



Energy SMEs in sub-Saharan Africa: Outcomes, barriers and prospects in Ghana, Senegal, Tanzania and Zambia

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Energy SMEs in sub-Saharan Africa

– Outcomes, barriers and prospects in
Ghana, Senegal, Tanzania and Zambia –



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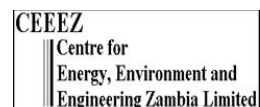
Outcomes, barriers and prospects in Ghana, Senegal, Tanzania and Zambia

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This study is dedicated to our dear colleague, Professor Abeeku Brew Hammond, founder of KITE and one of the originators of the AREED concept, who sadly passed away in March 2013.

Glossary

ADEPME	Agency for the Development and Support of SMEs (Senegal)
AREED	African Rural Energy Enterprise Development
ASER	Senegalese Agency for Rural Electrification
CEEEZ	Centre for Energy, Environment and Engineering Zambia
CERER	Centre for Studies and Research into Renewable Energy (Senegal)
ECG	Electricity Company of Ghana
EDS	Enterprise Development Services
ENDA TM	Environment Development action in the third world
EPA	Environmental Protection Agency
EUF	End User Finance
FESELEC	Federation of Enterprises in the Electricity sector (Senegal)
FIT	Feed-in Tariff
GEDAP	Ghana Energy Development and Access Project
GPSDF	Ghana Private Sector Development Fund
GVEP	Global Village Energy Partnership
IFC	International Finance Corporation
IPP	Independent Power Producer
KITE	Kumasi Institute for Technology and Environment
LPG	Liquid Petroleum Gas
MFI	Micro-Finance Institutions
NBSSI	National Board for Small Scale Industries
NTBC	National Technology Business Centre
RE	Renewable Energy
REP	Rural Enterprises Programme
RET	Renewable Energy Technologies
SACCOS	Savings and Credit Cooperative Societies
SME	Small and Medium-sized Enterprises
SHS	Solar Home System
SSA	Sub-Saharan Africa
TANESCO	Tanzania Electric Supply Company
TaTEDO	Tanzania Traditional Energy Development and Environment
UNEP	United Nations Environment Programme

“Generally, SMEs are confronted with unique problems... constraints include insufficient working premises and limited access to finance. In addition, Business Development Services, namely services related to entrepreneurship, business training, marketing, technology development and information are underdeveloped and not readily available. On the other hand, SME operators lack information as well as appreciation for such services and can hardly afford to pay for the services. As a result, operators of the sector have rather low skills. Also, there is no umbrella association for SMEs. At the same time, the institutions and associations supporting SMEs are weak, fragmented and uncoordinated partly due to lack of clear guidance and policy for the development of the sector”

Ministry of Industry and Trade, United Republic of Tanzania (2002)¹

¹ Referenced from the “small and medium enterprise development policy”. w www.tanzania.go.tz/pdf/smepolicy.pdf

Executive Summary

This report presents the findings of research into the main outcomes of government and donor-backed efforts to promote small and medium-sized energy businesses (energy SMEs) in sub-Saharan Africa. The research follows an outcome analysis methodology. The focus is on four countries: Ghana, Senegal, Tanzania and Zambia and primarily on UNEP's AREED programme (2002-2012).

This research focuses on the 'contributing factors' – a deliberately broader term that incorporates the internal 'success factors' – for energy SMEs, about which much has already been written. Indeed, the research findings presented in this report reaffirm most of what has been concluded in previous studies, including Kolominskas (2003); Mehlwana (2003); Denton (2006) and Napier-Moore (2006). These studies identified the lack of access to affordable finance as the being the predominant, persistent, barrier to establishing and scaling up a commercially viable energy SME sector, emphasising the lack of strong policy support from governments, poor business skills capacity and the high cost of many RETs as related cause-and-effect barriers.

While these issues continue to characterise, to a greater or lesser extent, the energy SMEs sectors in the countries studied for this research, it is more relevant to revisit the main assumption behind AREED and other donor-backed programmes designed to promote energy SMEs. The assumption is that the solution to the aforementioned barriers would be overcome by a 'demonstration effect' whereby successful energy SMEs, supported by donor-backed programmes, influence the commercial financial sector to invest in energy SMEs, thus triggering a virtuous circle of growth and profitability. Experiences drawn from a decade of AREED support across four of the project countries reveal both the presence (Ghana, Senegal) and absence, or weak presence, of this demonstration effect (Tanzania, Zambia). This is a central question, and one which was not the focus of previous research, presumably because the answer was not fully apparent prior to 2006 when the last substantial work was conducted.

Where there is an absence, or weak presence, of a demonstration effect a number of explanatory factors can be identified. These include, inter alia, the lack of an entrepreneurial culture; an SME 'dependency syndrome' perpetuated by grant-based support from governments and donor agencies; persistent shortcomings in business skills capacity; lack of clearly defined markets; demand-side barriers to purchase relatively high capital-intense energy products.

Where numerous energy SMEs are in operation and thus where a valid demonstration effect can be identified, there is a perceived paradox that serves to undermine commercial interest in investing in energy SMEs. The paradox is that the donor-supported businesses that were issued with concessional and/or flexible loans serve to demonstrate that these businesses *depend upon* such concessional terms, i.e., that they could not survive in 'the real world'. While this assumption is widely regarded as self-evident by private investors, there are in fact other, more concrete, factors that act to undermine the demonstration effect. These include, inter alia, relatively high transaction costs of investing in SMEs; the inherently complicated nature of energy sector SMEs with longer supply chains and slower pay-back periods for capital-intensive technologies such as solar PV; rigid rules regarding the need to secure collateral.

These factors can be understood as structural issues that conspire to increase the financial risk of investing in energy SMEs and thus are not the product of ignorance on the behalf of the banking sector. In the countries studied for this research, these factors are compounded by the high opportunity costs for banks where higher rates of return can be secured from investing in high-turnover businesses, for example those trading in high-volume, perishable goods. There is also a more general challenge faced by a range of SME entrepreneurs where such individuals and businesses are considered by banks to have an inherently higher risk profile, a factor which, to some extent, appears to be the product of 'anti-SME' discrimination, where investors favour larger corporate players operating under licence, often backed by strong branding, reputation and/or political connections.

There is evidence that government in the countries studied is now more receptive to the concept of energy SMEs. For example, most governments have eased the burden of red tape that traditionally surrounded business registration in many African countries and some governments, such as Senegal, have set up government departments whose sole purpose is to support SMEs. However there is a predominant view among stakeholders, across the countries studied, that governments are ineffective in designing and implementing tangible support for energy SMEs, despite politicians often providing strong rhetorical support. As such the establishment and success of energy SMEs more often depends on support provided by donor agencies or NGOs that can provide technical assistance and/or subsidised loans.

