Commission (2011: 132) concluded that "such questions are probably most useful as a way of complementing more objective approaches, giving a reality check on them". This makes intuitive sense in the South African context, where subjective measures could be used as a means of enhancing our understanding of the nature, extent and temporal dynamics of energy poverty in the country.

5.4.3. Thermal Inefficiency Approach

Another measure of energy poverty relies on assessments of the condition of one's place of residence, focusing particularly on thermal comfort levels relative to social needs. In essence, this involves rating the thermal efficiency of dwelling units, since this influences the amount of energy required to heat the home to an acceptable standard and typically represents a notable determinant of domestic energy costs. Most common in European countries, housing energy efficiency data are usually obtained through expert evaluations, [2] though in the case of the present survey, this was not feasible. Instead, we have used four survey questions on the physical state of dwellings to determine a thermal efficiency rating. The specific items and the associated response codes are listed below:

I would now like to ask you some questions about your accommodation.

How satisfied are you with your accommodation?
(1=very satisfied, 2=satisfied, 3=neither satisfied nor dissatisfied, 4=dissatisfied, 5=very dissatisfied, 8=don't know)

Would you describe the state of repair of your home as good, adequate or poor?
(1=good, 2=adequate, 3=poor, 8=do not know)

Do you have any of the following problems with your accommodation? (Code all that apply)
Lack of adequate heating
Leaky roof
Damp walls, floors, foundations, etc.
Damaged or broken windows or doors
None of these problems with accommodation

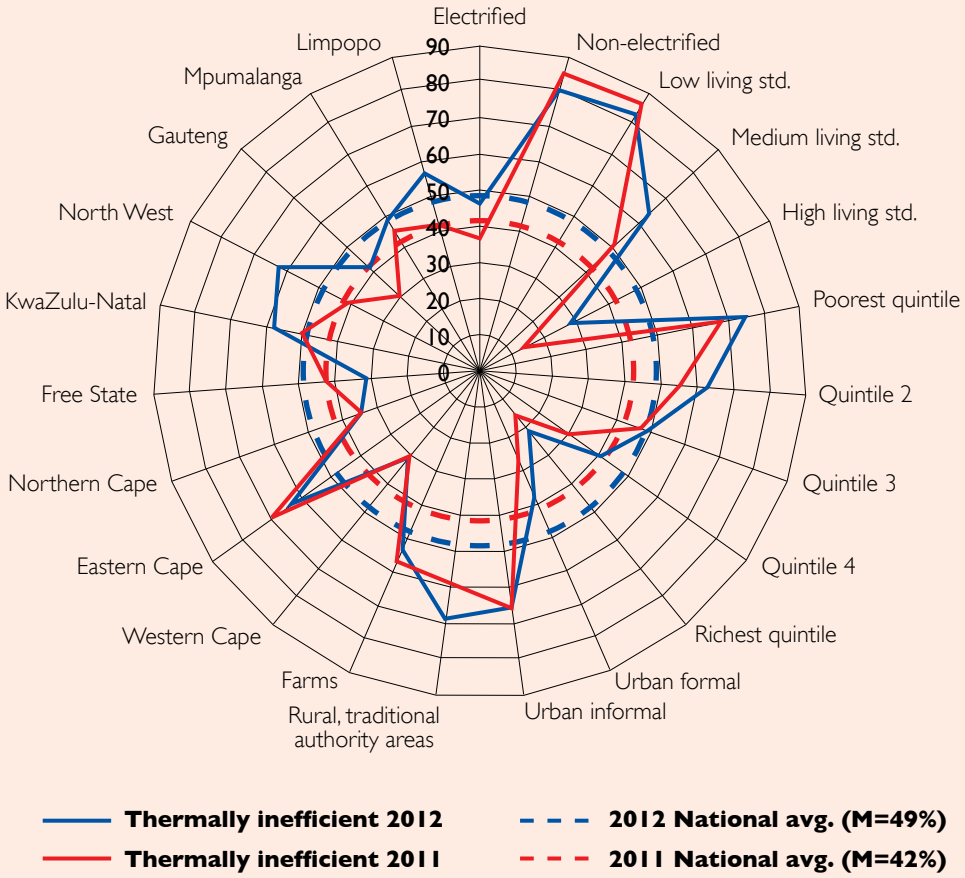
Has your health or the health of anyone in your household been made worse by your housing situation?
(1=Yes, 2=No)

A set of four dummy variables was created, based on responses to each of the four survey items. Firstly, households were assigned a value of 1 if respondents noted that they were dissatisfied or very dissatisfied (Code 4 or 5) with their accommodation, with all other responses being coded as zero. For the second variable, a value of 1 was assigned to cases where the state of repair of the home was described as "poor" (Code 3). The third dummy variable was coded as 1 if households reported one or more of the following: "lack of adequate heating", a "leaky roof", "damp walls, floors or foundations", or "damaged or broken windows or doors". The final dummy variable was created for

[2] For example, in the United Kingdom, use is made of the Standard Assessment Procedure (SAP), a Government-recommended measure used for assessing the energy performance of dwellings. The SAP rating of a dwelling is an indicator of energy consumption per unit of floor space and includes the costs associated with space heating, water heating, ventilation and lighting, minus any cost savings from self-generated energy.

those reporting that the housing condition had resulted in the deteriorating health of someone in the household. Based on these four items, a summated thermal efficiency scale was constructed by adding together the responses, so that the highest possible score was 4 (highest level of thermal inefficiency) and the lowest was 0 (lowest level of thermal inefficiency). In turn, a dummy variable was created where values of one or higher were recoded as 1 and zero values were retained. This was employed as the thermal inefficiency rating measure used for the analysis in this section.

Figure 15: Thermal Inefficiency of Homes, by Household Attributes (Percent)

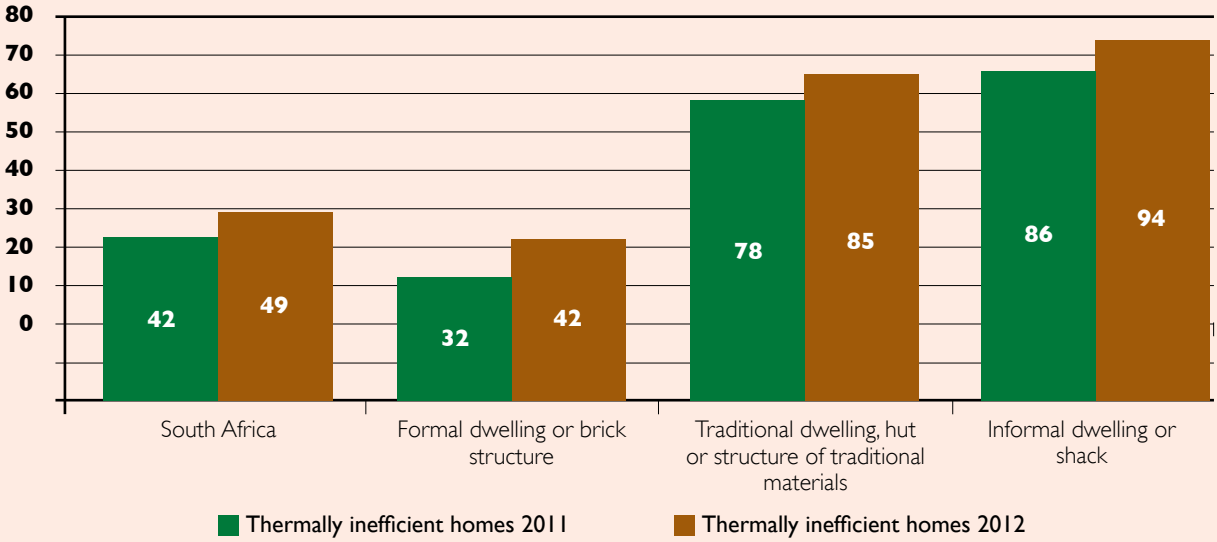


Source: SASAS Energy related behaviour and perception survey (2011; 2012)

Based on this measurement approach we find that in late 2012, on aggregate, 49% of households were categorised as thermally inefficient and 51% thermally efficient. In Figure 15, we present the incidence of residential thermal inefficiency by various household attributes in 2011 and 2012. In both survey years, South Africans who lived in households which are not electrified or who have a low living standard are the most likely to suffer thermal inefficiencies (80% or higher). Likewise, residents of the Eastern Cape and North West (65% and 62% respectively), people who reside in rural traditional authority areas (69%), informal urban settlements (66%), or on rural farms (54%) are also likely to suffer from thermal inefficiency. As one would expect, households in the wealthiest income quintile (21%) or with a high living standard (28%), as well as those located in the Western Cape (31%) and formal urban areas (38%) are least likely to suffer such thermal inefficiencies. Patterns of thermal inefficiency again tend to be broadly similar in both years, though there does appear to be a modest upward trend. On the one hand, households in poorer provinces such as North West and Limpopo reported notable increases in thermal inefficiency. On the other hand, certain better-off households also demonstrate a tendency towards higher thermal inefficiency in 2012 relative to 2011. This is case with those with high and medium living standards, those in formal urban areas, those in Gauteng, and those in formal dwellings and brick structures.

Since the thermal inefficiency classification is based on evaluating the physical structure and conditions of a dwelling unit, one would expect a significant gradient of difference based on the type of dwelling that households occupy. In Figure 16 we test out this assertion, and find that there is substantial variation in level of thermal inefficiency in both rounds of interviewing.

Figure 16: Thermal Inefficiency of Homes 2011-12, by Dwelling Type (Percent)



Source: SASAS Energy related behaviour and perception survey (2011; 2012)

In 2012, slightly more than two-fifths (42%) of formal dwellings or brick structures were classified as thermally-inefficient, based on this definitional approach. This is appreciably lower than informal dwellings or shacks, of which 94% are deemed thermally inefficient. Similarly, 85% of traditional dwellings, huts or structures of traditional materials are not energy efficient. Again there are signs of a rising trend between the two survey evaluations.

Table 40: Thermal Inefficiency Among South Africans, by Household Attributes (Mean Scores)

	2012 Mean thermal inefficiency score	Oneway ANOVA results		Base N	2011 Mean
		Signif.	Post-hoc Scheffe test		
South Africa	0.49	...	...	2518	0.42
Electrification status					
Electrified	0.46	**	• Non-electrified > electrified	2247	0.37
Non-electrified	0.80			251	0.85
Living standard level					
Low living std.	0.83	**	• All mean scores are significantly different	200	0.86
Medium living std.	0.64			1130	0.51
High living std.	0.28			939	0.13
Per capita income					
Poorest quintile	0.75	**	• Q1> Q2>Q3, Q4 > Q5	428	0.68
Quintile 2	0.63			460	0.56
Quintile 3	0.49			542	0.48
Quintile 4	0.41			536	0.31
Richest quintile	0.21			504	0.15
Geographic location					
Urban formal	0.38	**	• Rural trad auth, urban informal, farms > urban formal • Rural trad auth > Farms	1552	0.27
Urban informal	0.66			223	0.66
Rural, traditional authority areas	0.69			536	0.60
Farms	0.54			207	0.57
Province					
Western Cape	0.31	**	• EC, NW, KZN, LP> FS, WC, NC • EC, NW, KZN > GP	253	0.30
Eastern Cape	0.65			328	0.70
Northern Cape	0.35			147	0.35
Free State	0.31			198	0.42
KwaZulu-Natal	0.58			586	0.50
North West	0.62			162	0.41
Gauteng	0.42			436	0.30
Mpumalanga	0.49			207	0.45
Limpopo	0.57			201	0.42
Dwelling type					
Formal dwelling or brick structure	0.42	**	• Traditional dwelling, informal dwelling > formal dwelling	2025	0.32
Traditional dwelling or hut	0.85			184	0.78
Informal dwelling or shack	0.94			238	0.86

*Note: n.s. indicates mean score differences are not statistically different. * indicates significance at the 5 percent level. ** indicates significance at the 1 percent level.*

Source: SASAS Energy related behaviour and perception survey (2011; 2012)

These aforementioned findings suggest a correlation between thermal inefficiency and material disadvantage. This is confirmed in Table 40, which presents ANOVA tests and post hoc Scheffe tests based on the mean thermal inefficiency scores based on household attributes. Thermal inefficiency is significantly more prevalent in non-electrified compared to electrified households, and is indirectly related to both living standard level and income quintile. Households

outside formal urban areas are more greatly predisposed towards thermal inefficiency than other locations. A greater share of households in the Eastern Cape, North West and KwaZulu-Natal are thermally inefficient than in the Western Cape and Gauteng. Traditional and informal dwelling types are also significantly more thermally inefficient than formal structures.

Thermal inefficiency does not necessarily constitute a measure of energy poverty. Many non-poor households could be thermally inefficient out of choice, even though they possess the material resources to ensure that this is not the case. It is for this reason that the Hills Fuel Poverty Review in the UK (2011, 2012) considered as one of its energy poverty measurement options an approach that focuses on the households that have both low incomes and energy inefficient dwellings. This effectively classifies households as energy poor if they are surviving on a lower income and cannot be kept warm at a reasonable cost. For this reason, we have experimented further and refined the thermal inefficiency measure by combining it with a measure of lower income. For this report, we have chosen a threshold of 60% of median per capita monthly income (R642 in 2012; R600 in 2011). This means that a household is energy poor if it is thermally inefficient and has a per capita monthly income of less than R642.

Table 41 indicates that 26% of households were energy poor in 2012 using this low income and low energy efficiency definition. This represents a modest increase from 22% in 2011. A familiar pattern emerges in terms of the characteristics of households associated with a significantly higher level of energy poverty. Households that are non-electrified, and those with a lower living standard level and income status are predisposed towards being identified as energy poor. Households in rural traditional authority areas have a considerably higher incidence of energy poverty, while those in informal urban settlements and on rural farms are more inclined to be energy poor than those based in formal urban areas. Limpopo, Eastern Cape, KwaZulu-Natal and North West again possess high levels of energy poverty, especially in comparison with Gauteng and Western Cape. Finally, formal structures are less likely to be energy poor than informal dwellings, which in turn are less energy poor than dwellings constructed of traditional materials. Based on the low income, thermal inefficiency measure, energy poverty increased most notably over the two years for households in the poorest income quintile or with medium living standards, in informal settlements or constructed of informal materials. Double-digit percentage point increases in this form of energy poverty were also evident among households in Limpopo and North West.

Table 41: Low Income and Thermal Inefficiency Among South Africans, by Household Attributes (Mean Scores)

	2012 Mean low income thermal inefficiency score	Oneway ANOVA results		Base N	2011 Mean
		Signif.	Post-hoc Scheffe test		
South Africa	0.26	...	...	2518	0.22
Electrification status					
Electrified	0.23	**	• Non-electrified > electrified	2247	0.18
Non-electrified	0.52			251	0.52
Living standard level					
Low living std.	0.52	**	• All mean scores are significantly different	200	0.53
Medium living std.	0.40			1130	0.29
High living std.	0.07			939	0.02
Per capita income					
Poorest quintile	0.71	**	• Q1> Q2	428	0.57
Quintile 2	0.60			460	0.56
Quintile 3	0.00			542	0.04
Quintile 4	0.00			536	0.00
Richest quintile	0.00			504	0.00
Geographic location					
Urban formal	0.15	**	• All mean scores are significantly different	1552	0.11
Urban informal	0.39			223	0.28
Rural, traditional authority areas	0.49			536	0.42
Farms	0.23			207	0.30
Province					
Western Cape	0.10	**	• LP, EC, KZN, NW > WC, GP •LP, EC, KZN > FS, NC •LP > MP	253	0.09
Eastern Cape	0.37			328	0.50
Northern Cape	0.18			147	0.20
Free State	0.18			198	0.16
KwaZulu-Natal	0.35			586	0.26
North West	0.32			162	0.21
Gauteng	0.17			436	0.11
Mpumalanga	0.24			207	0.26
Limpopo	0.40			201	0.29
Dwelling type					
Formal dwelling or brick structure	0.20	**	• All mean scores are significantly different	2025	0.16
Traditional dwelling or hut	0.63			184	0.58
Informal dwelling or shack	0.53			238	0.41

*Note: n.s. indicates mean score differences are not statistically different. * indicates significance at the 5 percent level. ** indicates significance at the 1 percent level.*

Source: SASAS Energy related behaviour and perception survey (2011; 2012)

This section has attempted to provide a profile of energy poverty among South African households using three different measurement approaches that had initially been field tested in a nationally representative survey conducted on behalf of the Department of Energy in late 2011, namely: a commonly-employed expenditure approach, a subjective approach, and an approach based on residence condition. These approaches each have their relative advantages and limitations. The results do show that the overall incidence of energy poverty does fluctuate somewhat and the identification of sub-groups as energy poor in not entirely consistent across all three methods and across years. There are, nonetheless, some repeated findings. These include the greater propensity to be categorised as energy poor if a household:

- Is located in the Eastern Cape, Limpopo or Mpumalanga, is or in a rural traditional authority area;
- Has a lower living standard level or falls in the lowest per capita income quintiles.

The subjective and thermal inefficiency measures, unlike the expenditure method, also commonly identify non-electrified households and those without a formal dwelling or brick structure as more likely to be energy poor.