This point highlights an important status quo, and an issue that was itself one of the key rationales behind supporting energy SMEs in the first place, i.e., to by-pass government in efforts to supply sustainable energy technologies to low income consumers by supporting SMEs. However, early experience with the practical challenge of supporting energy SMEs led observers, including Denton (2006) and Napier-Moore (2006), to consider the role and importance of an 'enabling framework' necessary for energy SMEs to function and thrive. While this issue would appear to present itself as a chicken-and-egg dilemma, the research findings presented here from Senegal, and to a lesser extent with Ghana's LPG market, do suggest that conducive economic and regulatory conditions are a prerequisite for scaling up the commercial success of energy SMEs. At the same time, one of the well-understood success factors for specific energy SMEs is the head start given to relatively mature technologies that are reliable, easy to understand and suitable for local distribution, thus presenting a 'low-hanging fruit' opportunity for SMEs. LPG and fuel efficient cook stoves are the obvious technologies that have proven to be most commercially viable, and indeed the failure to conduct in-depth market testing for energy products and services has been a major cause of commercial failure for otherwise well organised and motivated SMEs.

A major geographical outcome is that energy SMEs continue to mostly operate in, and supply, urban and peri-urban markets. As such, programmes (including AREED) that were originally intended to address the rural market, where traditional fuel use accounts for major social and environmental impacts, have largely failed. This is due to low levels of entrepreneurial capacity, higher transaction costs for supplying a dispersed rural market, and demand-side barriers for capital-intensive RETs. However this market focus is not unique to the energy sector and entrepreneurial talents and opportunities tend to dominate in urban areas, across all sectors.

1. Research Background and Rationale

This research focuses mostly on the African Rural Energy Enterprise Development (AREED) project countries, although it is not an evaluation of AREED. A ‘terminal evaluation’ of the AREED I programme was carried out by N’Guessan (2009) and similar evaluations have been done for other programmes. As such, the aim of this research is to go further than simply documenting the extent to which various projects and programmes aimed at supporting energy SMEs (the definition of which is discussed later) have achieved their stated objectives. Rather, the research aims to step back and ask broader questions of “what difference have these programmes made?” So while the research focuses primarily on the work of the AREED project it also takes into account other international projects and organisations operating in various sub-Saharan African countries, as well as domestic initiatives, to support and promote energy SMEs.

The question of “what difference have these programmes made” can be answered by identifying a range of outcomes that can be connected to individual programmes and projects. Where outcomes – and how they occurred – are identified as positive and constructive the findings will be subject to an in-depth analysis of if and how the mechanisms of change can be transferred and/or scaled up.

This study pursues a qualitative methodology based on a combination of outcome harvesting (Wilson-Grau and Britt, 2012) and semi-structured interviews with targeted individuals involved with these programmes and projects, and /or knowledgeable about energy SMEs in Africa. As such, this study provides a forward-looking analysis, drawing out findings that are primarily of use to the individuals and organisations involved in the study, i.e., the project managers and those that can influence energy policy, at various levels. This report should also be relevant to the wider international development donor community. Nonetheless this research also steps back and places the projects in a wider context, providing a rigorous analysis appropriate to an academic audience. This context includes the shifting landscape of thought and practices on energy access in Africa, in particular the role and importance of energy SMEs as a viable mechanism for helping to close the energy access gap in Sub-Saharan Africa.

This research, conducted in Ghana, Senegal, Tanzania and Zambia², aims to answer the following questions:

1. To what extent have specific businesses demonstrated that energy SMEs are a viable means to provide scalable access to modern energy sources?
2. What are the key factors that have determined the success or failure of specific energy SMEs in the identified countries?
3. What are the main, persistent, barriers facing entrepreneurs when setting up, operating and expanding energy SMEs in the identified countries?

² Mali, the 5th country in the AREED project, was omitted due to security concerns regarding political developments, which deteriorated in the second half of 2012. Efforts were however made to consult the Mali Folkecentre in July 2012, including the offer of payment for desk-based input, though this did not come to fruition.

Answers to these three questions enable a summary of the main lessons that can be learned for national policy makers and donor agencies charged with designing programmes to promote energy SMEs in sub-Saharan Africa. To address questions 2 and 3 it is also necessary to document and analyse the market and regulatory conditions, e.g., the legislative and institutional frameworks in place in each country to support the establishment and operation of energy SMEs. These country-specific conditions can be viewed as an 'enabling framework' that can, to a greater or lesser extent, encourage the establishment of energy SMEs and the diffusion of sustainable technologies.

1.1 What is an outcome analysis?

With regard to African SMEs operating in the energy sector, there has been significant experience since 2000, justifying a study that can reflect on this experience and ask the question "what difference have various programmes made in promoting energy SMEs, both as a concept, and in practice?" An investigation of these 'differences' equates to the level of 'outcomes', as developed in Outcome Mapping methodologies, which are themselves based on definitions provided by the OECD (Wilson-Grau, 2008). Therefore it is necessary first to define 'outcomes', as distinct from 'outputs' and 'impacts' which are terms that are often used erroneously and/or interchangeably, creating confusion among development practitioners. Here, the most basic point is that outputs, outcomes and impacts should be seen as separate levels, whereby outputs are the immediate products of an organisation's or programme's activities, i.e., the processes, goods and services that it produces (OECD, 2002). These can include, for example: workshops, training manuals, research and assessment reports, guidelines and action plans, strategies, and technical assistance packages (Wilson-Grau, 2008). In other words, 'outputs' are within almost total control of a programme or project's managers.

After the level of outputs comes 'outcomes', which, in the context of development assistance, the OECD defines as "the observable behavioural, institutional and societal changes that take place over 3 to 10 years, usually as the result of coordinated short-term investments in individual and organizational capacity building for key development stakeholders" (OECD, 2002). In other words, this is the intermediary level of observable positive or negative changes in the actions of the social actors (in this case, energy SME entrepreneurs) that "have been influenced, directly or indirectly, partially or totally, intentionally or not, by (a programme's) activities..." (Wilson-Grau, 2008). It is important to bear in mind that the programme or project in question can only influence these outcomes, since the individuals are the recipients or targets of the project and are free to interpret and react to the 'outputs' in any number of ways, not necessary in the intended direction of the programme or project's objectives. In addition, there are many more factors (at the level of outputs) that influence an individual's or an organisation's behaviour, thus claims of cause-and-effect will logically compete with those of other projects and programmes. However, at the level of outcomes, the claims of any given programme or project can be tested through questioning the 'change agents', where outputs and outcomes are sufficiently connected to support plausible cause-effect claims. This is the outcome analysis.

Following the Outcome Mapping conception of the output-outcome-impact chain, we then move even further away from the sphere of influence when talking about 'impacts'. Like outcomes, impacts can be judged to be positive or negative, intended or unintended, however they concern the broader (often implicit) objectives of a given programme or project. In the context of the development sector, these objectives are usually to help achieve long-term, sustainable changes that help reduce poverty and conserve natural resources and the environment. As such it is unreasonable to assume that any single programme or project can do more than only contribute, partially and indirectly, to the 'bigger picture' impacts. This weakened cause-effect link is often referred to as the 'attribution gap' in the development literature (GTZ, 2004) and care has to be taken when assessing any given project or programme, where there are often strong incentives to close this gap in order to demonstrate 'impacts'.

2. International Donor Support for SMEs

In line with wider trends in the growth of SMEs in OECD countries, especially as engines of creativity and innovation, the international development donor community began to increase its focus on programmes to support the development of SMEs in Africa during the 1990s. This reflected a broader trend to diversify development aid which had traditionally focused on large-scale infrastructure investments as well as policies and programmes to encourage national and multinational corporations able to drive economic growth and create much needed employment. A review of relevant academic literature is provided in annex 11.4.

2.1 Energy sector SMEs

Despite wide reference to the term ‘energy SME’ within the academic and grey literature of the environment and development community, the term has not been fully defined. What constitutes, specifically, an energy SME depends on the focus of the business activity. Here various studies suggest that an energy SME is simply a business that supplies energy-related products and services (Brew-Hammond, 2010; Karekezi, 2002; Prasad and Dieden, 2007). However this definition creates plenty of space for interpretation of what is an energy product or service, and neither does it place a measure on the extent to which these business focus on energy, in addition to other activities.

Energy, and specifically access to clean and modern energy technologies, has long been understood as a key sector worthy of targeted support due to the various co-benefits associated with the transition from traditional biomass fuels and kerosene lamps that have been the dominant energy sources throughout sub-Saharan Africa, to modern, cleaner technologies. These co-benefits include access to higher-quality light and heat, reduced in-door air pollution and pressure of deforestation.

Specific donor-backed programmes to support SMEs in the energy sector were developed by a few international agencies, NGOs and not-for-profit organisations, including E+Co a US-based clean technology investor set up in 1994. This was followed by UNEP’s AREED programme (2000), ESMAP (World Bank) and various programmes of the Global Village Energy Partnership (GVEP), set up after the World Summit on Sustainable Development in Johannesburg (2002). The idea of establishing an active energy SME sector has been, to a large extent, an antidote to the widespread failure of post-colonial development aspirations, which included large-scale electrification and the provision of other, cleaner, fuels through major infrastructure. At the same time, local SMEs were a favoured means to deliver clean energy products and services based on two key assumptions:

1. That SME entrepreneurs know and understand the needs and desires of local consumers
2. That SMEs are more able and willing than larger companies to supply rural markets where transaction costs are higher

The challenge of defining what is an energy SME is relevant to the analysis of SME support programmes like AREED since the qualifying criteria was not stated. Therefore, in some cases the specific businesses supported by AREED did not have energy products or services as their main activity, but rather had energy as a major aspect, i.e., input, into their business activity and so were included on that basis.

2.1.1 The AREED project

According to the original project document, the intended outcomes of the AREED project were the following:

1. Enhanced capacity of entrepreneurs to start and develop energy businesses (Enterprise Development Services, EDS)
2. Improved capacity of local NGO Partners
3. Strong partnerships established with Financial Institutions (FI)
4. Improved capacity of government officials and agencies to formulate and implement policies supportive of SMEs
5. Dissemination of AREED's experience and lessons

Source: N'Guessan (2009)

Of these 5 intended outcomes, the emphasis of AREED's activities were placed on outcomes #1 and #3. The key idea behind the AREED model is that it would have an important effect in demonstrating that energy SMEs can be commercially viable. However the need to demonstrate the commercial viability of energy SMEs is a means to tackle what has long been understood as the #1 barrier to energy SMEs: the lack of access to affordable finance. This logic reveals a key assumption behind AREED, and other donor-backed programmes, where it is supposed that banks and other financial institutions do not lend to energy SMEs simply because they do not know the energy sector and hence regard it as a high-risk investment, thus only agreeing to lend money at high interest rate and/or demands for 100% collateral. It is therefore important to ask whether there has been a significant 'demonstration effect', and if so, has it made any difference to the lending activities of relevant banks and financial institutions?

Previous research, monitoring and evaluation and other reports have documented the AREED project, with generally favourable assessments of the project's design, implementation and results (Kolominskas, 2003; Mehlwana, 2003; Napier-Moore, 2006; Denton, 2006; N'Guessan, 2009). Of these reports, the most relevant is the Terminal Evaluation (N'Guessan, 2009), which made the following recommendations:

1. The AREED model should focus more on removing financial barriers to energy SMEs
2. The AREED model should also focus on removing institutional barriers
3. A formal body at the national level (National Steering Committee) should be established to ensure the follow-up and involvement of local parties (both private and public)
4. Concerning the relation between local actors, there is a need for further national capacity building

5. Given the novelty of the market-based approach of the AREED model, it is important that it is adequately publicised in both scholarly journals and in the development community at large

Important gaps in the Terminal Evaluation (N'Guessan, 2009) concern the roles of national governments and financial institutions in supporting energy SMEs, whose views and opinions were not sought. The N'Guessan report also focused more on the West African project countries (Ghana, Mali and Senegal) and did not conduct its evaluation in either Zambia or Tanzania. In addition to addressing these gaps, there are no known studies conducted since 2006 that aim to assess the influence that various policies and programmes (both donor-backed and national government-led) have had in the development of energy SMEs in Africa.

3. Research Methodology

Desk-based preparations for this study began in June 2012. Field work in Zambia, Tanzania, Ghana and Senegal took place between 10 September and 5 October 2012 with 5 days work conducted in each country.

3.1 Outcome Harvesting by Consensus

To help answer the research questions and to sharpen the focus of the in-country interviews, a 1-day workshop was held in 4 of the targeted AREED project countries where the technique of 'Outcome Harvesting' (OH) was adapted and applied. During the workshops, 4-5 specific energy SMEs (whose performance here is treated as 'outcomes') were described by the workshop participants, working in groups. The participants are defined here as the 'change agents', i.e., those that sought to affect change with regard to energy SMEs, which included the entrepreneurs themselves, government officials, financial institutions and NGOs. The second task at the workshops was for the change agents to agree upon an account of the plausible 'contributions' made by various individuals and organizations (and other, external, contributing factors) to the identified businesses.