Considering the evidence provided, two broad recommendations need to be made. Firstly, given the policy significance of this social phenomenon from a poverty, health and well-being aspect, as well as an environmental point-of-view, it is critical that the Department of Energy as a matter of urgency examine and decide upon an official definition of energy poverty for the country. Secondly, different options for measuring energy poverty need to be examined and a decision made regarding which of these alternatives is the preferred approach for classifying households and individuals as energy poor, in a manner that is consistent with the official definition that is chosen. This would not preclude the fielding of other supplementary measures for cross-validation purposes, but an official definition and measurement approach in respect of energy poverty is required for effective monitoring and policymaking purposes.

6. Satisfaction, Quality and Pricing of Electricity

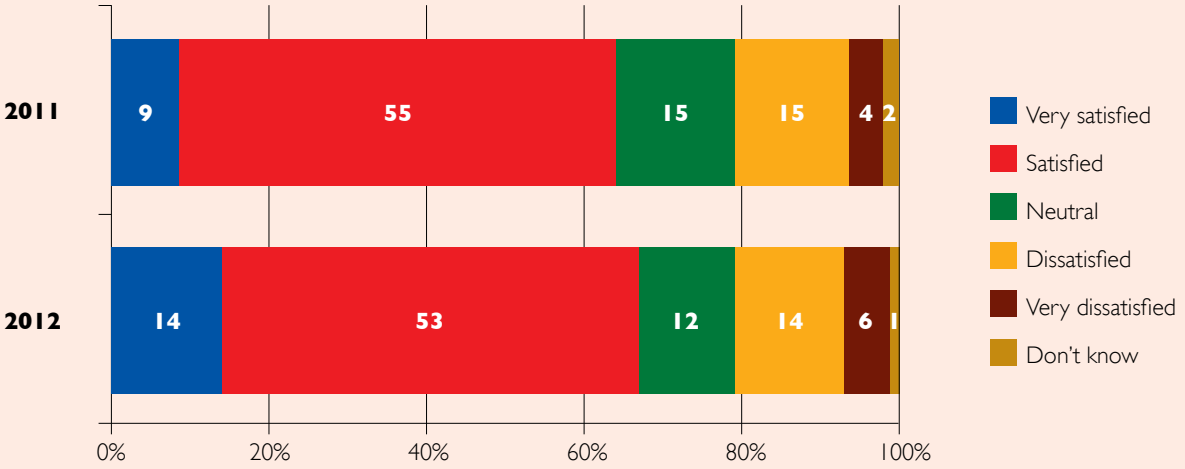
As part of its manifesto, the democratically elected government made a promise that all South Africans should have basic services and that poor South Africans should have a quantum of free basic services. Free basic electricity was quantified as up to 50 kWh of electricity per household per month. This approach is generally supported and seen as a step in the right directions, although some critics maintain that this is only meant to help the state to contain and control the poor and promote a 'culture of payment' for services (Ruiters, 2011). Other stakeholders are concerned about the small amounts of services, therefore questioning the impact of such initiatives stating that the government has set the level of 'basic needs' so low that it will keep people poor, rather than uplift them.

Given these debates, it is important to determine attitudes around electrification and to determine satisfaction levels. In this survey, South Africans were asked to rate electricity provision in terms of levels of satisfaction, quality of electricity and pricing of electricity. Only households with access to electricity were required to respond to these questions.

6.1. Satisfaction with the Provision of Electricity in the Neighbourhood

In order to determine satisfaction with electricity provision, South Africans were asked how satisfied or dissatisfied they are with the way electricity is being provided in their neighbourhood. In the 2012 round of the survey, more than two-thirds (67%) of South Africans indicated that they were either very satisfied or satisfied with the provision of electricity in their neighbourhood. Just more than a tenth (12%) were neither satisfied nor dissatisfied with two-fifths (20%) stating they were either dissatisfied (14%) or very dissatisfied (6%). Compared to 2011, the 2012 results are fairly similar and even encouraging with a larger proportion (67%) being satisfied with electricity provision in 2012 as opposed to 2011 (64%).

Figure 17: Satisfaction with the Provision of Electricity in the Neighbourhood



Source: SASAS Energy related behaviour and perception survey (2011; 2012)

In order to understand which groups profiled as least or most satisfied, this question was analysed by select socio-demographic variables. Also, in order to establish a comparative scale for this question, an Electricity Satisfaction Index (ESI) was developed which calculated a mean satisfaction score. The responses which varied from "very satisfied" to "very dissatisfied" were recorded to represent a satisfaction score ranging from 5 (very satisfied) to 1 (very dissatisfied). A high score therefore represented a higher satisfaction rating. In the calculation of the ESI, the don't know responses were not considered. The score was then converted to a 0-100 scale. The higher the mean score, the higher the satisfaction with electricity provision in the neighbourhood. The percentages and mean satisfaction scores are displayed in Table 42.

Statistically significant ($p<0.000$) differences in perceptions were identifiable across population group, living standard, location and province. Although no statistical significant differences were found for age group, it is evident that the youngest age group (16-19 years) were much less satisfied with electricity provision than the older age groups. Between group significant testing showed they were less satisfied- a trend worth examining since the younger age cohorts (the so called born frees) often tend to have higher expectations than older cohorts. This trend is worth monitoring since unrealistic expectations or expectations that are not met could lead to civil unrest and unhappiness. An analysis of satisfaction of electricity provision by population group revealed that whites and Indians were more satisfied with the provision of electricity than blacks and coloureds. Around three-quarters of whites and Indians (80% and 76% respectively) were satisfied with the provision of electricity, whilst smaller shares of coloureds (69%) and blacks (64%) were satisfied. This trend is confirmed by the mean scores, being highest for whites (M=71.4) and Indians (M=68.4), followed by blacks (M=62.3) and coloureds (M=61.9).

From the living standard analysis it is clear that a steep economic gradient is present with regards to satisfaction with electricity provision. Results showed that the higher the living standard, the higher the levels of satisfaction with electricity provision. Just more than two-fifths (43%) of people with a low living standard were satisfied with electricity provision, followed by people with a medium living standard, amongst whom 61% were satisfied. Among people with a high living standard, three-quarters (75%) indicated satisfaction. This trend was also clearly portrayed in the analysis of the mean scores, with people in the low living standard measurement category recording low levels of satisfaction (M=48.7), followed by people in the medium living standard category (M=60.7) and high living standard category (M=68.2). A clear linear relationship therefore existed between living standard and satisfaction with electricity provision.

Table 42: Satisfaction with the Provision of Electricity (Percentage; Mean)

	Very Satisfied	Satisfied	Neither satisfied nor dissatisfied	Dissatisfied	Very Dissatisfied	Don't know	Electricity Satisfaction Index (ESI) Mean Score (0-100)
South Africa	14	53	12	14	6	0	63.8
Gender *n.s.*							
Male	15	56	10	12	7	0	64.9
Female	13	51	13	16	6	1	62.8
Age *n.s.*							
16-19 years	12	49	12	17	9	2	59.5
20-29 years	17	51	13	12	6	0	65.1
30-39 years	11	53	11	20	6	0	60.9
40-49 years	15	51	11	14	9	0	62.7
50-59 years	10	63	11	11	5	1	65.2
60-69 years	18	55	14	10	3	0	68.7
70+ years	19	59	9	11	2	0	70.7
Population group *							
Black African	14	50	12	16	6	0	62.3
Coloured	8	61	9	12	9	1	61.9
Indian / Asian	17	59	9	11	4	0	68.4
White	18	62	11	5	4	1	71.4
Living standard *							
Low	5	38	10	38	8	0	48.7
Medium	12	49	15	16	7	0	60.7
High	17	58	8	11	5	1	68.2
Geographic location *							
Urban formal	15	55	11	12	6	1	65.4
Urban Informal	16	38	13	17	15	0	56.1
Rural, traditional authority areas	12	56	13	16	3	0	64.3
Farms	9	42	12	27	10	0	53.5
Province *							
Western Cape	14	57	19	5	3	2	68.8
Eastern Cape	9	60	11	12	8	0	62.7
Northern Cape	12	50	10	25	2	0	61.2
Free State	22	35	5	17	21	0	55.3
KwaZulu-Natal	10	51	19	15	6	0	61.2
North West	10	45	12	24	9	0	56.1
Gauteng	18	55	7	13	7	0	66.0
Mpumalanga	12	58	8	19	2	2	65.3
Limpopo	17	54	12	15	3	0	67.0

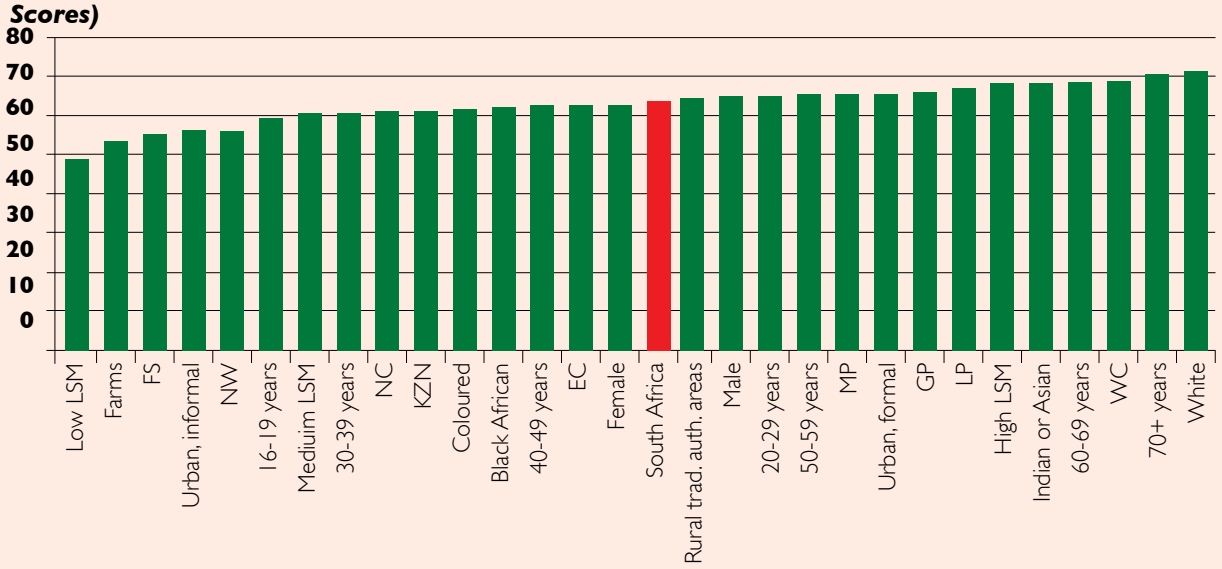
Mean of a five-point Likert scale, where 1='very dissatisfied', 2='dissatisfied', 3='neither satisfied nor dissatisfied', 4='satisfied' and 5='very satisfied' converted to a 0-100 scale. n.s. means that the mean scores are not statistically significant based on ANOVA testing, while * indicates that the mean scores are significant different ($p<0.05$

Source: SASAS Energy related behaviour and perception survey 2012

People on farms were least satisfied with electricity provision with just more than half (51%) satisfied with the provision of electricity. This was lower than residents of urban informal areas (54%), rural traditional authority areas (68%) and urban formal areas (70%). The mean scores also indicated that households on rural farms were less satisfied (M=53.5) than people in informal settlements (M=56.1), rural traditional authority areas (M=64.3) and urban formal areas (M=65.4).

Turning to provinces, it was evident that the highest proportion of satisfied residents was found in Gauteng (73%), Western Cape and Limpopo (71%). The highest proportion of dissatisfied residents was found in North West (55%) and Free State. Mean scores corroborated this finding, indicating that households in Free State were least satisfied (M=55.3) followed by North West (M=56.1). Western Cape had the highest mean score (M=68.8), indicating the highest level of satisfaction with electricity provision. In Figure 18, the mean electrification satisfaction score is ranked an displayed.

Figure 18: Electricity Satisfaction Index by Select Socio-Demographic Attributes (Ranked Means Scores)



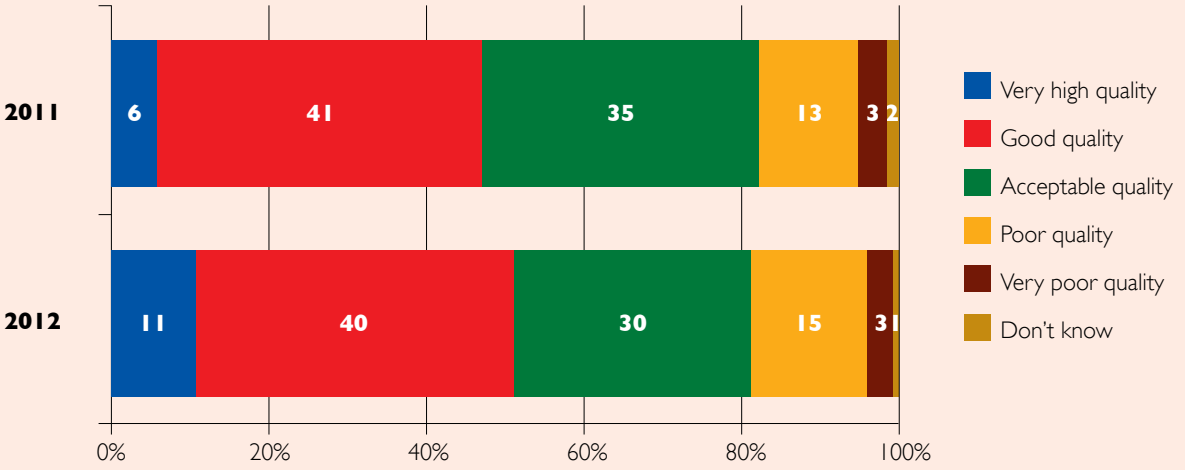
Source: SASAS Energy related behaviour and perception survey (2012)

The average means score for the Electricity Satisfaction Index (ESI) out of a 100 is 63.8, indicating that satisfaction with electricity tends to lean towards the positive side. However, it is evident that satisfaction levels differ for the various socio-demographic groups and that satisfaction with electricity has an economic gradient. People who have a low living standard or who live on farms or in informal settlements tend to be much less satisfied with electricity than other groups. In contrast, people with a high living standard, those who are Indian/Asian, or older than 60 years or white are most satisfied with the provision of electricity.

6.2. Quality of Electricity

In order to further the debate on satisfaction of electricity provision in South Africa, an explicit question about the quality of electricity was included. South Africans were asked: "In your opinion, what is the quality of electricity in the area where you live?" Results from the 2012 survey reveal that just more than a tenth (11%) rated the quality of electricity in their area as very high. The largest proportion, two-fifths (40%), rated the electricity in their area either as good, with under a third (30%) rating the quality as acceptable. The rest felt the quality was either poor (15%) or very poor (3%). A significant share (82% in 2011 and 81% in 2012) of South Africans therefore rates the quality of their electricity as acceptable. Less than a fifth of South Africans regard the quality of their electricity as poor or very poor.

Figure 19: Quality of Electricity in Residential Areas



Source: SASAS Energy related behaviour and perception survey (2011; 2012)

In order to determine who were more likely to rate the quality of electricity as low or high, the question was analysed by select socio-demographic attributes. Also, in order to establish a comparative scale for this question, an Electricity Quality Index (EQI) was developed which calculated satisfaction with the quality of electricity. The response options ranged from "very high quality" to "very poor quality" which was recoded to represent a quality score ranging from 1 (very poor quality) to 5 (very high quality). The score was then converted to a 0-100 scale. The higher the mean score, the higher the perceived quality of electricity in the area. The scores are displayed in Table 43.

Table 43: Perception About the Quality of Electricity (Percentage; Mean)

	Very high quality	Good quality	Acceptable quality	Poor quality	Very poor quality	Don't know	Electricity Quality Index (EQI) Mean Score (0-100)
South Africa	11	40	30	15	3	0	60.1
Gender *n.s.*							
Male	10	40	32	14	3	0	60.0.
Female	11	41	28	17	3	1	60.2
Age *n.s.*							
16-19 years	10	38	33	17	3	0	58.9
20-29 years	11	38	33	14	3	1	60.1
30-39 years	9	40	28	19	3	0	58.4
40-49 years	11	46	22	16	4	0	61.0
50-59 years	9	43	29	15	3	1	60.2
60-69 years	15	34	37	10	3	0	61.7
70+ years	16	48	24	11	1	0	66.7
Population group *							
Black African	10	36	32	18	4	0	57.7
Coloured	9	48	26	14	2	1	62.0
Indian or Asian	21	43	27	8	1	1	68.8
White	14	54	23	7	1	0	68.4
Living standard level *							
Low	0	26	31	31	7	5	44.9
Medium	9	34	32	20	5	1	55.6
High	15	49	26	8	1	0	67.3
Geographic location *							
Urban formal	13	45	28	11	2	0	64.0
Urban Informal	11	26	29	25	9	1	51.6
Rural trad auth areas	5	35	36	20	3	0	54.9
Farms	6	30	27	29	5	2	50.8
Province *							
Western Cape	9	47	37	7	0	0	64.5
Eastern Cape	10	40	31	13	5	1	59.1
Northern Cape	7	43	13	30	4	2	54.7
Free State	27	34	16	13	8	2	65.2
KwaZulu-Natal	4	37	41	15	3	0	55.8
North West	5	36	30	24	3	1	53.6
Gauteng	16	43	24	14	2	0	63.9
Mpumalanga	12	39	25	19	5	0	58.2
Limpopo	9	38	30	21	2	0	57.5

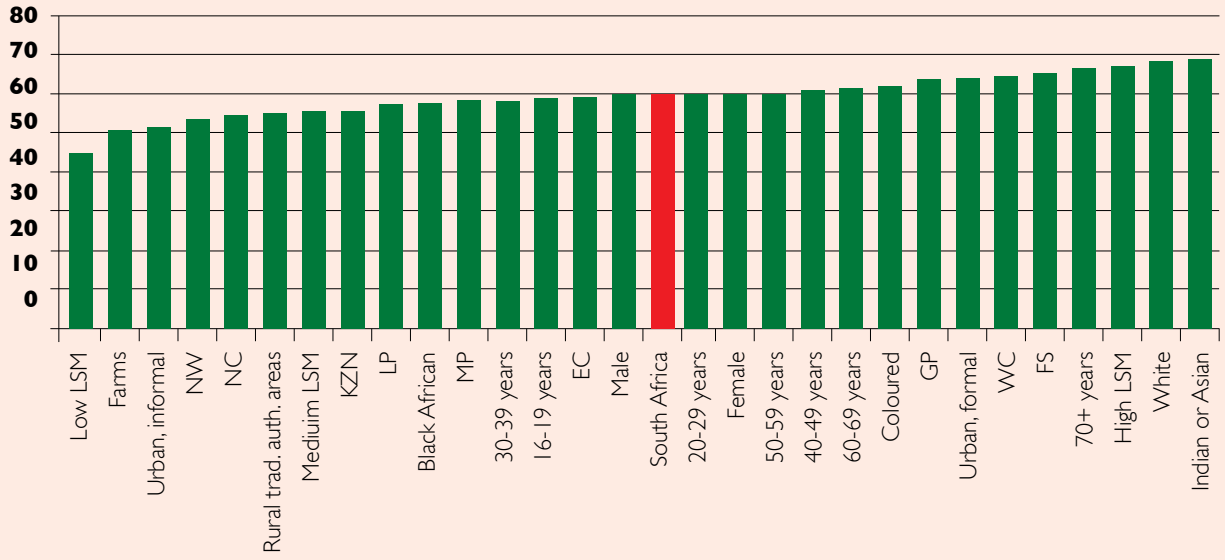
Mean of a five-point Likert scale, where 1='very poor quality', 2='poor quality', 3=acceptable quality', 4='good quality' and 5='very high quality' converted to a 0-100 scale. n.s. means that the mean scores are not statistically significant based on ANOVA testing, while * indicates that the mean scores are significant different ($p<0.05$

Source: SASAS Energy related behaviour and perception survey (2012)

No significant differences regarding the quality of electricity were found for gender and age groups. Statistically significant ($p<0.000$) differences were, however, found for population group, level of living standard, geographic location and province. Black South Africans rated the quality of electricity much lower than other population groups, with only 46% stating that electricity is of a very high or good quality compared to coloured people (57%), Indians (64%) and whites (68%). The mean scores from the Electricity Quality Index (EQI) confirmed that among South Africans, blacks were least satisfied (M=57.7), followed by coloureds (M=62), whites (M=68.4) and Indians (M=68.8).

Concerns about the quality of electricity were most common among people with a low living standard. None of them indicated that they regard their electricity of a very high quality, with only a quarter (26%) indicating that their electricity was of a good quality. Almost two fifths (38%) of this group indicated that the electricity that they received was of a poor or very poor quality. In contrast, the majority of people with a high living standard indicated that their electricity is of a very high or good quality (64%) with less than a tenth (9%) indicating that it is of poor or very poor quality. The EQI mean score confirmed this trend with people with a low living standard scoring the quality of electricity as a 44.9 out of 100, followed by people with a medium living standard (M=55.6) and high living standard (M=67.3). In figure 20, the mean scores for the EQI are ranked and displayed.

Figure 20: Electricity Quality Index Scores by Select Socio-Demographic Attributes (Ranked Means Scores)



Source: SASAS Energy related behaviour and perception survey (2012)

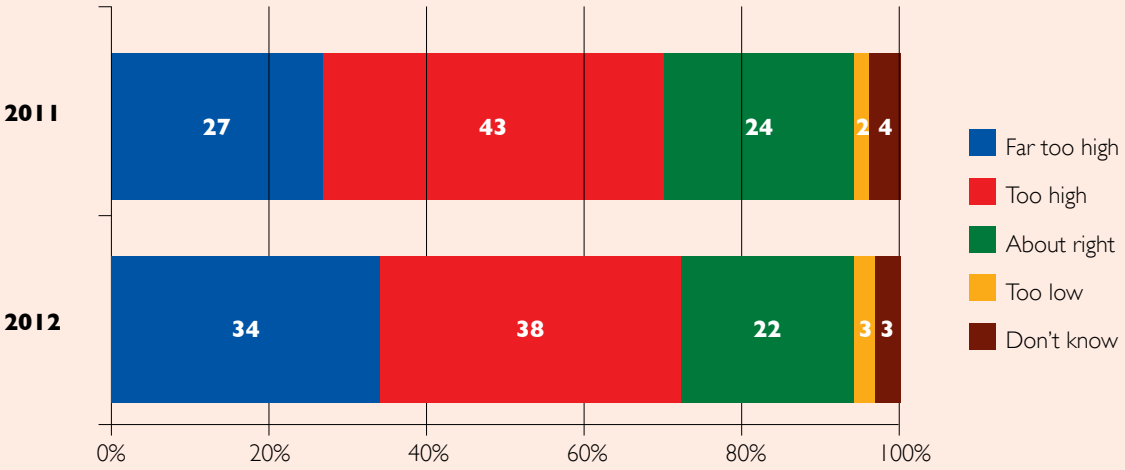
The ranked mean scores from the Electricity Quality Index (EQI) indicate similar findings to the preceding question about satisfaction with electricity provision in the neighbourhood. Although the mean EQI score of 60.1 out of a 100 indicates a positive skew, certain groups are generally much less satisfied with the quality of electricity than others. Again an economic gradient is notable, with people with a low living standard, specifically residing on farms or in urban informal areas, most likely to state that their electricity is of a poor quality. By contrast, older people (70+years), people with a high living standard, Whites or Indian/Asians are much more likely to experience electricity of a very high or good quality.

6.3. Pricing of Electricity

Households in South Africa were asked if they felt that electricity prices were far too high, too high, about right or too low. This question is particularly relevant, given the escalated electricity price increases in South Africa since 2008. In 2008, the average residential electricity price increases averaged 28%, followed by a 31% increase in 2009, 25% in 2010, 26% in 2011 and 16% in 2012. Although ESKOM asked for a 16% increase in 2013, this was disregarded and an 8% increase was awarded by NERSA. Despite this lower increase, households and especially poorer households are likely to suffer under the cumulative electricity price burden. As illustrated in the first section of the report, large shares of households are already considered as energy poor, spending more than 10% of their income on energy. Asking people about their perceptions of the pricing of electricity was therefore extremely important.

As can be seen from Figure 21, more than a third (34%) of households felt they pay far too much for what they receive, with another 38% saying they pay too much. Under a quarter (22%) felt they pay about the right amount for what they receive. Very few (3%) said they pay too little and 3% said they do not know. Clearly, people's perception about the price they pay for electricity is skewed towards the feeling that they are paying too much for electricity. On aggregate, almost three-quarters (72%) are of the opinion that they are paying too much for electricity. These findings are similar to the 2011 survey.

Figure 21: Perceptions about the Pricing of Electricity



Source: SASAS Energy related behaviour and perception survey (2011; 2012)

In order to determine who were more likely to rate the price of electricity as being too low or too high, the question was broken down by select socio-demographic attributes. The differences in perceived levels of pricing vary between people of different genders, ages, population groups, living standards, residential locations and provinces of South Africa. These differences are portrayed in Table 45. Also, in order to establish a comparative scale for this question, an Electricity Pricing Index (EPI) was developed which calculated perceptions about the pricing of electricity. The response options ranged from "far too high" to "too low" which was recoded to represent a pricing score ranging from 1 (too low) to 4 (far too high). The higher the score, the higher people perceived the price to be. "Don't know" options were coded as missing data. The score was then converted to a 0-100 scale.

Table 44: Perceptions about the Pricing of Electricity (Percentage; Mean)

	Far too high	Too high	About right	Too low	Don't know*	Electricity Pricing Index (Mean score) (0-100)
South Africa	34	38	22	3	3	68.8
Gender *n.s.*						
Male	34	38	23	3	2	68.3
Female	35	38	22	2	3	69.3
Age *						
16-19 years	20	52	16	6	6	63.5
20-29 years	34	33	26	3	3	67.5
30-39 years	32	40	23	3	2	67.9
40-49 years	40	38	20	1	1	72.8
50-59 years	42	33	21	3	2	71.9
60-69 years	35	40	19	2	3	70.6
70+ years	39	32	27	1	1	70.0
Population group *						
Black African	27	42	25	4	2	64.9
Coloured	52	27	15	2	4	78.2
Indian or Asian	54	26	18	0	1	79.0
White	50	30	15	0	4	78.9
Living standard *						
Low	31	36	27	1	4	67.2
Medium	29	41	23	4	2	65.9
High	42	34	19	2	3	73.5
Geographic location *						
Urban formal	37	36	22	2	3	70.7
Urban Informal	26	42	20	10	2	61.8
Rural, traditional authority areas	28	45	22	4	1	65.9
Farms	43	22	27	1	7	71.9
Province *						
Western Cape	44	39	15	1	1	75.9
Eastern Cape	39	42	16	1	1	73.9
Northern Cape	37	27	28	2	7	68.8
Free State	29	23	37	10	1	57.4
KwaZulu-Natal	38	39	20	2	1	71.2
North West	30	38	28	1	4	66.4
Gauteng	29	38	24	3	5	66.0
Mpumalanga	39	33	24	2	3	70.4
Limpopo	28	43	23	5	1	64.8

*Mean of a four-point Likert scale, where 1='too low', 2=about right, 3='too high' and 4='far too high' converted to a 0-100 scale. n.s. means that the mean scores are not statistically significant based on ANOVA testing, while * indicates that the mean scores are significant different (p<0.05)*

Source: SASAS Energy related behaviour and perception survey (2012)

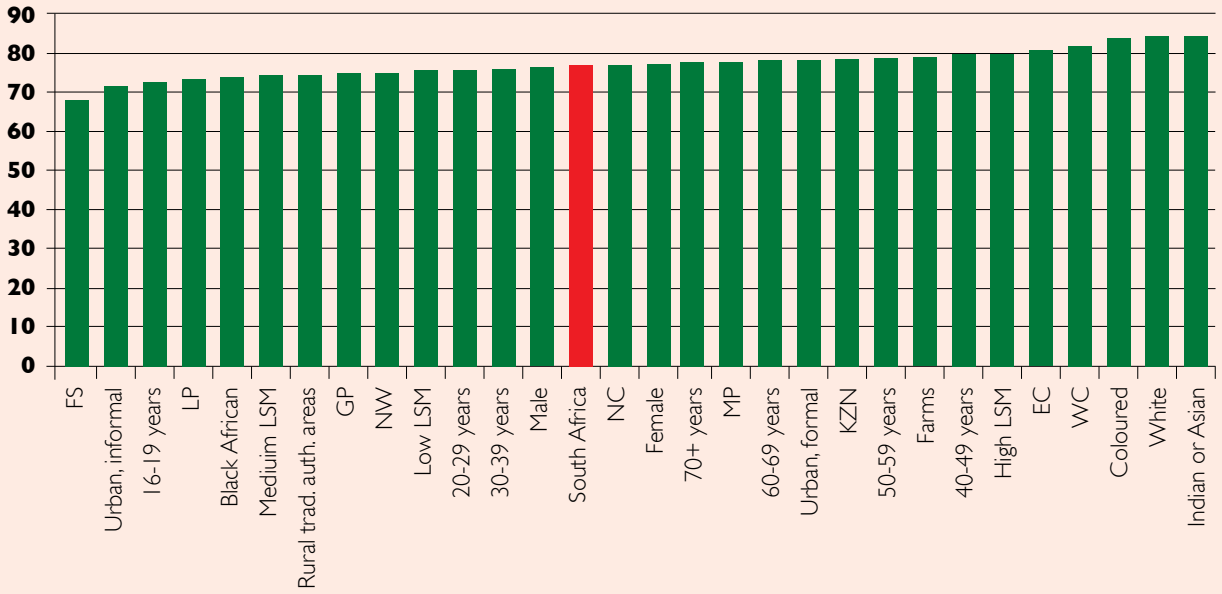
With regards to the pricing of electricity, no statistically significant differences were found for gender. Statistically

significant differences were found for the age groups. A trend emerged where an increase in age also resulted in an increase in perceptions that electricity prices were too high. In terms of population group, very large proportions of Indians and whites (80% respectively), and coloureds (79%) felt that the price of electricity was too high. Significantly fewer black South Africans (69%) were of the opinion that electricity prices are too high. Mean scores confirmed the finding, with the EPI score for blacks at 64.9, followed by whites (78.2), Indians (78.9) and coloureds (79).

Large proportions of people with a high or medium living standard felt that electricity prices were too high (76% and 70% respectively). A smaller proportion (67%) of people with a low living standard felt that electricity prices were too high. Mean scores confirmed that people with a high living standard are more likely to think the price of electricity is too high (73.5) compared to people with a low living standard (67.2) or medium living standard (65.9). Residents in urban formal and rural traditional areas (73%) were much more inclined to state that electricity prices are too high, compared to residents in urban informal areas (68%) or rural farms (65%).

People in the Western Cape (83%) and Eastern Cape (81%) were most likely to think that electricity prices were too high. By contrast, people in the Free State were least likely to feel that they are paying too much (52%), with more than a third of households in this province indicating that electricity prices are "about right". This finding was also confirmed by the EPI. In Figure 22 the mean scores for the EPI are ranked and displayed.

Figure 22: Electricity Pricing Index Scores by Select Socio-Demographic Attributes (Ranked Mean Scores)



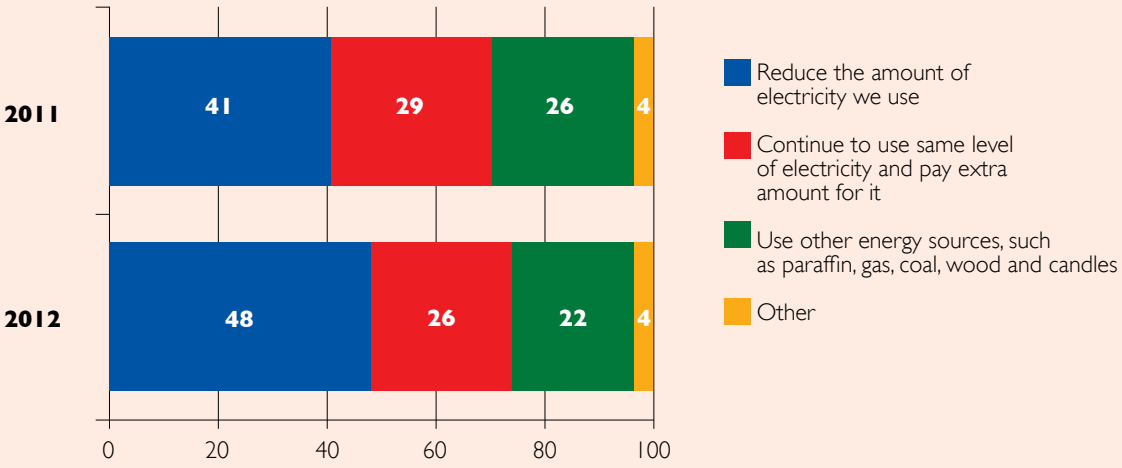
Source: SASAS Energy related behaviour and perception survey (2012)

The average EPI score out of a hundred is 68.8, indicating that the majority of South Africans feel that electicity prices are too high. Free State residents, people living in urban informal areas, aged between 16-19 years, people living in Limpopo and black Africans tended to score lowest on the Electricity Pricing Index, indicating that they were much less inclined than other groups to rate the price of electricity as too high. On the other hand, people with a high living standard, or people residing in the Western Cape, as well as Coloureds, whites and Indians were much more inclined to rate the price of electricity as too high. This might be due to the fact that these groups tend to use more electricity and therefor pay higher rates as per the Inclined Block Tariff structure.

6.4. Strategies Employed by Households to Cope with Increasing Electricity Prices

In order to understand the strategies employed to manage increases in electricity prices, South Africans were asked which strategies they engaged to cope with the last electricity price increase. Respondents had the opportunity to choose one of three options, namely: (a) continue to use the same level of electricity and pay the extra amount for it; (b) reduce the amount of electricity used; or (c) use other energy sources such as paraffin, gas, coal, wood or candles. Respondents also had the option of specifying "other strategies" or to state "don't know".