According to the OH methodology, the identification of outcomes and contributions must be a participative process where 'harvest users' (the change agents) and the 'harvester' (in this case the UNEP Risø Centre) work together to understand the process of change that occurred. This principle was adhered to in this research, although the standard OH methodology was altered with regard to verification. Instead of working one-to-one with specific change agents and then seeking to verify their contributions with independent experts, this study opted to extract contributions through group work, thus ensuring a greater degree of reliability through consensus. Whereas an individual from an organization may be tempted to exaggerate his or her contributions (direct or indirect) to a given outcome, the advantage of conducting this research in groups was to keep individuals 'in check', as a substitute for independent verification. In most cases this worked well and individuals displayed a high degree of recognition regarding the contributions of other, sometimes competing, organisations.

Outcome harvesting by consensus was chosen largely due to practical constraints faced by the researchers, and has some limitations. Under 'standard' OH, the contributions are focused on one organisation for the sake of understanding the activities that work well, and those that work less well (and why), as a tool for self-improvement. For this research the application of OH by consensus was a tool in order to gather key information on the outcome-contribution relationship at a broader level, moving away from a project or programme-specific focus, to one where everyone involved can build up a clearer picture of the effectiveness of energy SMEs per se, and of the relative importance of the various means available to promote energy SMEs.

3.2 Semi-structured interviews

While the workshops aimed to obtain answers related to project outcomes, semi-structured interviews were conducted with various 'change agents' in order to expand upon the issues raised in the country workshops. Questions were drafted based on the issues identified during the desk study, and were refined following the country workshops to better reflect the particular issues in each country. However, generally speaking, the interviews focussed more on the country-specific conditions including the 'enabling frameworks' that can, to a greater or lesser extent, encourage the establishment of energy SMEs and the diffusion of sustainable energy technologies. A list of the core interview questions and interviewees can be found in the annex 11.1. The following country chapters are ordered alphabetically, Ghana, Senegal, Tanzania and Zambia.

4. Ghana

4.1 Energy background

Ghana has relatively high levels of electrification, totalling 72% in 2011 (Ministry of Energy, 2012), compared to approximately 23% in 1990. Of this total, 99% of the urban population (100% in Accra) has access to electricity, compared to an average of 49% in rural areas (KITE, 2012). Total grid-connected electricity capacity totalled 2,280 MW in 2012, 52% of which came from hydro sources and 48% from thermal technologies. However biofuels and waste biomass sources make up 59% of Ghana's total primary energy supply, with petroleum products accounting for 35% and hydro power the remaining 6% (Energy Commission, 2012). Rural households rely more than 96% on wood (charcoal, firewood and crop/sawmill residue) for cooking, while approximately 53% of urban households rely primarily on charcoal (KITE, 2012). Ghana's National Energy Policy (2010) places an emphasis on developing the country's renewable resources, particularly small scale hydro, biomass and biofuels, and well as exploring opportunities for grid-connected wind power and promoting efficiency measures, with a central role expected from private sector investors and operators (REEEP, 2012).

In December 2011, the Renewable Energy Law (Act 832) was signed by the President with the stated aim of increasing the share of new renewables in the country to 10% of total grid-connected electricity capacity, with large-scale hydro accounting for 75%. A Renewable Energy Fund will be set up, likely to be financed by a mix of donor support and taxation on energy-intensive industries (including the country's burgeoning oil and gas extractives sector), that would contribute to investments in new RE projects. It is understood that the Fund will complement a FIT that is also part of the law, in order to incentivise private sector investment in IPPs. However, while the Act states that the FIT shall be guaranteed for a period of ten years, subject to review every two years (Ahiataku-Togobo, 2012), there is, as yet, no clarity regarding the exact value of the initial tariff support for RETs.

4.2 Energy SMEs in Ghana

In this section we explore the extent to which specific businesses have demonstrated that energy SMEs are a viable means to provide scalable access to modern energy sources in Ghana, drawing upon the outcomes described during the workshop, in addition to desk-based research.

4.2.1 AREED supported energy SMEs

Ghana was one of the five countries that participated in the AREED project, with in-country implementation led by the Kumasi Institute of Technology, Energy and Environment (KITE), based in Accra. As with the other country partner centres, KITE maintained principal responsibility for communicating the project and for co-implementing (alongside E+Co) the enterprise development services (EDS). Since 2001, KITE has processed 60 separate energy SMEs under the AREED programme, 15 of which were successful in passing through the application and EDS process, and were provided with subsidised loans to either start up or expand their businesses:

- AB Management: Energy Efficiency; Industrial Power Factor Correction
- Anasset: LPG Retail and Marketing Company
- Fee-Hi Ventures: LPG retail
- Gladymmanuel: CFLs
- Lambark Gas: LPG Distribution
- M38: LPG Distribution
- RKA: LPG Stoves
- Trans-Legacy Ventures: LPG Stoves
- ABARA Gas: LPG Distribution
- Bansim Binara (BBE): LPG Distribution
- Power World: Energy Efficiency
- Toyola: Biomass Cookstoves
- WilkinSolar: PV Solar Home Systems& Solar Water Heaters
- Best Solar: PV Solar Home Systems & Solar Water Heaters
- NorthLite: Solar Lighting Products

As was the case in Zambia, Tanzania and Senegal, most of these energy SMEs were in fact urban-based businesses in Ghana, due mostly to the limited number of rural-based entrepreneurs that responded to the adverts for AREED support. However, as with Tanzania and Zambia, many of the urban-based energy businesses were aiming to supply the rural market, particularly with the manufacture of efficient cook stoves. Below follows a summary of some of the energy SMEs that have operated in Ghana since 2002, both AREED-support and non-AREED, describing both the 'outcome' (business activity and performance) and the 'contributions' (factors that helped in the set up and operation of specific businesses).

4.2.2 Ghana energy SMEs: outcomes and contributions

This section corresponds to research question #1, i.e., to what extent have specific businesses demonstrated that energy SMEs are a viable means to provide scalable access to modern energy sources in sub-Saharan Africa? The following paragraphs document the specific energy SME outcomes and contributions in Ghana, both AREED and non-AREED supported businesses³.

Toyola

Toyola Energy limited as set up in 2003 by two entrepreneurs Suraj Wahab and Ernest Kyei to manufacture and sell energy efficient charcoal cook stoves, known as the 'Toyola Coalpot' mostly to

³ The information gathered represents what was available to the researchers, from various sources both primary and secondary, but does not claim to be exhaustive. However the authors are grateful to KITE for providing extensive information on AREED-supported SMEs, including a summary table of their progress and status, reproduced in annex 11.12.

Ghana's low-income urban households. The entrepreneurs received their original training under the Ghana Household Energy Project in 2003, but were unable to secure financial backing from local banks to expand the business. In 2006 they applied for support from AREED, which resulted in the provision of EDS and the approval of US\$ 270,000 in loans. The loan was given in tranches: the initial loan released to Toyola was US\$70,000. The company subsequently received two more loans of US\$100,000 each from E+Co, payable over 5 years.