Figure 23: Strategies Employed to Cope with the Current Electricity Price Increase



Source: SASAS Energy related behaviour and perception survey (2011; 2012)

As evident from Figure 23, the strategy employed by most South Africans in the past year to cope with the rising electricity costs was to reduce the amount of electricity used. In 2012, almost half (48%) of South Africans saved electricity by reducing the amount of electricity used. This represents an increase of 7% from 2011, indicating that energy saving is becoming common practice in South Africa. This might partly be due to the fact that people are financially strained and therefore forced to change behaviour and take up energy saving strategies propagated by energy efficiency campaigns.

The second strategy, embarked upon by 26% of South Africans, was to continue to use the same level of electricity and pay the extra amount for it. Just more than a fifth (22%) had to use other energy sources to cope with increasing electricity prices. Increased electricity prices therefore resulted in almost half of all households in South Africa resorting to energy savings strategies and other strategies to reduce the amount of electricity used. In a fifth of cases, higher electricity price increases encouraged energy switching and multiple energy use. The 2012 pattern was similar to 2011, however, in 2012, notably more households were embarking on strategies to reduce the amount of electricity used.

Table 45: Strategies Employed to Cope with Rising Energy Prices in the Past 12 Months -Strategies Employed by Households (Percentage)

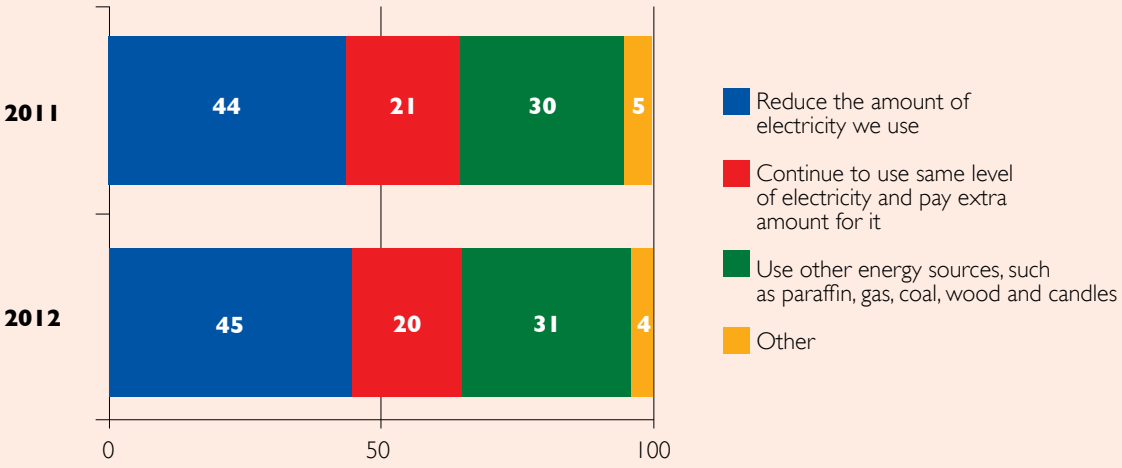
	Reduce the amount of electricity we use	Continue to use the same level of electricity and pay the extra amount for it	Use other energy sources, such as paraffin, gas, coal wood and candles	Other	Don't know	Total
South Africa	48	26	22	1	3	100
Population group						
Black African	44	28	23	1	4	100
Coloured	52	21	23	1	3	100
Indian or Asian	47	23	29	0	1	100
White	55	25	15	4	2	100
Living standard						
Low	28	9	26	6	32	100
Medium	43	25	28	1	3	100
High	51	28	17	2	2	100
Geographic location						
Urban, formal	52	27	18	2	2	100
Urban, informal	37	35	20	0	8	100
Rural traditional authority areas	40	24	32	1	4	100
Farms	38	20	33	2	7	100
Province						
Western Cape	58	25	16	0	1	100
Eastern Cape	58	19	20	1	3	100
Northern Cape	32	39	22	1	6	100
Free State	47	27	22	0	4	100
KwaZulu-Natal	61	19	16	0	3	100
North West	25	41	26	1	6	100
Gauteng	49	28	17	3	3	100
Mpumalanga	30	32	37	0	2	100
Limpopo	32	24	40	1	3	100

Source: SASAS Energy related behaviour and perception survey (2012)

As was expected, different strategies were employed by different types of households. The strategy "to reduce the amount of electricity used" was most prevalent among White (55%) and Asian households (47%). Reducing the amount of electricity used was mostly employed by high LSM households – most likely a function of the fact that they had the option of reducing spare capacity whilst low income households were in all likelihood already surviving on the bare minimum. Residents of urban formal areas are also much more likely than those in other areas to reduce the amount of electricity used. Of all provinces, households from KwaZulu-Natal (61%) as well Western Cape and Eastern Cape (58%) were most likely to employ reduce the amount of electricity used. The largest contingent of households that said they would continue to use the same level of electricity and pay the extra amount were Black African households, high LSM households, households in urban informal areas and also households in North West and Northern Cape. Fuel switching as an option was mostly implemented by Indian or Asian households, households in the medium living standard category, households in rural traditional authority areas and on rural farms as well as in Mpumalanga and Limpopo.

The same question was asked again to households, but this time it focused prospectively (in other words the next 12 months). Respondents were asked which strategies they would engage if electricity prices were increased tomorrow. As with the previous question, respondents had the opportunity to choose one of three options, namely: (a) continue to use the same level of electricity and pay the extra amount for it; (b) reduce the amount of electricity used; or (c) use other energy sources such as paraffin, gas, coal, wood or candles. Respondents also had the option of specifying "other strategies" or to state "don't know".

Figure 24: Strategies Employed to Cope with Future Electricity Price Hikes

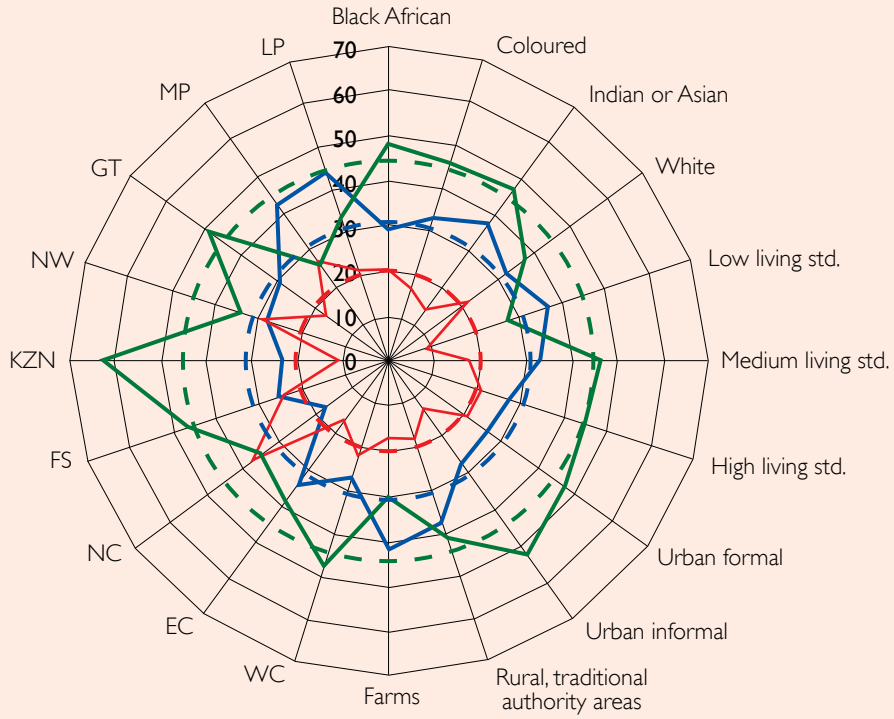


Source: SASAS Energy related behaviour and perception survey (2011; 2012)

From Figure 24, it is clear that just under half (45%) said they would reduce the amount of electricity used, with a sizeable 31% indicating that they would resort to energy switching - in other words, switching from electricity to paraffin, gas, coal, wood and candles. A fifth said they would continue to use the same level of electricity and pay the extra amount for it. These results clearly show that future energy price increases will have a bearing on the types of energy used. Currently, due to the unavailability of alternative clean energy sources, fuel switching leads to the use of more solid fuels which increases health risks. However, as safe energy alternatives become more available, it is highly likely that people will engage more in energy switching. Similar figures were noted in 2011.

In order to understand which socio-demographic groups were most likely to undertake the various strategies, a radar diagram was constructed with the percentages supporting each strategy.

Figure 25: Strategies Employed by Households to Cope with Future Electricity Increases by Select Socio-Demographic Attributes (Percentage)



Source: SASAS Energy related behaviour and perception survey (2012)

The most common strategy that would be employed if electricity were increased "tomorrow" was to reduce the amount of energy used. The largest shares who mentioned this option were found among Indian households (63%), households in urban informal areas (53%), and households in Gauteng (49%). Fuel switching as an option was understandably more feasible for people living on rural farms (42%) or in rural traditional authority areas (38%). A high percentage of Indian or Asian households (38%) also indicated that they would switch fuel sources should electricity prices go up. This was also an option for more than a third of households with a low living standard (37%). Interestingly, the highest proportions of households that would continue to use the same level of electricity and pay the extra amount for it were found in Northern Cape (38%) and North West (29%). Although the average of the don't know response was 3% it was alarming to see that more than a quarter (27%) of households with a low living standard measure indicated that they did not know what they would do if electricity prices would be increased again. This reflected certain desperation from low income households.

7. Energy Saving

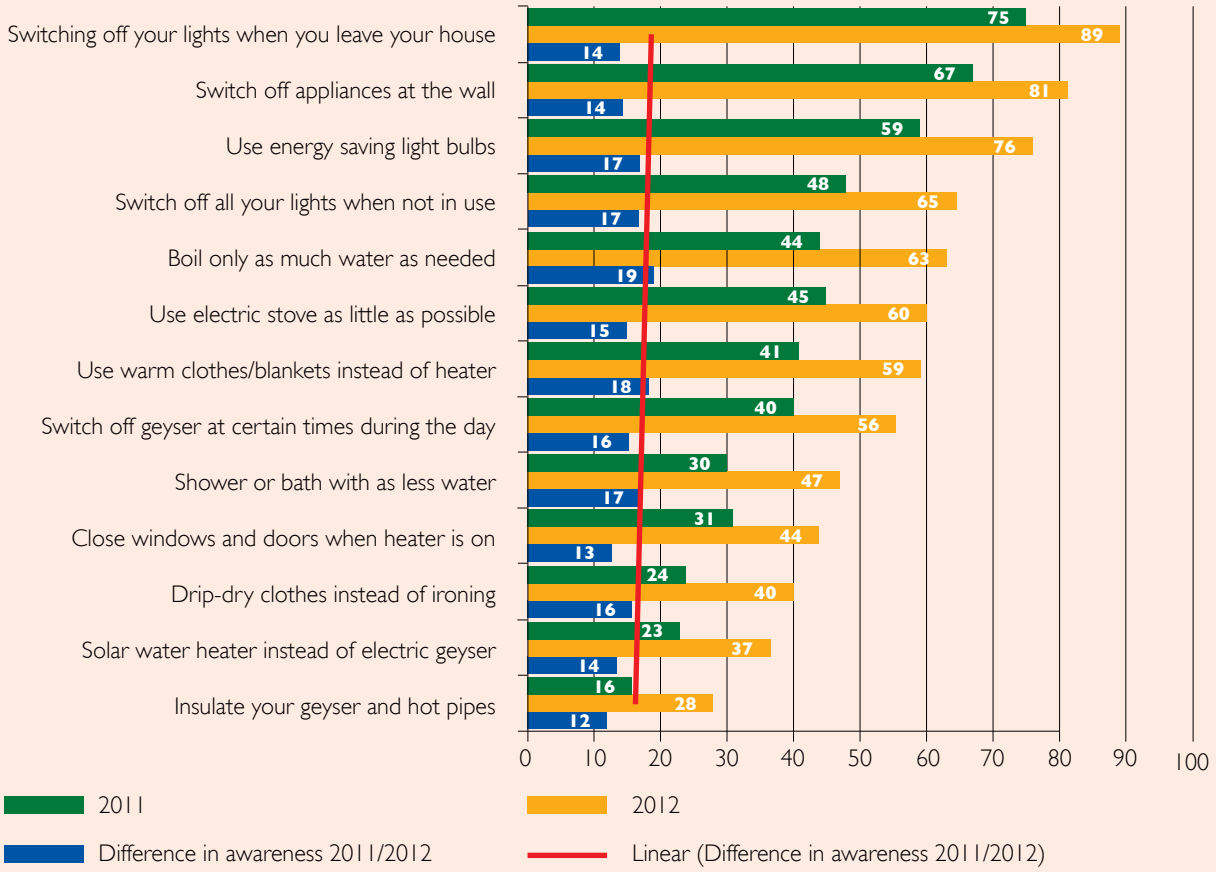
In 2011 ESKOM launched its 49M campaign, which was the country's biggest energy-saving movement, seeking to address the issue of the country's constrained power system. The idea behind the 49M, based on 49-million people, the population of the country, was that each and every South African has a responsibility to exercise some saving in the supply and use of electricity so that there is a greater amount available to the country.

In the 2011 study, respondents were given a list of energy-saving measures and asked to indicate if they are aware of the specific measure and, if so, whether they actually undertake it. These questions were repeated in the 2012 study and in the next section awareness of the various measures are compared for the two years. Not only does this section compare awareness for the two years it also compares the actual undertaking of the various energy saving measures between the years. In both instances, very encouraging results are noted, with awareness as well as undertaking increasing significantly between the two years.

Messages pertaining to energy saving strategies have therefore definitely impacted on more people in 2012 and have on average increased awareness by 10%. When compared to 2011 it was noted that levels of awareness generally increased for all energy savings measures but that the ranking of awareness of the various measures had not changed. Therefore consistent with 2011 levels, the energy-saving measures of which households are most aware are switching off of lights when leaving the house (89%), followed by switching off appliances (81%) and using energy-saving light bulbs (76%).

Fewer households in South Africa are aware of the following energy-saving measures: switching off lights in the home when not in use (65%), boiling only small amounts of water in a pot or kettle (63%), using stove plates and the oven as little as possible (60%), using warm clothes instead of an electric blanket (59%) and switching off the geyser at certain times during the day or night (56%). Fewer than half (47%) were aware that taking a short shower or bathing in little water would save energy and more than two-fifths (44%) were aware that closing the windows and doors when a heater is on constitutes an energy-saving measure. A fifth (40%) was aware that drip drying of clothes rather than ironing would result in energy-saving measures. Similar proportions (37%) were aware that the installation of a solar water heater rather than electric geysers would result in energy saving. Fewer people (28%) were aware that the insulation of geysers and hot pipes would lead to energy saving.

Figure 26: Awareness of the Various Energy Saving Measures for 2011 and 2012

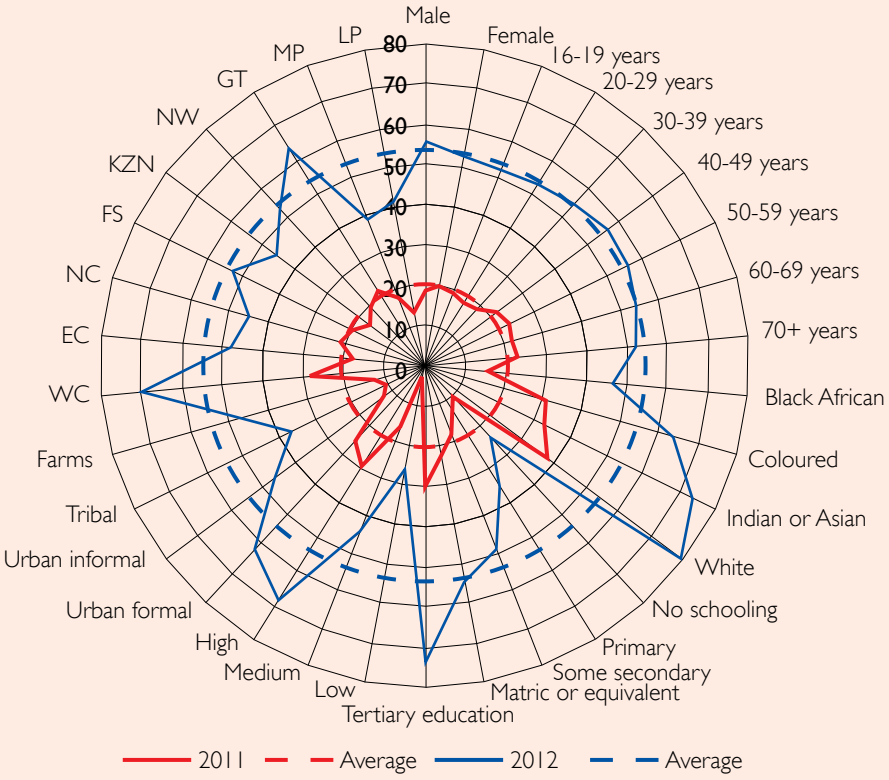


Source: SASAS Energy related behaviour and perception survey (2011; 2012)

In terms of the difference in awareness between 2011 and 2012, the following was observed. The highest increase in awareness between 2011 and 2012 of energy saving was noted for basic everyday actions, which is encouraging since these would be applicable to and achievable by the majority. This highest increase in awareness between the two years (19%) involved only boiling required amounts of water and not more, or using warm clothes or blankets instead of heaters (18%). The smallest increase in awareness was noted at 12% and this was for awareness regarding energy savings when insulating geysers and hot pipes. This finding is not surprising since this application is very technical and also only applicable to households where geysers are available.

In order to further the analysis on energy-saving measures and how it relates to various household characteristics, an Energy Awareness Index (EAI) was developed. Each energy-saving measure that households were aware of was coded as a 1 and then summed together to get a total score. Households could therefore score a minimum of a 0, implying they are not aware of any of the cost-saving measures, or a maximum of 13, implying they are aware of all the energy-saving measures. These scores were converted to a 0 -100 scale. The mean scores for various socio-demographic variables were calculated and are portrayed in the radar gram below.

Figure 27: Awareness of the Different Energy-Saving Measures by Socio-Economic Attributes (Mean)



Source: SASAS Energy related behaviour and perception survey (2011; 2012)

As can be seen from the diagram above, the average increase in awareness from 2011 to 2012 on a 0-100 scale was approximately 34 points. This increase is extremely significant and an indication that the awareness of energy savings strategies has escalated dramatically in a one year period. This could be attributed to the successful energy efficiency and saving campaigns and also to escalating electricity prices which forced people to embark on energy saving measures in order to stay within their budgets. Between 2011 and 2012, the pattern in terms of awareness among the socio-demographic groups remained fairly consistent. Looking at 2012, non-significant differences were noted between genders and age groups. Contrary, awareness was significantly different among the population groups with Black Africans least aware, followed by Coloured, Indian and White respondents. A steep educational gradient was also noticeable with people with no schooling almost three times less aware of energy saving strategies than people with a tertiary education. A socio-economic gradient was also noted with those with a high living standard being more aware than people with a low living standard. In terms of the provincial distribution, awareness was highest in Western Cape and Gauteng whilst lowest in Limpopo, Mpumalanga, Northern Cape and Eastern Cape.

Once awareness levels were determined it was also very important to understand whether people undertake these various energy saving measures. In the following table the awareness levels are compared with the undertaking of the energy saving measure and the ratio between awareness and undertaking is portrayed.

Table 46: Awareness and Performance Regarding the Various Energy-Saving Measures (Percentage)

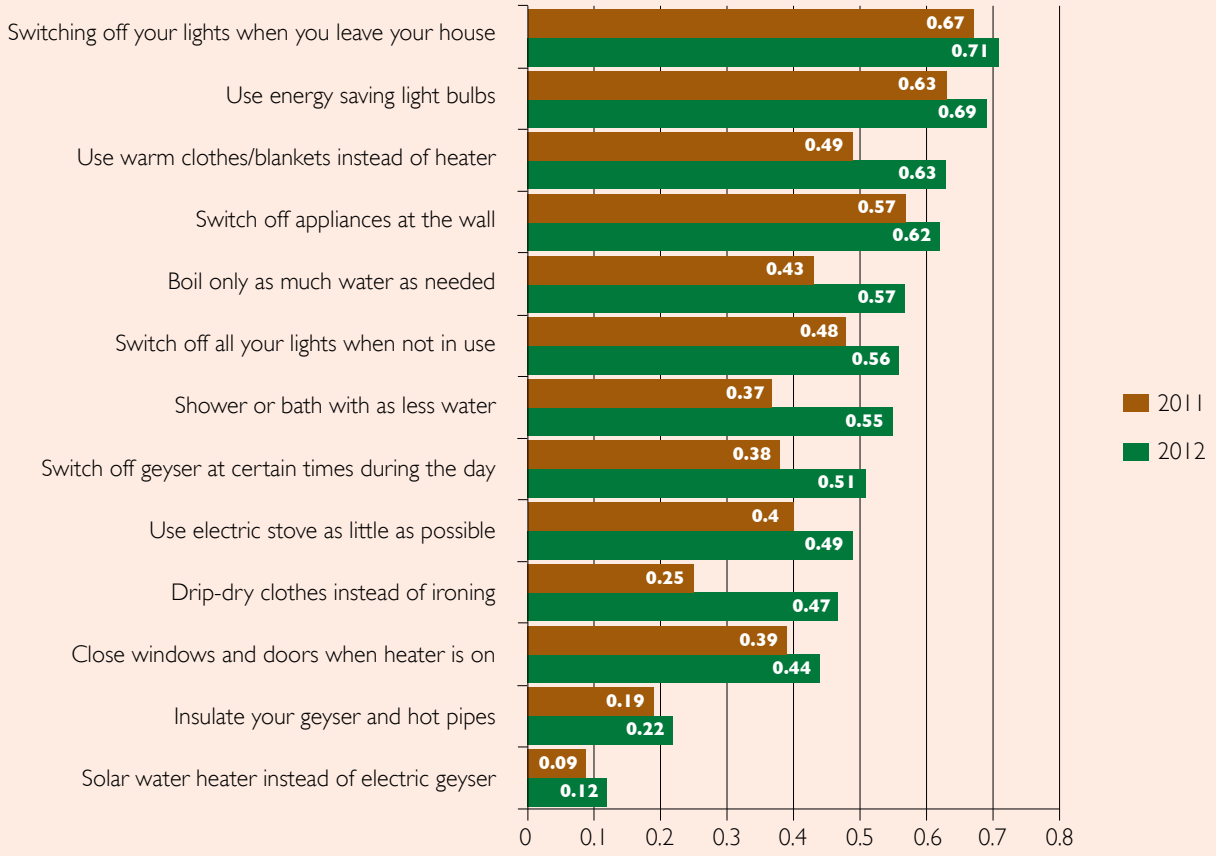
	Awareness %	Often do %	Ratio between awareness and doing
Switching off your lights when you leave you house	89	64	0.71
Using energy saving light bulbs	76	53	0.69
Use warm clothing or blankets instead of an electric heater	59	38	0.63
Switch off appliances (TV, radio, hi-fi) at the wall (not the remote control) when not in use	81	51	0.62
Boil only as much water with a pot or kettle that is needed	63	36	0.57
Switch off all your lights except security lights in home when not in use	65	36	0.56
Take a short shower or bath with as little water as possible	47	26	0.55
Switch off geyser at certain times during the day or at night	56	28	0.51
Electric stoves use a lot of electricity, so use the plates and oven as little as possible	60	30	0.49
Allow clothes to drip-dry instead of ironing	40	19	0.47
Close windows and doors when a heater is on	44	19	0.44
Insulate your geyser and hot pipes	28	6	0.22
Install a solar water heater instead of an electric geyser	37	4	0.12

Source: SASAS Energy related behaviour and perception survey (2012)

The energy-saving measures of which households are most aware and actually do most often are switching off of lights when leaving the house. Seven in ten people that are aware of this measure actually embark and use this energy saving measure. The national campaign of distributing and marketing energy savings light bulbs has also impacted with almost 70% of all people aware of this energy saving measure actually implementing it. Higher than 0.6 ratios were also noted for people using warm clothing or blankets rather than electric heaters and people switching off appliances at the wall when not in use. Lower ratios (between .50 and .60) were noted for boiling only as much water as is needed; switching off all lights except security lights when not in use; taking a short shower or bath with as little water as possible and switching off the geyser at certain times during the day or night. The lowest rations (less than .50) were noted for using the electric plates and the oven sparingly; allowing clothes to drip dry instead of ironing; closing windows and doors when the heater is on; insulating geysers and hot pipes as well as installing a solar water heater instead of an electric geyser.

It has been established that awareness of all energy saving measures has increased significantly from 2011 to 2012. In an attempt to understand if this increase in awareness has actually translated into actions, and to determine if this has increased from 2011 to 2012, the ratio between awareness and action for the 2011 and 2012 years are portrayed below. As can be seen from Figure 28, in 2012 the ratio between awareness and undertaking is higer on all energy saving measures. This implies that energy saving behaviour for all these measures had increased on a year to year basis.

Figure 28: Ratio between Awareness of an Energy-Saving Measure and Taking Action



Source: SASAS Energy related behaviour and perception survey (2011; 2012)

8. Support for Different Energy-Related Activities

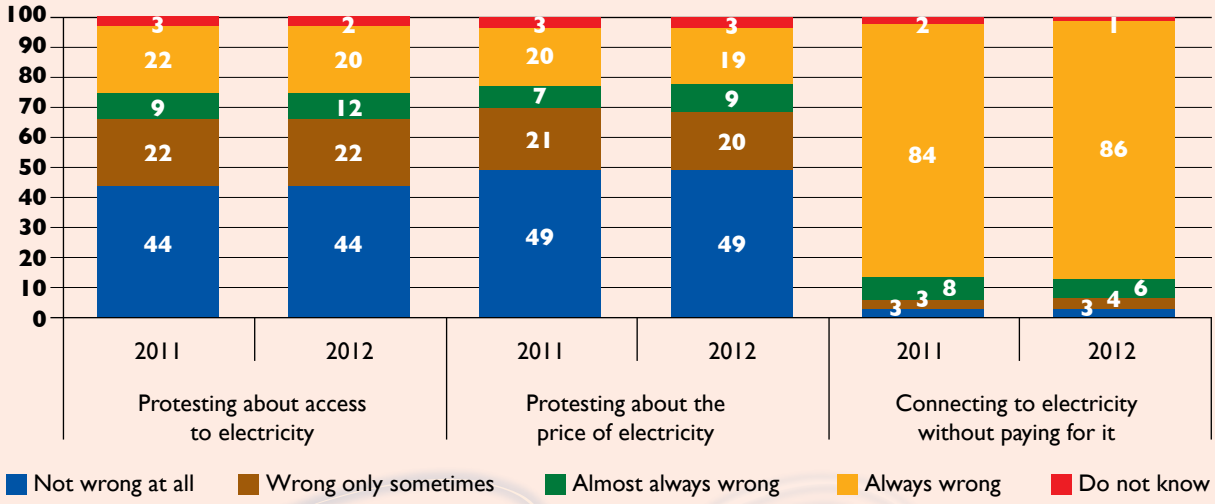
South Africa has been dubbed "the protest capital of the world" (Rodrigues, 2010) since it has one of the highest rates of public protest in the world. During the 2004/05 financial year about 6,000 protests were officially recorded, approximately 1000 were illegal and banned and an unknown number of protests went unrecorded. Since 2005 the number of protests has escalated dramatically and Heese and Allan (2011) report that "2009 and 2010 together account for about two-thirds of all protests since 2004". The number of protests reached an all time high between 2010 and 2012 and can therefore be said to be escalating.

These protests are usually referred to as service delivery protests in the media and it is evident that there is growing unhappiness with service delivery. Zwelinzima Vavi, COSATU Secretary General, has described the increasing rate of popular protest as a "ring of fire" closing in on major cities that could result in a revolution. As these protests continue some analysts take the view that protests are also becoming increasingly radical. Some commentators have concluded that "a large majority of South Africans feel that conventional mechanisms of engaging the state are failing and that alternatives may be more effective (Pillay, 2011). Some commentators have also been stating that service delivery protests are part of a broader Rebellion of the Poor.

In the light of the escalating protests, it was important to include questions about perceptions around protest action in the questionnaire. South Africans were asked if it was "not wrong at all", "wrong only sometimes", "almost always wrong" or "always wrong" to connect to electricity without paying for it, to protest about access to electricity or the price of electricity. Similar questions were also asked in 2011 and the results are portrayed below.

In line with commentary, results from the 2011 and 2012 survey showed that two-thirds of South Africans felt that it was not wrong at all (44%) or wrong only sometimes (22%) to protest about access to electricity (Figure 29). The rest (under a third) stated that it almost always wrong or always wrong to protest over this issue. People felt even stronger about protesting against the price of electricity with almost half (49%) of people in both the 2011 and 2012 survey stating that it is not wrong at all to protest over the price of electricity. Furthermore, a fifth of people in the 2012 survey and just more than a fifth (21%) in 2011 stated that it was "wrong only sometimes". About a quarter (27% in 2011 and 28% in 2012) felt that it was almost always or always wrong to protest about the price of electricity. However strong opposition was voiced against illegal connections with national results indicating that the majority (nine in ten) South Africans in both the 2011 and 2012 surveys were of the opinion that it is almost always wrong or always wrong to connect to electricity without paying for it.

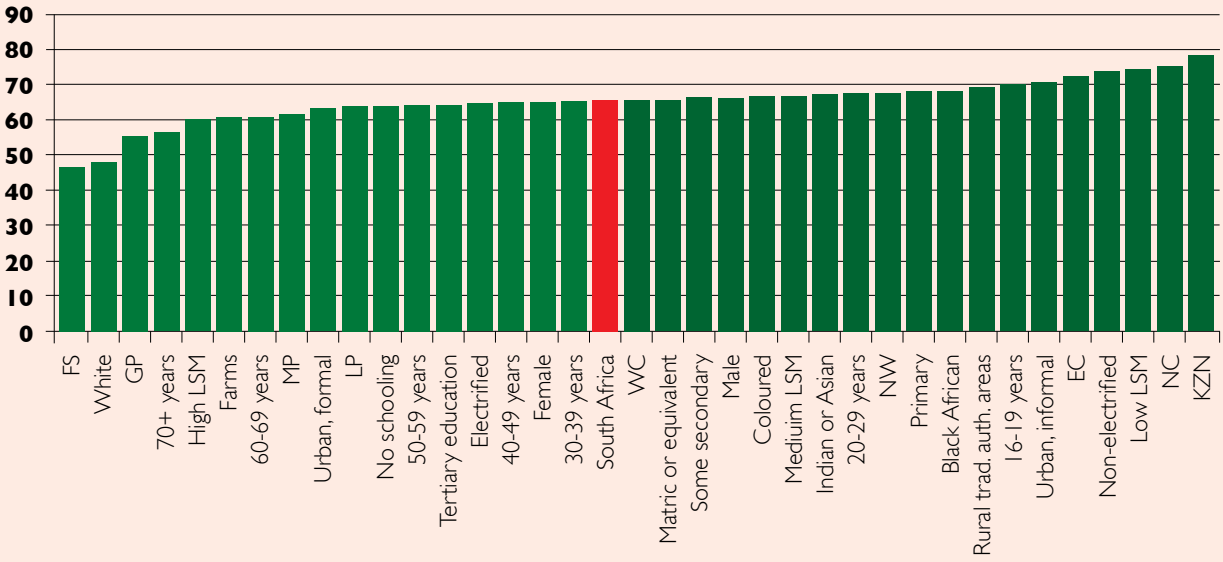
Figure 29: Protesting about Electricity (Percentage)



Source: SASAS Energy related behaviour and perception survey (2011; 2012)

In order to understand who were most likely to support protest action against high electricity prices and issues regarding access, a Protest Action Index (PAI) was created. The Index was created by recoding the scores to 4=Always wrong; 3=Almost always wrong; 2=Wrong only sometimes and 1=not wrong at all. Answers to the two questions were added together and a 0-100 scale was created. "Don't know" responses were eliminated from the calculation. A higher score indicated a higher propensity towards finding protest action acceptable.

Figure 30: The Protest Action Index (Ranked Mean Scores)



Source: SASAS Energy related behaviour and perception survey (2012)

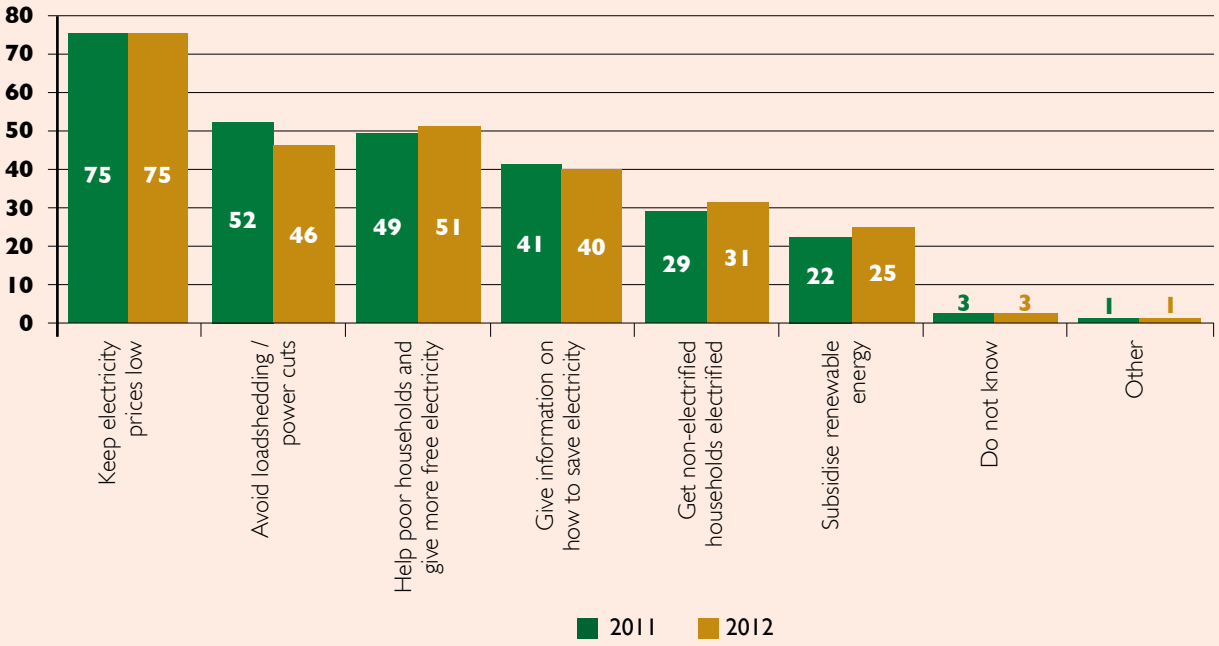
When scores of the various socio-demographic groups were ranked on the Protest Action Index, it was evident that people from the Free State, whites, residents from Gauteng, older people (those 70 years and older), people with a high living standard and people from rural farms were most likely to think that protest action was wrong. In contrast, residents from KwaZulu-Natal and Northern Cape, people who have a low living standard or live in non-electrified households, or reside in the Eastern Cape or live in urban informal areas or youngsters (between the ages of 16-19 years) were most likely to support protest action against high prices and access issues.