This significant capital injection enabled Toyola to expand production from approximately 3,000 to 35,000 units per year by 2010, with sales across 6 regions in Ghana and to neighbouring Benin, Togo and Nigeria. Toyola made and sold 154,000 efficient cook stoves between 2007 and 2011 and a survey carried out by the Kwame Nkrumah University of Science & Technology found that 93% of the stoves are currently in use, benefiting more than 500,000 people by reducing indoor air pollution and savings on charcoal. Toyola employs five people directly and provides work to approximately 300 self-employed artisans. The stoves currently in use are saving about 26,000 tonnes of charcoal each year and about 150,000 tonnes CO₂e per year. In 2009/10 Toyola Energy Ltd., had an income of USD 550,000, 72% from stove sales and 28% from carbon finance.

Toyola's business model is built upon a network of commission-based door-to-door salespeople, who also collect payments from households under a credit scheme which allows customers to pay in instalments, from the savings they make due to lower charcoal consumption. This network of salespeople also identified a demand in rural areas for other energy technologies, most notably solar lanterns, which Toyola has branched into. Other notable aspects of Toyola's business and management model include the development of quality assurance and standardization systems were put in place to secure the quality and performance of the stoves; training programmes for artisans to ensure compliance with quality standards; a tracking system was put in place whereby each stove is given a serial number allowing the company to keep records of who assembles each stove, who sells it and who buys it; Access to Carbon Finance where Toyola stoves are registered for Gold Standard carbon finance, and there is regular monitoring of stoves in use, surveys of users, and audits of greenhouse gas savings. For these reasons, Toyola is regarded as one of Ghana's energy SME success stories, with much emphasis and praise placed on the individual entrepreneurs as being responsible for this success. In 2010 Mr. Suraj Wahab was awarded with Africa's Energy Personality of the Year prize.

Impact Energies Ghana

Impact Energies Ghana is a social enterprise set up in 2010 by Hugh Whalan (also CEO of Energy in Common⁴) which works to develop new ways of financing and distributing clean and low-carbon energy technologies to low-income consumers in Ghana. Impact Energies, with the help of the Energy in Common platform, supplies solar systems, sold through MFIs. Under this model the MFIs are sold the solar technologies by SMEs, working on commission. Local salespeople are then trained to sell the products on behalf the MFIs, which in turn provide EUF. Impact Energies refers to this integrated business model as a Factory-to-Village (FTV) supply chain. Impact Energies approached Lighting Africa (an IFC funded initiative) which provided support in terms of advertising, marketing and paying for local workshops to promote solar technologies. Sales of solar technologies range from US\$ 25 to US\$ 500, typically for 2.5% monthly interest rates. According to Foster Yaw Adu-Dartey (Ghana Operations Coordinator) the quality of the products is good but consumers need to be told how to use them properly, as misuse often accounts for reported technical failures.

4 "a web-based person-to-person platform which allows individuals to make green energy microloans to the poor in East and West Africa"

WilkinSolar Engineering

WilkinSolar was spun out of Wilkins Engineering Limited which is involved in consulting, management and implementation of grid extension projects, general electrical engineering services for both commercial building and industries, employing approximately 600 staff. Through WilkinSolar, the company first entered the market for solar home systems in 1998, focusing on the sale and installation of solar PV, totalling 5,736 installations in households and institutions in urban, peri-urban and rural communities in Ghana by 2012. Approximately 20% of Wilkins' global revenues come from solar technologies.

In 2003 KITE provided EDS to the company after Mr. Omane Frimpong, the owner and CEO of Wilkins, sought funding from the AREED facility. Wilkins went through the entire AREED process successfully and received an investment of US\$ 127,000 from AREED at 6% interest. In 2006 WilkinSolar set up a small assembly line for solar lanterns, financed through a US\$ 300,000 loan from E+Co to import LEDs and other solar parts for local production. However from 2007/8 a glut of cheap solar products from China rendered the local assembly production unprofitable where solar stock purchased for 4.13 EUR per watt fell in price to 3 EUR per watt, and so the assembly plant was closed. Nonetheless, by 2012 WilkinSolar had sold about 10,000 solar lanterns, with an average retail price of US\$ 30. Mr. Omane Frimpong is also the current (as of 2012) President of the Association of Ghana Solar Industries (AGSI).

AB Management

Mr. Fred Agyeman Berko, the Executive Director of AB Management responded to an advert by KITE offering support for clean energy services in the Daily Graphic. KITE and E+Co supported AB by providing EDS and seed capital from the AREED project. The company is involved in the installation of capacitors for power-factor correction in commercial and industrial facilities. Since 2001, AB Management has worked with over 166 companies in various energy efficiency measures such as PF correction, the use of high frequency electronic ballasts, high efficiency motors, variable speed drives, and cooling systems. A simulation for the 166 companies targeted shows that implementing the efficiency measures (other than PF correction) identified by AB has reduced power consumption by about 20% resulting in the reduction of greenhouse gas emissions (GHG) by more than 15,000 tonnes of CO₂ per year.

AB Management is the local agent for Power Economy, U.K., a supplier of energy efficiency equipment, which won an international tender from the Ministry of Energy of Ghana to provide power-factor capacitors in various companies and building in Ghana. As a means to conducting its market research and business plan development, AB Management consulted Dekon Engineering Services to carry out the following activities: a detailed audit of customer's facility; specifying capacitor required to improve the power factor to 0.90 or better; calculating savings and payback period; installing capacitor at customer's facility and providing maintenance for the capacitor during the payback period; monitor to ensure that savings are achieved; and training customer's staff to maintain capacitors periodically.

Anasset Company Ltd.

Anasset Company Ltd., retails LPG for domestic, transport and commercial applications. The company recorded annual sales of between 1.87 million kg and 4.40 million kg of LPG per year over a five year period from 2002 to 2006. These sales translate to a displacement of between 9,340 tonnes and 22,024 tonnes of charcoal per year, over the period. The company was established in the 1990s and, as of 2012, employs 60 people, operating in various towns in Ghana, aside from Accra.

Mr. Seth Nanemeh is the Managing Director of Anasset, who responded to an advert posted by KITE in the Daily Graphic in 2001, offering support for innovative clean energy businesses in Ghana. The entrepreneur followed the entire AREED process, from the original proposal, preliminary assessment, an adjusted proposal, Introduction Sheet, business plan and due diligence. KITE provided seed capital and EDS to Anasset from the AREED project in 2002 (US\$ 38,000) and again in 2007 (US\$ 225,000) which enabled the company to expand significantly, mainly through the establishment of a refilling station in Aflao near Ghana's eastern border with Togo. In 2010 Mr. Nanemeh took out a loan with a commercial bank, apparently breaking the terms of a contract with E+Co who had issued a previous loan. This was an unpopular decision with the board, not least because terms of the loan were worse.