9. Policy Preferences

9.1. Government Priorities in Supplying Electricity to the People

Government has various demands and priorities when it comes to providing people with electricity. In order to understand what mandate the people of South Africa would give government, some priorities were listed and the South Africans were asked to choose three top priorities that government should prioritise. These responses were combined and are listed in Figure 31.

Figure 31: Policy Preferences in terms of Government Priorities in the Supply Of Electricity (Multiple Response - Percent)



Source: SASAS Energy related behaviour and perception survey (2011; 2012)

In 2011 and 2012, three-quarters of all adult South Africans stated that the priority of the Department should be to keep electricity prices low. Economical considerations outweighed other priorities by a considerable margin. The second priority, mentioned by just more than half (52%) in 2011 and 46% in 2012, was that the Department should ensure that load-shedding and power cuts are minimised. A further priority, shared by almost half of South Africans (49% in 2011 and 51% in 2012), was that the Department should help poor households by giving more free electricity. Keeping electricity prices down, avoiding load-shedding and giving more free electricity to help the poor are the top three policy preference in relation to electricity provision. Fewer South Africans (40%) supported the idea that the Department should prioritise dissemination of information about energy-saving measures. Even smaller shares of people (29% in 2011 and 31% in 2012) felt that the priority should be to get non-electrified households electrified or that renewable energy should be subsidised (22% in 2011 and 25% in 2012).

Table 47: Policy Preferences by Select Socio-Demographic Attributes (Percent)

	Keep electricity prices low	Help poor households by giving more free electricity	Avoid load-shedding or power cuts	Give information on how to save electricity	Get non-electrified households electrified	Subsidise renewable energy
South Africa	75	51	46	40	31	25
Electrification status						
Electrified	77	50	49	41	29	25
Non-electrified	55	64	15	32	57	21
Gender						
Male	74	48	47	41	30	28
Female	76	54	45	39	32	22
Age						
16-19 years	70	50	42	45	28	25
20-29 years	79	49	49	44	27	21
30-39 years	73	55	47	34	37	24
40-49 years	75	51	45	39	34	28
50-59 years	79	47	50	36	34	29
60-69 years	66	55	43	38	24	32
70+ years	77	58	35	42	25	23
Population group						
Black African	73	54	44	42	34	21
Coloured	78	57	46	26	30	29
Indian	82	43	57	31	26	35
White	83	28	55	40	17	41
Living standard level						
Low	59	66	19	32	53	18
Medium	75	57	44	43	32	21
High	79	41	54	36	25	32
Geographic location						
Urban formal	79	46	51	38	25	29
Urban Informal	68	51	40	44	39	31
Rural, trad authority areas	73	62	42	43	40	14
Farms	63	50	34	36	36	26
Province						
Western Cape	80	50	39	35	26	36
Eastern Cape	73	62	45	32	33	16
Northern Cape	73	56	44	39	21	35
Free State	67	40	66	47	19	30
KwaZulu-Natal	80	53	44	40	41	24
North West	74	50	36	50	31	32
Gauteng	74	44	52	36	30	29
Mpumalanga	72	49	48	41	32	12
Limpopo	73	62	42	54	28	12

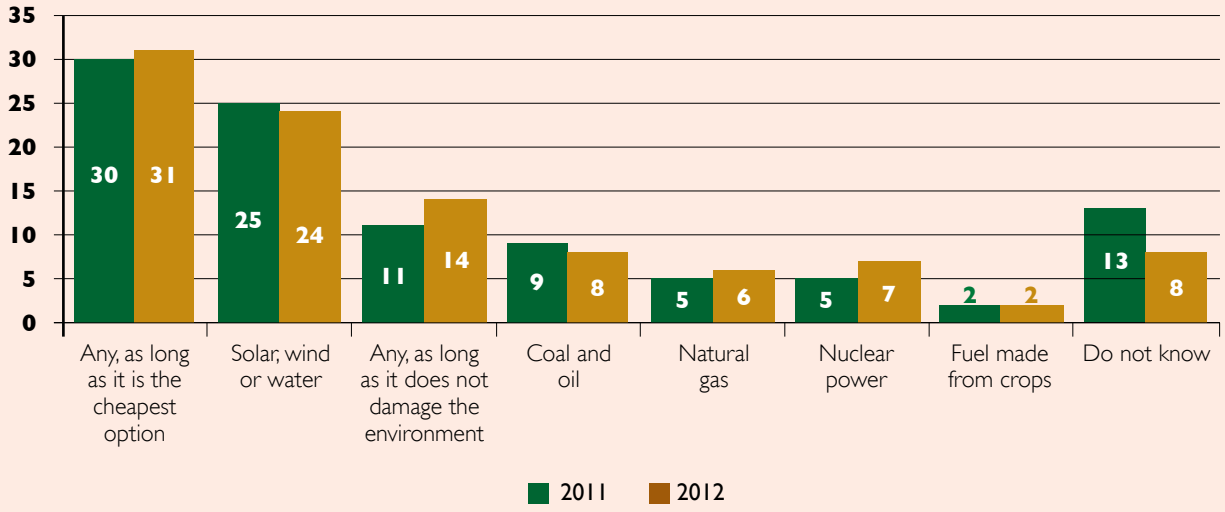
Source: SASAS Energy related behaviour and perception survey (2012)

Three quarters of the South African public (75%) believes that the policy priority in terms of electrification should be to keep prices low. As illustrated in Table 47, this conviction is mostly found among Whites (83%), Indians (82%), residents of KwaZulu-Natal and Western Cape (80% respectively). The redistributive policy "give free electricity to poorer households" was most important to people with a low living standard (66%) or living in non-electrified households (64%), people residing in Eastern Cape, Limpopo or rural traditional authorities (all 62%). Avoiding load-shedding or power cuts was most important to people living in the Free State (66%), Indians (57%), whites (55%), people with a high living standard (54%) or living in urban formal areas (51%). Giving information on energy-saving measures was most supported by people living in Limpopo (54%), North West (50%) and Free State (47%). As could be expected, the highest preference for getting non-electrified households electrified were found among people living in non-electrified households (57%) or poorer households with a low living standard (53%). Highest support for subsidising renewable energy was found among whites (41%), residents of the Western Cape (36%), Indians or people that live in the Northern Cape (both 35%).

9.2. Future Sources of Electricity Supply

In common with many countries throughout the world, South Africa is presently grappling with the twin policy challenges of addressing climate change and ensuring that the future energy needs of the country are adequately met. It is increasingly apparent that this mounting concern with respect to climate change and energy security has influenced the direction and nature of energy policy in South Africa in recent years, with nuclear power being recast as low-carbon technology (DoE, 2012). From an international perspective, South Africa has rather high levels of greenhouse gas (GHG) emissions, a situation that is informed by the country's energy-intensive economy that is overwhelmingly dependent on coal (Winkler & Marquand, 2009). Fossil fuels therefore dominate the energy sector, with coal providing 75% of the fossil fuel demand and accounting for more than 90% of electricity generation (DEAT, 2009: 3). In response, the government has committed to reducing its GHG emissions by 34% by 2020 and 43% by 2025, a decision that has salient implications for the energy sector. The International Energy Agency has defined energy security as 'the uninterrupted physical availability of energy at a price which is affordable, while respecting environmental concerns' (IEA, 2001). Bearing this in mind, an over-reliance on coal, coupled with environmental considerations and a need for a developmental approach in securing the energy requirements for all South Africans has resulted in a strong energy policy emphasis on diversifying primary energy sources in coming decades. South Africans were asked about their policy preferences regarding future sources of energy supply.

Figure 32: Policy Preferences in Meeting South Africans' Future Energy Needs (Percent)



Source: SASAS Energy related behaviour and perception survey (2011; 2012)

In choosing future sources for electricity generation, South Africans are clear that economic imperatives are the most important, hence the response "It does not matter which source, as long as it is the cheapest". Having said this, almost a quarter (24%) of South Africans also support renewable energy sources such as solar, wind and water, with a further 14% explicitly placing emphasis on sources that are not damaging to the environment. Economic and environmental considerations are thus important to South Africans when considering future energy sources. Less than a tenth supported other energy sources such as coal and oil (8%), natural gas (6%), nuclear power (7%) and fuels made from crops (2%). These results were similar for the 2011 and 2012 survey year. Interestingly, the inclination towards solar, wind, or water as well as sources that are not harmful to the environment is in line with the generating capacity proposed for South African in the future, where the emphasis will be more on renewable, environmental friendly energy sources and less on coal and oil.

Table 48: Policy Preferences in Meeting South Africa's Future Energy Needs by Select Socio-Demographic Attributes (Percent)

	Any, as long as it is the cheapest	Solar, wind or water	Any, as long as it is environment friendly	Coal and oil	Nuclear	Natural gas	Fuels from crops	Don't know
South Africa	31	24	14	8	7	6	2	8
Electrified	31	25	14	7	7	6	2	8
Non-electrified	36	12	19	9	4	1	2	17
Gender								
Male	30	26	14	8	8	6	1	7
Female	33	21	15	7	7	6	2	10
Age								
16-19 years	23	20	18	9	10	10	1	9
30-39 years	31	22	15	8	9	5	3	9
40-49 years	36	23	14	7	5	5	2	7
50-59 years	28	29	14	7	7	7	1	7
60-69 years	35	24	13	7	6	4	1	10
70+ years	28	29	10	8	7	6	2	9
Population group								
Black African	33	20	15	8	7	6	2	9
Coloured	37	25	10	6	6	3	2	10
Indian	18	41	12	12	8	7	0	1
White	19	43	12	7	8	4	1	7
Living standard level								
Low	33	14	18	6	6	2	3	18
Medium	36	21	13	7	6	6	1	10
High	25	28	15	9	8	6	2	6
Geographic location								
Urban formal	27	27	14	8	9	6	2	7
Urban Informal	38	21	20	7	5	4	0	6
Rural, trad authority areas	37	18	14	8	5	6	2	10
Farms	31	22	12	4	3	2	1	25
Province								
Western Cape	30	20	24	2	9	5	5	5
Eastern Cape	40	21	12	9	3	4	4	6
Northern Cape	19	35	16	1	4	0	0	24
Free State	30	25	12	3	9	4	2	14
KwaZulu-Natal	31	26	14	7	8	6	0	7
North West	30	25	9	7	6	5	1	17
Gauteng	27	24	15	11	9	7	1	6
Mpumalanga	27	31	8	4	4	5	2	20
Limpopo	41	15	13	11	5	8	2	6

Source: SASAS Energy related behaviour and perception survey (2012)

Of all the different socio-demographic variables that this preference was examined by, the highest proportion indicating a preference for the cheapest energy was found among people living in Limpopo (41%), Eastern Cape (40%), people living in urban informal areas (38%) and rural traditional authority areas (37%) or coloured people. Preference for renewable energy such as solar, wind, or water was highest among whites (43%) and Indians (41%) or people living in the Northern Cape (35%). People in the Western Cape (24%), in urban informal areas (20%), in non-electrified areas (19%) were mostly in favour of environmentally-friendly solutions. Coal and oil as sources of electricity were mostly favoured by Indians (12%), and residents of Limpopo (11%) and Gauteng. Youngsters (aged between 16 and 19 years) were particularly in favour of nuclear energy and natural gas.

9.3. Government Policies

One of the main priorities of the department is the provision of accessible, affordable, and reliable energy to the people of South Africa. In order to achieve this, certain policies and strategies are crafted. In this section we look at some of the policies and strategies employed by the Department and determine to what extent these policies and strategies are supported by South Africans. Respondents had the opportunity to rate to what extent they were strongly in favour, in favour, neither nor, against or strongly against the strategy.

Table 49: Policy Preferences (Percentage)

The South African government should:	Strongly in favour	In favour	Neither in favour nor against	Against	Strongly against	(Do not know)	Mean score
Spend money to replace electric geysers with solar geysers	41	37	12	5	2	4	78.4
Give all households an amount of free energy per month	46	33	10	6	4	3	77.8
Spend money on campaigns to encourage people to use less energy	28	45	9	10	5	3	71.1
Make the price of electricity higher for rich households than for poor households	15	23	20	24	14	4	49.9

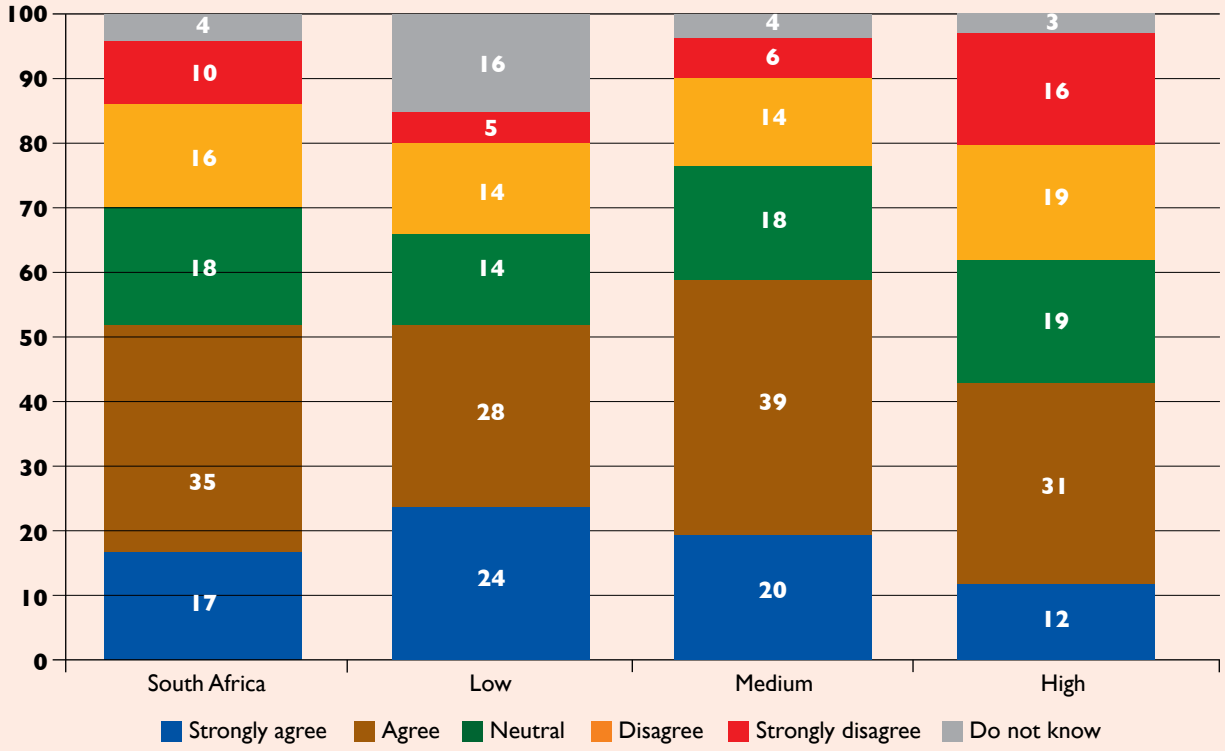
Source: SASAS Energy related behaviour and perception survey (2012)

The two most preferred strategies in terms of energy-saving initiatives were to replace electric geysers with solar geysers and to give households an amount of free energy per month. More than three-quarters (78%) of South Africans were strongly in favour or in favour of the option of replacing electric geysers with solar geysers. Similarly a large proportion (79%) was in favour of allocating an amount of free energy per month to all households. Another popular policy preference option, nominated by 73%, was to spend money on campaigning to encourage people to use less energy. Just more than a third (38%) of people was in favour of making the price of electricity higher for richer households.

Interestingly, support for campaigns to encourage people to use less energy was forthcoming from people with no schooling (76%) or a primary school qualification (74%) or people living on farms and in KwaZulu-Natal (74%) or Mpumalanga (74%). People with a lower educational status felt that education regarding the better use of electricity was important. Furthermore, South Africans were generally in agreement that money should be spend to replace

electric geysers with solar geysers and this feeling was most prevalent among whites, people with no schooling and people residing in the Northern Cape (83%). As could be expected, people with a low living standard (86%) were most in favour of households receiving free electricity whilst Whites and those with a high living standard were least in favour of this. This trend was similar for making the electricity price higher for rich households.