Fee-Hi Ventures

Free-Hi Ventures was set up by Mr. S.A. Adu in 2003 after submitting a draft business concept note to KITE. The company retails LPG products to households, commercial customers and automobiles at Ashaiman, a suburb of Accra. The company sold over 3.60 million kg of LPG from 2004 to 2009 which translates to a displacement of about 18,000 tonnes of charcoal. As with Anasset, Free-Hi Ventures completed the EDS process and was issued with a US\$ 33,500 AREED loan in 2004 to finance a second refilling plant at Akim Oda in the Eastern Region of Ghana. However construction of the Akim-Oda plant suffered delays due to problems with the provision of electricity to the proposed site. As a result, the entrepreneur decided instead to expand its plant at Ashaiman, utilising the gas storage holders and other equipment acquired for the Akim Oda plant. The AREED loan was serviced from the operation of the Ashaiman plant. In 2011, Free-Hi Ventures secured a management buy-out from Xpress Gas, a larger LPG retailer operating in Ghana.

Gladymanuel Trading Enterprises Limited (GTEL)

Gladymanuel Trading retails, distributes and installs energy efficient lighting systems in domestic and commercial facilities, selling an estimated 56,000 energy-saving light bulbs per year which translates into the approximately 6,000 tonnes of CO₂ emission reductions. The company was started by entrepreneur Mr. Emmanuel Nii Abbey, who acts as Managing Director. Mr. Abbey responded to a newspaper advert in the Daily Graphic in 2002 about the AREED facility to support energy SMEs start-ups. KITE, with technical support from E+Co, provided EDS to Mr. Abbey, helping him develop the company's business plan. AREED-backed loans totalling US\$ 120,000 were issued in 2002 (US\$ 70,000) and 2005 (US\$ 20,000) to GTEL.

Lambark Gas

Lambark Gas is currently one of the market leaders in LPG distribution for automobiles and for domestic and commercial heating purposes, in the Kumasi Metropolis. Employing 17 staff, the company sells over 2.5 million kg of LPG each year, equivalent to 12,500 tonnes of charcoal. Ms. Mallam Abukari Amadu is the entrepreneur behind Lambark, who received EDS from KITE to help her refine the company's business plan. AREED invested a total of US\$ 359,746 in Lambark Gas between 2004 (US\$ 109,746) and 2007 (US\$ 250,000). As of 2012 the company was on track to make a full loan repayment to AREED.

M38 Ventures

M38 is an LPG retail business based in western Accra, set up by Mrs. Clara Koranteng in 2003 (though her maiden name was Mankata and she was 38 when the business started, hence M38). Mrs. Koranteng

was working as a secretary when she got the idea of setting up her own LPG retail business, motivated by the long queues in her neighbourhood for refilling at that time. She was also encouraged by a friend involved in LPG retailing who advised her it was a lucrative business to get into. She first worked to secure all relevant permits and approval, i.e., from the EPA, fire service and construction authorities. She first tried to secure a bank loan but they didn't want to lend, then she saw the AREED project advertised in the Daily Graphic and contacted KITE. She was later told that she was the only female applicant to express interest in AREED from a total of 1,441 across the 5 African countries. The EDS process provided by KITE helped her when it came to sourcing the two gas tanks, which were imported from Germany. The tanks, once delivered, had to be tested by local authorities and the Oil Marketing Company (OMC) trained their workers in safe re-filling. M38 was approved a US\$ 59,000 start-up loan in 2004, backed by AREED with variable interest of between 5-8%, which was paid off within 18 months. M38 sells approximately 0.45 million kg of LPG per year, equivalent to about 2,250 tonnes of charcoal. The company's refuelling station employs 4 staff and the company is now (as of 2012) planning to set up another LPG filling station, using its own finance. However M38 is not the only job for Mrs. Koranteng; she also works for Agricultural Development Bank.



M38's refilling station in western Accra, September 2012

RKA Limited

RKA, based in Batsonaa near Accra, manufactures high quality machine-finished gas stoves and gas burners for the household market, which are endorsed by the Ghana Standards Board. The company produces an average of 2,300 stoves per month and utilises a network of wholesalers and retail stores to market its products. RKA has two shareholders one of whom is directly involved in the day-to-day operations of the company as the Managing Director, whilst the other is an investor. The Managing Director is Mr. Ali, a Lebanese, who has lived in Ghana for the past 23 years with his family. He spotted the opportunity to seek

funding to support his enterprise through AREED, advertised by KITE. Mr. Ali followed the entire AREED process, from the original proposal, preliminary assessment, an adjusted proposal, introduction sheet, business plan and due diligence. This resulted in a loan of US\$ 104,080 to purchase raw materials and expand the company's product line to include four-burner table top stoves, thus becoming Ghana's first large importer of LPG ovens and stoves. Soon after the AREED loan was issued, RKA was contracted by the Government to supply LPG stoves and accessories to government agencies in all of the 120 districts of Ghana. Mr. Ali is well known amongst key LPG stove dealers and marketers.

Trans-Legacy Ventures

Trans-Legacy Ventures manufactures and sells LPG stoves to commercial and domestic users, with an average annual output of approximately 4,000 units, directly employing 3 staff and providing work indirectly to over 100 artisans. The company was established by Mr. Prosper Gatti, who responded to an advert post by KITE in Daily Graphic in 2003, offering support for innovative clean energy businesses in Ghana through the AREED programme. KITE, with technical support from E+Co, provided seed capital and EDS to Trans-Legacy, helping the company to refine its business plan. A US\$ 20,000 loan was issued in 2003. However the company did not meet its initial growth projections and so the loan was restructured and the business received further technical support from the AREED team to improve its performance. According to KITE, the main challenge was to help improved the entrepreneur's business and marketing skills, to match his technical skills.



Fuel-efficient stove production at Trans-Legacy Ventures, Ghana

Abara Company Limited

Abara was a start-up LPG refilling plant established in the Ashanti Region of Ghana to retail LPG to households, commercial customers and automobiles. The company recorded annual sales of between 0.88 million kg and 1.60 million kg during its first five years of operation. These sales equate to between 4,400 and 8,000 tonnes of charcoal. As with most of the above-detailed businesses the entrepreneur behind Abara, Mr. Kofi Asante, approached the AREED facility for support through KITE, who, in partnership with E+Co, provided technical support, EDS and seed capital. Total AREED-backed investment in AREED amounted to US\$ 102,990 in 2006.