Figure 33: Support for the Inclined Block Tarrif Structure by LSM (Percentage)



Source: SASAS Energy related behaviour and perception survey (2011; 2012)

In 2008 the inclined block rate structure was implemented which implied that households that use more electricity would be charged at a higher tarrif price. In Figure 33, we determine support for this policy and find that nationally, just more than half (52%) of South Africans support his policy with just over a quarter 26% opposing it by disagreeing or strongly disagreeing with the policy. When analysed by living standard measure, it is not surprising to find that support for this policy is lowest among households with a high living standard – in all likelihood motivated by the fact that they are the households that use more electricity and would be penalised by paying higher tarrrif prices. A large proportion of low income households was unsure about whether to support this policy with 16% stating "don't know".

From this section it is clear that South Africans are broadly in favour of current policies that are being implemented by government. The majority of South Africans favour campaigns to encourage people to use less energy and also support the instalment of new energy saving devices such as solar geysers. As could be expected, policies that implied increasing the rates for higher income households or paying escalating tariffs for increased usage were accepted by fewer people, especially the high income earners most affected by these policies.

10. Conclusion and Recommendations

Progress towards providing greater access to modern energy services in South Africa has generally been hailed a success, but despite this, certain obstacles still remain in achieving universal access. Some of these obstacles include the lack of financial resources to build infrastructure and reduce first-cost barriers to access; remote inaccessible terrain; and low income levels among the un-served population. Despite all these challenges, the Department has committed itself to increase access to modern energy sources to 92% by 2014 and, in line with the national development plan, universal access by 2025. In order to achieve this, various strategies needs to be employed. This report interrogated important issues around energy-related behaviour and perceptions in South Africa and gave some guidance in terms of strategies for the department.

From this report it is evident that in late 2012, considerable patterns of difference continued to exist between electrified and non-electrified households in the range of energy sources relied upon to meet basic needs. Those with electricity all reported that they used this source either for lighting, cooking or heating, although it is apparent that other sources such as candles, paraffin, firewood and gas continue to be relied upon in at least a fifth of cases. Conversely, in the absence of a domestic connection, non-electrified households rely primarily on candles, paraffin and firewood, with more nominal shares reporting the use of coal and gas. Dry cell batteries are more common in non-electrified households owing predominantly to their use for operating appliances.

Poorer households use electricity mainly for lighting but often cannot afford to use it for cooking or heating. For cooking, almost half of all electrified households in South Africa use electricity in combination with other energy sources such as firewood, paraffin and gas for cooking. This is also the case with heating, where wood and coal are widely used for heating rather than electricity. Non-electrified households depend mostly on paraffin and candles for lighting, firewood and paraffin for cooking and firewood for heating. Water heating for bathing purposes and non-bathing purposes is mostly done by using an electric kettle or geyser. Firewood and paraffin is mostly used in these households to heat water for bathing and other purposes. This enforced dependence on solid fuels has a number of negative impacts on health, environmental degradation and energy poverty. Poorer households might well be aware of the burden, inconvenience and health detriments of cooking over smoky fires, but their economic choices are very limited.

From this report it is evident that the use of solid fuels has been decreasing steadily over the past 15 years, with only about 13% of all households currently relying solely on solid fuels for cooking and 17% relying solely on solid fuels for heating. This signifies a positive trend, not only in terms of energy but also in terms of general development goals such as achieving millennium development goals. Despite this progress, it is important to note that progress is uneven with less than 5% of households using solid fuels for cooking in Western Cape, Free State and Gauteng, but more than 20% still using solid fuels for cooking in Eastern Cape, Mpumalanga and Limpopo. The over reliance on solid fuels in the more rural provinces is concerning and alternative energy sources should be sought to provide energy in these rural provinces.

Multiple energy use in South Africa remains a reality, especially in poorer households in South Africa. Given this reality, it is important that the Department adopts energy strategies that focus on diversification as well as issues of affordability, reliability, clean and safe energy services. The answer is therefore not in only stand-alone grid connected electricity but rather a combination of sources, i.e. a kerosene lamp or PV panel providing home lighting. The approach should be to determine the most effective way of delivering services to remote rural areas, and what combination of sources could be used most effectively. The idea is that multiple technologies are required depending on the resource availability and cost effectiveness of the delivery systems available. An example of such a diversification strategy could be to diversify ways of heating water for general purposes. From this report it is evident that 95% of households use a single energy source for heating water for purposes other than bathing and in a majority of cases an electrical

appliance is involved. This creates an opportunity for the Department to employ a diversification strategy where devices such as solar panels can relieve pressure on the national grid. Also, as can be seen from the report, the uptake of solar geysers among affluent households has been slow. It is therefore recommended that campaigning for a switch to solar geysers be intensified in order to reduce reliance on the national grid.

Evidence linking the provision of energy services with achievements of social objectives and economic progress is well documented with the opposite also being true. Extreme energy poverty leads to malnutrition, disease and even child and adult mortality. This study measured energy poverty and used three approaches namely, household energy expenditure relative to household income, a subjective measure and an energy-inefficient dwelling approach. The most common indicator of the three - namely, the household energy expenditure relative to income approach - stipulates that a household is energy poor if it uses more than 10% of its income on energy. Households with energy expenditure exceeding this threshold are considered to be energy poor and in consequence are likely to be confronted with difficult choices between meeting energy requirements and other basic competing spending priorities. Results show that close to half of all South African households are energy poor, with almost three-quarters (72%) of households in the poorest quintile being energy poor. Furthermore, this report shows that high income households also suffer under the burden of higher electricity prices and that even among the richest quintile, 18% of households are energy poor. These findings are consistent with the 2011 survey and can therefore be regarded as reliable. In the 2011 and 2012 surveys it was also consistently found that between a quarter and a third of households felt that their energy was not sufficient and this was mostly due to affordability issues. Increasing electricity prices are a threat to all South Africans and energy price reviews are urgently needed to ensure that households do not get further entrapped in energy poverty. This calls for a review of the current electricity pricing increase model and the current tariff structures.

The profile of energy poverty using the all three energy poverty approaches revealed that energy poor households are found disproportionately in the Eastern Cape, Limpopo or KwaZulu-Natal, and in rural traditional authority areas. There was also an increased likelihood of being energy poor if a household has a lower living standard level or falls in the poorest per capita income quintiles. Poorer households in South Africa are therefore carrying an enormous energy burden and current policies of subsidisation of energy sources to electrified and non-electrified households by policies such as the FBE, FBAE and IBT are a step in the right direction and a welcome relief to ensure that these households do not get trapped even deeper into poverty and vulnerability. All of these policies are designed to assist poor households, but many authors argue that this is still not enough. Whereas the FBE subsidy paid to consumers is certainly a contribution to affordable electricity, some researchers have reservations about the amount and claim that the 50 kW/h are not sufficient. They argue that the wider socio-economic development benefits of electrification and other energy relief initiatives seem disappointing, partly because of the fact that poorer households are still not able to meet basic needs with the amounts subsidised by government. Consideration needs to be given to these issues and it is recommended that targeted interventions need to be made with regards to municipalities with no or low revenues where a significant majority of households are poor. The recommendation is for government to increase the fiscal allocation to these types of municipalities. However, this fiscal increase should be done in a conditional grant manner that restricts them to FBE and FBAE aimed at indigent households.

It is evident from the report that the IRP should take economic imperatives seriously when planning for future energy choices. The majority of households indicated that they wanted the cheapest energy alternative, regardless of the energy source option, be it solar, wind, coal, oil, natural gas, nuclear power or fuels made from crops, etc. Ideological sentiment seems to vanish in the wake of economic realities. The desperation in terms of energy price increases is even more evident if it is considered that more than a quarter of poor households said "they would not know what to do if electricity prices would be increased again". Although this study found that households are willing to pay and have an aversion to illegal connections, the reality of raising energy prices is desperately burdensome.

In 2011, ESKOM launched its 49M campaign, which was the country's biggest energy-saving movement, seeking to address the issue of the country's constrained power system. The idea behind the 49M, based on 49-million people, the estimated population of the country, was that each and every South African has a responsibility to exercise some saving in the supply and use of electricity so that there is a greater amount available to the country. Messages pertaining to energy saving strategies have definitely impacted on more people in 2012 and have on average increased by 15% - from 42% in 2011 to 57% in 2012. From the results it is clear that the energy saving campaigns have had a significant impact and that it has increased awareness and behaviour substantively. This study therefore propagates that awareness campaigns should continue and even be intensified since there is clear evidence of their impact on awareness which lead to changes in behaviour.

Although these awareness campaigns certainly contributed towards energy saving behaviour, it might also be that general price increases have left people with little option but to change behaviour. Although painful, the increase in energy prices does provide an opportunity for creating more awareness and could instil lasting energy saving behaviour patterns in South Africa as common practice. It is therefore imperative that these campaigns continue to educate and inform South Africans. From this paper it was evident that education played a critical role in predicting or determining awareness levels of energy saving measures. People with higher education levels are more susceptible to energy saving messages than people with lower education levels who tend to have lower awareness levels. For this reason it is implied that energy efficiency campaigns should be diversified, also to target households with a low living standard and the less educated with specific local awareness campaigns.

In the final analysis, as suggested in the 2011 report, it is imperative that the Department of Energy examine and decide upon an official definition of energy poverty for the country. This could then be used as a baseline to monitor and track energy poverty levels in South Africa. As a matter of urgency, residential energy-pricing models and tariff structures need to be reviewed in order to relieve pressure on households in relation to the high levels of energy poverty shown in this study. In addition, a clear need is expressed by households that government should invest more in energy-saving and efficiency information awareness campaigns countrywide.

11. References

Annecke, W. (2005). 'Prepayment Meters in Merlo, Argentina and Khayelitsha, South Africa', in Electricity Supply Industry Africa, Issue 2.

Bekker, B., Gaunt, C.T., Eberhard, A., & Marquard, A. (2008). Uncertainties within South Africa's goal of universal access to electricity by 2012., Journal of Energy in Southern Africa, 19(2) May 2008, pp4-13

Boardman, B. (1991). Fuel poverty: from cold homes to affordable warmth. Belhaven Press, London

Burger, J. (2009). The Reasons Behind Service Delivery Protests in South Africa. Institute for Security Studies 29 July 2009. http://www.issafrica.org/topics/corruption).

Buzar, S. (2006). Estimating the extent of domestic energy deprivation through household expenditure surveys. CEA Journal of Economics, 1: 5-14.

Department of Environmental Affairs and Tourism. (2009). Greenhouse Gas inventory South Africa 1990 to 2000: National Inventory Report, Pretoria: Department of Environmental Affairs and Tourism.

Department of Minerals and Energy . (2003). Electricity Basis Support Services Tariff Policy, 30 June, Pretoria. Department of Minerals and Energy (DME),

Department of Energy . (2011). Integrated National Electrification Programme: briefing by Department of Energy. Parliamentary Monitoring Group. 7 March 2011.

Department of Energy . (2012). A survey of energy-related behaviour and perceptions in South Africa: The Residential Sector. http://www.energy.gov.za/files/media/Pub/Survey

Free Basic Alternative Energy Policy. (2007). Household Energy Support Programme. Government Gazette 2 April 2007. Notice 391 of 2007.

Fankhauser, S., & Tepic, S. (2007). Can poor consumers pay for energy and water? An affordability analysis for transition countries. Energy Policy, 35(2), 1038-1049.

Heese, K & Allan, K (2011). Are fiery street protests replacing the vote? Business Day. 18 February 2011.

Hills, J. (2011). Fuel poverty: The problem and its measurement. Interim report of the Fuel Poverty Review. London: Department for Energy and Climate Change (DECC).

Hills, J. (2012). Getting the measure of fuel poverty: Final report of the Fuel poverty Review. London: Department for Energy and Climate Change (DECC).

Howells, M., Victor, D. G., Gaunt, T., Elias, R. J., & Alfstad, T. (2006). Beyond free electricity: The costs of electric cooking in poor households and a market-friendly alternative. Energy Policy, 34(17), 3351-3358.

International Energy Agency. (2001). Toward a sustainable energy future. OECD/IEA, Paris.

Lamech, R., & O'Sullivan, K. (2002) Energy. Chapter 21 in Klugman, J. (ed.) A sourcebook for poverty reduction strategies. Washington, D.C: World Bank.

Magidmisha, H., Roberts, B., Gordon, S., & Struwig, J. (2011). Are you being served? Perceptions of service delivery. HSRC Review. Volume 10. September 2012.

Modi, V., McDade, S., Lallement, D., & Saghir, J. (2006). Energy services for the millennium development goals Energy Sector Management Assistance Programme (New York: United Nations Development Programme, UN Millennium Project, and World Bank)

National Energy Regulator of South Africa, (2010). Media Statement http://www.nersa.org.za/Admin/Document/Editor/file/News and Publications. 24 February 2010

National Development Plan. (2011). National Development Plan- Vision for 2013. http://www.npconline.co.za / medialib/downloads/home/NPC National Development Plan Vision 2030.pdf

Pillay, U. (2011). Delivery protests National problem requires local, tailor-made solutions, Business Day, 1 April 2011

Prasad, G. (2006). Social issues. In: H. Winkler, ed. Energy policies for sustainable development in South Africa: Options for the future. Cape Town, Energy Research Centre University. pp 61 – 76.

Rodrigues, C. (2010). "Black boers" and other revolutionary songs. News and Politics-Perspective. Mail and Guardian. 5 April 2010.

Ruiters, G. (2011). Developing or Managing the Poor: The Complexities and Contradictions of Free Basic Electricity in South Africa (2000-2006). Africa Development, Vol. XXXVI, No.1, 2011, pp. 119–14

Sebitos, A.B., & Pillay, P. (2005). Energy services in sub-Saharan Africa: how conducive is the environment? Energy Policy, 33 (16) (2005), pp. 2044–2051

Sefton, T. (2002). Targeting fuel poverty in England: is the government getting warm?. Fiscal Studies, 23(3), 369-399.

Winkler, H. (2006). Renewable Energy Policy in South Africa: Policy Options for Renewable Electricity. Energy Policy Vol. 33, pp.27-38

Winkler, H., & Marquand, A. (2009), Changing development paths: From an energy-intensive to low-carbon economy in South Africa, Climate and Development, 1 (1), pp47-65.

White, C., Bank, L., Jones, S., & Mehlwana, M. (1997). Restricted electricity use among poor urban households. Development Southern Africa, 14(3), 413-423.

World Health Organization (WHO). (2004). Energy, Sustainable Development and Health. Background document for the Fourth Ministerial Conference on Environment and Health, Budapest, Hungary, 23–25 June 2004. . Geneva: WHO.

Appendix A

SOUTH AFRICAN SOCIAL ATTITUDES SURVEY
Questionnaire 2: September 2012

RESPONDENTS AGED 16 YEARS +

Good (morning/afternoon/evening), I'm _____ and we are conducting a survey for the Human Sciences Research Council (HSRC). The HSRC regularly conducts surveys of opinion amongst the South African population. Topics include a wide range of social matters such as communications, politics, education, unemployment, the problems of the aged and inter-group relations. As a follow-up to this earlier work, we would like to ask you questions on a variety of subjects that are of national importance. To obtain reliable, scientific information we request that you answer the questions that follow as honestly as possible. Your opinion is important in this research. The area in which you live and you yourself have been selected randomly for the purpose of this survey. The fact that you have been chosen is thus quite coincidental. The information you give to us will be kept confidential. You and your household members will not be identified by name or address in any of the reports we plan to write.

PARTICULARS OF VISITS

	DAY MONTH	TIME STARTED HR	TIME STARTED MIN	TIME COMPLETED HR	TIME COMPLETED MIN	**RESPONSE
First visit	/ / 2012					
Second visit	/ / 2012					
Third visit	/ / 2012					

**RESPONSE CODES	
Completed questionnaire	= 01
Partially completed questionnaire (specify reason)	= 02
Revisit	
Appointment made	= 03
Selected respondent not at home	= 04
No one home	= 05
Do not qualify	
Vacant house/flat/stand/not a house or flat/demolished	= 06
No person qualifies according to the survey specifications	= 07
Respondent cannot communicate with interviewer because of language	= 08
Respondent is physically/mentally not fit to be interviewed	= 09
Refusals	
Contact person refused	= 10
Interview refused by selected respondent	= 11
Interview refused by parent	= 12
Interview refused by other household member	= 13
OFFICE USE	= 14

STRICTLY CONFIDENTIAL

Name of Interviewer .....

Number of interviewer

Checked by

Signature of supervisor

FIELDWORK CONTROL

CONTROL	YES	NO	REMARKS
Personal	1	2	
Telephonic	1	2	
Name	SIGNATURE		
.....	DATE ..... / ..... / 2012		

RESPONDENT SELECTION PROCEDURE

Number of households at visiting point

Number of persons 16 years and older at visiting point

Please list all persons at the visiting point/on the stand who are 16 years and older and were resident 15 out of the past 30 days. Once this is completed, use the Kish grid on next page to determine which person is to be interviewed.