4.2.3 Have Ghanaian energy SMEs demonstrated commercial viability?

In the previous section we detailed the histories of specific energy SMEs in Ghana, which helps us to address research question #1, i.e., to what extent have specific businesses demonstrated that energy SMEs are a viable means to provide scalable access to modern energy sources in sub-Saharan Africa? Based on the above-listed case histories, and an analysis of the literature and stakeholder interviews, the following issues and trends can be summarised for Ghana's energy SME sector:

1. Most of the surveyed energy SMEs were set up with EDS and loan support from donor-backed programmes, as opposed to commercial sources of finance or the entrepreneurs' own private sources of funding
2. More SMEs have been provided with AREED-backed EDS and loans compared with Zambia and Tanzania, and most of these have demonstrated commercial success
3. The most successful energy SMEs in Ghana, i.e., those experiencing higher rates of profitability and growth, are those operating in the LPG market
4. There is evidence of highly innovative business practices among energy SMEs, in particular the development of local-level sales techniques and end-user financing
5. There is a mature market of efficient cook stoves which has attracted significant interest from local entrepreneurs and donor agencies
6. There is a relatively large solar PV market supplied by SMEs, especially for solar lanterns, though these businesses have depended more on state or donor-backed projects to help create markets, raise technology awareness and support EUR mechanisms

4.3 Analysis of outcomes, barriers and solutions

This section provides the substantive analysis of the framework conditions within which the Ghanaian energy SME sector operates, based on the main issues raised by workshop participants, and elaborated upon by individuals during follow-up interviews. Here we build upon the 'contributions' aspect of the specific energy SMEs in Ghana, i.e., to understand the key causal factors, or mechanisms, through which energy SMEs have experienced either success or failure, thus addressing research questions #2.

The following analysis also addresses research question #3: what are the main, persistent, barriers facing entrepreneurs when setting up, operating and expanding energy SMEs in the identified countries? This includes a presentation of the range of 'solutions' proposed by national stakeholders to overcome these barriers, again based on the issues raised by workshop participants, and elaborated upon by individuals

during follow-up interviews. The overall focus of the analysis is on the specific circumstances in Ghana that have influenced, and continue to influence, outcomes in the country's energy SME sector, including the nature of relevant barriers to market development and expansion. To structure the discussion, we use the similar categories of the 'enabling framework', as in previous chapters, adapted to best reflect the specific circumstances in Ghana.

4.3.1 Policy and regulatory framework

There exist numerous government-led initiatives to promote SMEs in Ghana, including the Rural Enterprises Programme (REP) which is an expanded version of a project that first started in 1995. The current phase, REP-III (2012-2020) aims to "upscale and mainstream, within public and private institutional systems, the district-based micro and small-scale enterprises (MSEs) support system piloted by REP-II & I to at least 161 municipalities and districts in all the ten regions of the country...", where "MSEs" are regarded as an effective means to reduce rural poverty. REP-III is funded by the African Development Bank (39.7%), District Assemblies (20.6%), the International Fund for Agricultural Development (16.5%), Government of Ghana (12.7%), Beneficiaries (6.0%) and Participating Financial Institutions (4.5%), with a total budget of US\$ 125 million.

Another significant donor-backed government initiative to support SME entrepreneurs is the Ghana Private Sector Development Fund (GPSDF), financed by the Italian government and operating in partnership with the Ministry of Trade and Industry. The GPSDF supports non-farming SMEs that are 100% privately owned by Ghanaian entrepreneurs, with a total budget of € 33 million, starting in 2004. The second phase of the project (since 2007) is a majority loan component (€ 20 million) used to establish a credit facility for Ghanaian SMEs, with some funds set aside for grants (€ 2 million). However, as with the REP, the GPSDF does not have a programme dedicated to supporting energy SMEs.

There also exists the National Board for Small Scale Industries (NBSSI) which describes itself as "the apex governmental body for the promotion and development of the Micro and Small Enterprises (MSE) sector in Ghana". Listed among its stated remit are the following:

1. To contribute to the creation of an enabling environment for the small-scale enterprises development
2. To contribute to the development of an enterprise culture in Ghana
3. To facilitate MSEs access to substantial and high quality Business Development Services for their development
4. To promote MSE sector Associations
5. To facilitate access to credit for small enterprises

Judging by these activities, the NBSSI is clearly a relevant organisation regarding efforts to promote energy SMEs in Ghana. However its role and importance was not mentioned by stakeholders consulted for this research, and when questioned about the NBSSI most had not heard of it, or regarded its role as marginal and/or ineffective. The reasons for this lack of visibility or apparent impact are due to NBSSI not having a specific expertise in the energy sector. However some local observers suggested that NBSSI's low visibility is indicative of the largely dysfunctional dynamic between government agencies and the SME sector, and

indeed this was one of the issues explored with stakeholder for this research, in Ghana as well as the other countries studied.

In order to explore these real-world dynamics, it is relevant to start with the newly-formed Ministry of Energy's Business Development Support Facility (BDSF) which provides low-cost matching loans of up to US\$ 250,000 to energy SMEs supplying grid, off-grid or mini-grid electrification. According to Mr. Seth Mahu of the Ministry of Energy, the application process to the BDSF is simple, however he pointed out that very few entrepreneurs have expressed interest and stated that the main challenge is to attract SMEs that can bring their own finance to the table. Arguing from a business perspective, Mr. Kofi Asante, CEO of ICR Engineering, commented at the research workshop that the conditions placed on matching loans tend to limit their attractiveness. While others commented that the BDSF facility has been poorly publicised, and so few entrepreneurs are aware of this facility.

The Ministry of Energy hosts a working group which meets quarterly to review state support provided in the energy sector, including major donors, the Electricity Company of Ghana (ECG) and the Energy Commission. Mr. Mahu claims that attendance is high and the outcomes are constructive. While the private sector is invited to participate in the working group, it is understood that there is a failure to communicate the group's findings to government policy makers, meaning that key messages regarding energy SME requirements are not taken into consideration, or acted upon.

Indeed, numerous energy SME entrepreneurs claim that successive governments have done nothing or very little to promote energy SMEs in Ghana, with most technical and financial support being provided by donor-backed programmes or NGOs, including AREED. Such perceptions, common among the stakeholders consulted for this research, reveal a widespread lack of awareness and/or understanding of the technical and financial support provided to energy SMEs by government agencies in Ghana. From discussions noted at the Accra workshop organised for this research, there appears to be a dynamic similar to that observed in Zambia whereby government officials are 'passive', i.e., waiting for businesses to contact them regarding specific support, and, on the other hand, entrepreneurs tend not to actively look for assistance from the state. Broadly speaking, the reasons for the apparent lack of contact made on behalf of energy SME entrepreneurs can be divided into two groups: where entrepreneurs are willing to look for support from the government, but they simply do not know about what is available to them, or where to look for it; and where entrepreneurs are aware of government support but disregard it as a 'non-starter', either because of perceived bureaucracy and/or an inherent lack of faith in government.