Names of Persons Aged 16 and Older	
	01
	02
	03
	04
	05
	06
	07
	08
	09
	10
	11
	12
	13
	14
	15
	16
	17
	18
	19
	20
	21
	22
	23
	24
	25

NAME OF RESPONDENT:
ADDRESS OF RESPONDENT:
.....
.....
.....
TEL NO.:

GRID TO SELECT RESPONDENT

NUMBER OF QUESTIONNAIRE				NUMBER OF PERSONS FROM WHICH RESPONDENT MUST BE DRAWN																							
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1	26	51	76	1	1	1	3	2	4	1	3	5	8	6	5	12	10	1	6	8	7	19	19	13	21	13	24	25
2	27	52	77	1	2	3	4	3	1	2	2	3	4	8	3	7	2	5	14	4	15	4	8	6	16	14	22	19
3	28	53	78	1	1	2	1	4	2	7	6	9	3	5	11	2	1	3	11	7	10	16	16	10	5	2	2	3
4	29	54	79	1	2	3	2	1	3	5	8	6	2	4	2	4	8	11	10	16	6	9	10	15	11	12	11	18
5	30	55	80	1	1	1	4	5	6	3	5	7	5	9	8	14	3	2	13	5	18	1	4	1	20	11	5	24
6	31	56	81	1	2	2	2	3	5	7	7	8	7	1	4	9	14	8	2	17	17	14	12	14	22	10	3	14
7	32	57	82	1	2	1	1	4	1	4	1	4	6	3	6	5	7	13	9	2	3	13	14	8	2	7	20	4
8	33	58	83	1	1	2	3	2	5	1	4	2	1	7	10	6	5	4	15	10	5	2	13	4	17	5	17	8
9	34	59	84	1	1	3	2	5	6	2	2	1	9	10	1	10	4	6	6	1	9	10	1	5	6	9	1	12
10	35	60	85	1	2	2	4	1	3	3	6	9	10	11	12	3	9	15	7	8	11	6	3	9	4	3	10	1
11	36	61	86	1	1	1	3	1	4	5	3	1	6	2	9	13	11	14	4	11	4	15	15	17	1	1	23	2
12	37	62	87	1	2	3	1	3	2	7	5	6	5	7	7	8	6	10	3	3	1	12	20	7	13	22	12	16
13	38	63	88	1	1	2	1	5	3	6	4	3	4	6	2	11	13	12	1	15	8	7	2	12	15	21	13	7
14	39	64	89	1	2	3	2	4	1	4	7	8	2	5	6	11	12	9	16	13	16	11	18	18	14	16	18	23
15	40	65	90	1	2	1	4	2	4	3	8	7	7	11	1	3	5	7	12	14	13	8	17	20	19	20	19	11
16	41	66	91	1	1	3	3	1	6	5	1	5	9	10	3	2	11	13	8	12	12	5	6	21	8	8	4	15
17	42	67	92	1	1	2	2	3	4	2	6	2	3	2	12	5	2	10	13	5	8	18	9	16	10	17	16	20
18	43	68	93	1	2	1	4	2	6	4	1	4	8	9	10	7	9	3	12	12	9	7	20	19	9	19	21	13
19	44	69	94	1	2	2	1	3	5	2	8	9	10	4	9	8	13	1	1	14	10	19	10	11	18	15	7	6
20	45	70	95	1	1	3	2	5	4	1	3	8	1	3	8	6	6	9	5	7	13	4	15	1	7	22	15	21
21	46	71	96	1	1	1	2	5	1	7	2	3	2	1	11	4	7	5	3	2	1	3	12	18	5	19	14	9
22	47	72	97	1	2	1	3	1	3	2	6	2	1	8	7	1	4	2	11	8	2	17	4	17	21	16	3	5
23	48	73	98	1	2	3	4	2	2	6	7	7	8	3	4	9	3	6	2	11	11	16	2	8	11	23	6	22
24	49	74	99	1	1	2	1	4	6	3	5	5	3	1	5	13	1	14	8	14	6	15	9	14	3	6	9	17
25	50	75	100	1	1	2	3	3	2	4	6	4	7	5	3	12	12	12	4	6	2	17	11	2	12	4	8	10




SASAS QUESTIONNAIRE 1: 2012

Number of persons in this household		
Number of persons 16 years and older in this household		

INTERVIEWER: PLEASE CIRCLE APPROPRIATE CODES

Household schedule	Write in from oldest (top) to youngest (bottom)	Person number	How old is [name]? (in completed years; less than 1 year =00)	Is [name] a male or a female? M=1 F=2	What population group does [name] belong to?	What is [name]'s relationship to the respondent
Please list all persons in the household who eat from the same cooking pot and who were resident 15 out of the past 30 days		01				
		02				
		03				
		04				
		05				
		06				
		07				
		08				
		09				
		10				
		11				
		12				
		13				
		14				
		15				
Note: Circle the number next to the name of the household head.		16				
		17				
		18				
		19				
		20				
		21				
		22				
		23				
		24				
		25				

Population Group
1 = Black African
2 = Coloured
3 = Indian or Asian
4 = White
5 = Other (specify)

Relationship to respondent codes
1 = Respondent
2 = Wife or husband or partner
3 = Son/daughter/stepchild/adopted child
4 = Father/mother/ step father/step mother
5 = Brother/sister/step brother/step sister
6 = Grandchild/great grandchild
7 = Grandparent/great grandparent
8 = Mother- or father-in-law
9 = Son- or daughter-in-law
10 = Brother- or sister-in-law
11 = Other relation (e.g. aunt/uncle)
12 = Non-relation

ENERGY

I would like to ask you some questions about the energy sources that you use in your household.

1. Do you have access to electricity in your household?

In-house conventional meter	1
In-house pre-paid meter	2
Connected to other source which I pay for (e.g. connected to neighbour's line and paying neighbour)	3
Connected to other source which I do not pay for (e.g. connected to neighbour's line and not paying)	4
No access to electricity	8
(Uncertain/Don't know)	9

2. What sources of energy are used for lighting in this household?
3. What is the main source of energy for lighting in this household?

	2.(a)-(j) All sources used for lighting	3. Main source for lighting
	INTERVIEWER: MULTIPLE RESPONSE	INTERVIEWER: CIRCLE ONE OPTION ONLY
a. Paraffin	01	01
b. Gas	02	02
c. Candle	03	03
d. Solar System	04	04
e. Electricity	05	05
f. Batteries	06	06
g. Car batteries	07	07
h. Generator (petrol/diesel)	08	08
i. Other (specify)	09	09
j. (Don't know)	98	98

4. What sources of energy are used for cooking in this household?
5. What is the main source of energy for cooking in this household?

	4.(a)-(j) All sources used for cooking	5. Main source for cooking
	INTERVIEWER: MULTIPLE RESPONSE	INTERVIEWER: CIRCLE ONE OPTION ONLY
Paraffin	01	01
Gas	02	02
Coal	03	03
Firewood	04	04
Solar System	05	05
Electricity	06	06
Generator (petrol/diesel)	07	07
Other (specify)	08	08
(Don't know)	98	98

6. What sources of energy are used for heating rooms and keeping warm in this household?

7. What is the main source of energy for heating rooms and keeping warm in this household?

	6(a)-(o) All sources used for heating and keeping warm	7. Main source for heating and keeping warm
	INTERVIEWER: MULTIPLE RESPONSE	INTERVIEWER: CIRCLE ONE OPTION ONLY
a. Paraffin	01	01
b. Gas	02	02
c. Coal	03	03
d. Firewood	04	04
e. Solar System	05	05
f. Electricity	06	06
g. Batteries	07	07
h. Car batteries	08	08
i. Generator (petrol/diesel)	09	09
j. Blankets (not electric)	10	10
k. Warm clothing	11	11
l. Hot water bottle	12	12
m. Other (specify)	13	13
n. None of the above	14	14
o. (Don't know)	98	98

What sources of energy are used in this household to run the following appliances?

	8. Radio / hi-fi	9. Television	10. Fridge	11. Iron
a. Paraffin			01	01
b. Gas			02	02
c. Coal				03
d. Firewood				04
e. Solar System	05	05	05	05
f. Electricity	06	06	06	06
g. Dry cell batteries	07	07		
h. Car batteries	08	08	08	
i. Generator (petrol/diesel)	09	09	09	09
j. Other (specify)	10	10	10	10
k. (Don't know)	98	98	98	98
l. (Not applicable – no appliance)	99	99	99	99

12. What sources of energy are used in this household to heat water for bathing purposes?
13. What sources of energy are used in this household to heat water for other purposes?

	12. Heating water for bathing	13. Heating water for other purposes
	INTERVIEWER: MULTIPLE RESPONSE	INTERVIEWER: MULTIPLE RESPONSE
a. Paraffin	01	01
b. Gas	02	02
c. Coal	03	03
d. Firewood	04	04
e. Solar geyser	05	05
f. Electricity – electric geyser	06	06
g. Electricity – electric kettle	07	07
h. Electricity – electric stove / hotplate	08	08
i. Generator (petrol/diesel)	09	09
j. Other (specify)	10	10
k. (Don't know)	98	98
l. (Not applicable – water is never heated in the household)	99	99

14. How much did your household spend on energy in the last month? This would include expenses on all energy sources (electricity and other fuels)

INTERVIEWER: PLEASE TRY YOUR BEST TO AT LEAST GET A ROUGH ESTIMATE OF THE HOUSEHOLD'S EXPENDITURE ON ENERGY.

	Amount (In Rands)
R	

15. On average, how much does your household spend each month on the following energy sources?

INTERVIEWER: THE AMOUNTS GIVEN IN Q.14 - 26 SHOULD ADD UP TO THE TOTAL PROVIDED IN Q.15. PLEASE REPORT AMOUNTS TO THE NEAREST RAND – DO NOT INCLUDE CENTS.

	Energy cost (Rands)
16. Paraffin	**R**
17. Gas	**R**
18. Candle	**R**
19. Coal	**R**
20. Firewood	**R**
21. Solar system	**R**
22. Electricity	**R**
23. Batteries	**R**
24. Car batteries	**R**
25. Generator (petrol/diesel)	**R**
26. Other (specify)	**R**

27. Is the amount of energy your household has less than adequate, just adequate or more than adequate for your household's needs?

It is not adequate for your household's needs	1	
It is just adequate for your household's needs	2	• Skip to Q.29
It is more than adequate for your household's needs	3	• Skip to Q.29
(Do not know)	8	• Skip to Q.29

28. What is the main reason why you feel that the amount of energy is inadequate to meet your household's needs?

Not enough money to pay for the energy we need	1
There are many electricity power cuts in my area	2
The supply of electricity to my household is limited	3
Firewood is very scarce	4
Gas or paraffin not always available in the shops	5
Other (specify)	8
(Uncertain/Don't know)	9

And are the following inadequate, just adequate or more than adequate for your household's needs?

	It is not adequate for your household's needs	**It is just adequate for your household's needs**	**It is more than adequate for your household's needs**	**(Do not know)**
29. The amount of energy for lighting	1	2	3	8
30. The amount of energy for cooking	1	2	3	8
31. The amount of energy for heating rooms and keeping warm	1	2	3	8

32. In the last 12 months, how often has your household cut back on spending on energy for lighting, cooking or heating in order to make ends meet?

Very often	1
Often	2
Occasionally	3
Rarely	4
Never	5
(Do not know)	8

INTERVIEWER: SKIP TO QUESTION 41 IF HOUSEHOLD IS NOT ELECTRIFIED (CODE 8 IN Q5)

33. How satisfied or dissatisfied are you with the way that electricity is being providing in your neighbourhood? [Showcard 2]

Very satisfied	1
Satisfied	2
Neither nor	3
Dissatisfied	4
Very dissatisfied	5
(Do not know)	8

34. In your opinion, what is the quality of electricity in the area where you live?

Very high quality	1
Good quality	2
Acceptable quality	3
Poor quality	4
Very poor quality	5
(Do not know)	8

35. In your opinion, is the price you pay each month for electricity too high, too low, or about right for what you receive?

Far too high	1
Too high	2
About right	3
Too low	4
(Do not know)	8

36. What did your household do as a result of the increase in electricity prices in the last 12 months?

Continued to use the same level of electricity and paid the extra amount for it	1
Reduced the amount of electricity used	2
Used other energy sources, such as paraffin, gas, coal, wood and candles	3
Other (specify)	4
(Do not know)	8

37. If electricity prices were increased again tomorrow, which one of the following actions would your household do in order to meet its basic energy needs?

Continue using the same level of electricity and pay the extra amount for it	1
Reduce the amount of electricity we use	2
Use other energy sources, such as paraffin, gas, coal wood and candles	3
Other (specify)	4
(Do not know)	8

38. There are different ways of saving the amount of energy that is used in a household. Which of the following energy saving tips are you aware of?

39. And which of the following things does your household do often to save energy?

INTERVIEWER: MULTIPLE RESPONSES ALLOWED

	38. Aware of	39. Does often
a. Switching off your lights when you leave you house	01	01
b. Using energy saving light bulbs	02	02
c. Switch off all your lights except security lights in home when not in use	03	03
d. Switch off appliances (TV, radio, hi-fi) at the wall (not the remote control) when not in use	04	04
e. Switch off geyser at certain times during the day or at night	05	05
f. Boil only as much water with a pot or kettle that is needed	06	06
g. Electric stoves use a lot of electricity, so use the plates and oven as little as possible	07	07
h. Take a short shower or bath with as little water as possible	08	08
i. Use warm clothing or blankets instead of an electric heater	09	09
j. Close windows and doors when a heater is on	10	10
k. Allow clothes to drip-dry instead of ironing	11	11
l. Install a solar water heater instead of an electric geyser	12	12
m. Insulate your geyser and hot pipes	13	13
n. None of the above	97	97

40. To what extent have the things that your household is doing to save energy reduced your monthly energy costs?

Reduced costs a lot	1
Reduced costs a little bit	2
Made no difference to monthly costs	3
Costs have continued to increase	4
(Do not know)	8
(Not applicable – household did none of the actions listed in Q31 to save energy)	9

INTERVIEWER: NOTE THAT ALL RESPONDENTS ARE TO ANSWER Q.41 ONWARDS

Please tell the extent to which you think each of the following activities is wrong or not wrong. [Showcard 5]

	Not wrong at all	Wrong only sometimes	Almost always wrong	Always wrong	(Do not know)
41. Connecting to electricity without paying for it	1	2	3	4	8
42. Protesting about access to electricity	1	2	3	4	8
43. Protesting about the price of energy	1	2	3	4	8

A showcard is a type of prompt material in the form of a card with images, words, scales and pictures that are shown to participants during face to face interviews

44. What do you think should be the THREE top priorities for the Department of Energy in providing electricity?

INTERVIEWER: MULTIPLE RESPONSES ALLOWED. CIRCLE A MAXIMUM OF 3 OPTIONS

Avoid load-shedding or power cuts	1
Keep electricity prices low	2
Help poor households by giving more free electricity	3
Get non-electrified households electrified	4
Give information on how to save electricity	5
Subsidise renewable energy	6
Other (specify)	7
(Do not know)	8

45. Which of the following should be South Africa main priority in order to meet its future energy needs?

Coal and oil	1
Natural gas	2
Nuclear power	3
Solar, wind or water	4
Fuels made from crops (i.e. mielies, corn)	5
Does not matter, as long as it is the cheapest option	6
Does not matter, as long as it does not damage the environment	7
(Do not know)	8

There are various ways governments might try to get people to use less energy. To what extent would you be in favour or against the following options? The South African government should . . . . . [Showcard 21]

	The South African government should....	Strongly in favour	In favour of	Neither in favour nor against	Against	Strongly against	(Do not know)
46.	...spend money on campaigns to encourage people to use less energy	1	2	3	4	5	8
47.	...spend money to replace electric geysers with solar geysers	1	2	3	4	5	8
48.	...give all households an amount of free energy each month	1	2	3	4	5	8
49.	...make the price of electricity higher for rich households than for poor households	1	2	3	4	5	8

50. To what extent would you agree or disagree that households that use a lot of electricity should be charged a higher price for electricity than those that use less? [Showcard 1]

Strongly agree	1
Agree	2
Neither agree nor disagree	3
Disagree	4
Strongly disagree	5
(Do not know)	8

HOUSEHOLD CHARACTERISTICS

51. Indicate the type of main dwelling that the household occupies?

Dwelling/House or brick structure on a separate stand or yard or on farm	01
Traditional dwelling/ Hut/ Structure made of traditional materials	02
Flat or apartment in a block of flats	03
Town/cluster/semi-detached house (simplex, duplex or triplex)	04
Unit in retirement village	05
Dwelling/House/Flat/room in backyard	06
Informal dwelling/Shack in backyard	07
Informal dwelling/Shack not in backyard, e.g. in an informal/squatter settlement or on farm	08
Room/Flatlet	09
Caravan/Tent	10
Other, specify	11

52. How satisfied are you with your accommodation? [Showcard 2]

Very satisfied	1
Fairly satisfied	2
Neither satisfied nor dissatisfied	3
Slightly dissatisfied	4
Very dissatisfied	5
(Do not know)	8

53. Would you describe the state of repair of your home as good, adequate or poor?

Good	1
Adequate	2
Poor	3
(Do not know)	8

54. Do you have any of the following problems with your accommodation?

INTERVIEWER: MULTIPLE RESPONSES ALLOWED.

Shortage of space	1
Too dark, not enough light	2
Lack of adequate heating	3
Leaky roof	4
Damp walls, floors, foundations, etc.	5
Damaged or broken windows or doors	6
Other (specify)	7
None of these problems with accommodation	8

55. Has your health or the health of anyone in your household been made worse by your housing situation?

Yes	1
No	2

Notes




Notes

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