Frank Atta-Owusu, employed by Samsung in Ghana (as of 2012), was previously the AREED project manager at KITE and thus was able to provide some valuable insights into the experience of energy SMEs in Ghana. On the topic of Government and policy support, Atta-Owusu echoed the arguments of other stakeholders when he claimed that there was practically no official support for SMEs in Ghana, until the World Bank funded Ghana Energy Development and Access Project (GEDAP) was launched in 2007, into which AREED was able to contribute in terms of strategies to supply rural areas.

With regard to the efficacy of government policies to support energy SMEs, Mr. Omane Frimpong, CEO of Wilkins Engineering, argued that party politics is largely to blame for the lack of coherent and consistent policy, whereby if the government says that area X will receive solar power then the opposition party will promise them grid electricity. It is widely regarded in Ghana that such politicking undermines the value of legitimate energy planning and perpetuates false promises, to the detriment of the target region or community.

In November 2011, just prior to the passing of the Renewable Energy Law, the Association of Ghana Solar Industries (AGSI) issued an 'information memorandum' entitled "promoting solar energy application as a viable alternative power in Ghana" which focused on arguing for a tax waiver for 'imported solar energy systems and accessories', in order to reach the government's target of supplying 10% of grid-supplied electricity from non-hydro RE sources. It is surprising, given the number private actors operating in Ghana's solar market, and the relative maturity of this market, that such tax benefits have not already been issued for individual parts (tax benefits have always been available for completed solar units). To date (late 2012) this proposal is being considered by the government, though as with other countries studied for this research the challenge is to define a list of RE technologies and associated equipment (such as inverters) that is fair and not open to abuses by traders who would avoid tax but use the equipment for other, i.e., non RET, uses.

The capital vs. fuel costs equation among consumers in Ghana, which has been identified as a key economic barrier in other AREED project countries, especially for solar technologies, was not discussed as a major issue among stakeholders consulted for this research. Indeed it was repeatedly claimed that it is easy to convince consumers of the benefits of solar light, on quality terms alone. Rather, the main challenge is to convince consumers that the high quality products – which are more expensive – are worth paying for as there are many poor-quality solar products that look the same but don't last as long. In Ghana there are many SMEs competing in the solar energy market, importing and selling seemingly similar products of widely differing quality and prices. For this reason, the issue of standardisation is actively debated among energy SME stakeholders, and awareness over the importance of product approval standardisation processes, appears high. Here, the Ghana Standards Authority should have a key role to play. Among the remit of the agency are listed the following activities:

- National Standards development and dissemination;
- Testing Services
- Inspection Activities
- Product certification scheme
- Promoting Quality Management Systems in Industry
- Advise the Ministry of Trade and Industry, on standards and related issues

In reality, the task of lobbying for product standardisation and quality control is conducted by interested parties and organisations, for example the Association of Ghana Solar Industries. On this issue, Mr. Omane Frimpong stated that it was difficult to push the issue of standardisation, arguing that "AGSI was set up with the primary motivation of setting industry standards in the solar market... but the lack of applied quality standards is still a problem in Ghana". The IFC's Lighting Africa programme (2009-2012 in Ghana), which aimed, inter alia, to support commercially viable energy SMEs, was also focused on quality control and product standardisation. Lighting Africa worked with local laboratories and lamp manufacturers in China, India and Germany to improve products for the Ghanaian market, while pushing for 'truth in advertising' especially in the solar lanterns market. Here, the IFC's country manager Albert Eliason stated that the most successful examples of product improvements came from businesses that contacted Lighting Africa before developing their products, as a self-interested means to expand market share. Eliason's point was to emphasise that product standardisation in the retail energy sector is being driven by businesses, not government agencies.

SME entrepreneurs interviewed for this research, including Boniface Taylor (Technical Director, Windfield Engineering), Omane Frimpong (CEO, Wilkins Engineering) and William Aye-Addo (Managing Director, Syscom Energy Ltd.), argued that the public procurement process favours bigger players, and although there is no explicit discrimination, the MoEN argues that the capacity of SMEs must be improved so they can compete to secure high-profile contracts. This ‘barrier’ is one that is mentioned in the other AREED countries studied for this research, and is highlighted as a key frustration to many energy SME entrepreneurs who see public contracts as an important means to expand operations, gain experience and build up contacts for operating in other regions of the country.

In the solar PV market, the prospect of FIT support has the potential to kick-start major investments that would enable the Government to reach its 10% target of RE generation by 2020. WilkinSolar is among those hoping to invest in large-scale, grid connected PV, with plans for a 5 MW plant in northern Ghana. However Mr. Frimpong considers the cost of the FIT as too great to place on consumers and believes it would be politically impossible to support more than 20 MW of FIT-supported solar in Ghana. If so, this would rule out the 155 MW Nzema Project announced in December 2012: a US\$ 400 million foreign investment in the country’s Western Region that would increase Ghana electricity generation capacity by 6%. Nonetheless, there are other means to support FITs, including a period of committed donor-support that would make the Ghanaian FIT politically viable in the short to medium term.

SMEs investing in LPG technology have been a notable success in Ghana, with numerous reported cases where there wasn’t enough capacity to meet demand. The main barriers to further LPG market development in Ghana have been market-based, especially bottlenecks with the wholesale transport and distribution of gas. As with the other countries studied for this research, the stakeholders consulted in Ghana generally agreed that it is now easier and quicker to register an SME, as the process has been reformed since 2000. Registration is still centralised, but the process is more reliable than it used to be. At the same time, tighter government regulations are also creating new barriers for entrepreneurs. Clara Koranteng, owner of M38, explained that “...for LPG it’s harder now than 10 years ago due to bureaucratic implementation of health and safety regulations, especially when setting up an LPG business... the fire service and the Environmental Protection Authority (EPA) all need to approve operations, not just applications.” However it is important to balance this view with one that focuses on the interests of health, safety and the environment for a technology which is potentially more dangerous and damaging than most RETs.

When asked about the role of government in supporting energy SMEs, Albert Eliason, Country Manager for the IFC/Lighting Africa programme, argued that past experience, with many governments, had taught him to question their effectiveness, stating that “...it’s all about talk, talk and talk and nothing ever gets done. So for me the point is to always cut out [the government] and get on with what needs to be done... because we are always told about the ‘policy framework’, the ‘institutional regime’ etc., but nothing ever gets done.” He added his view that politicians think only in the short term and lack vision, producing plenty of good policy documents, but that the government, ultimately, has no plans and/or systems in place to implement them, so nothing happens. This ‘anti-government’ perspective is one that is shared by the architects of other organisations and programmes that have sought to promote energy SMEs, including E+Co and the AREED project which, at the outset, chose to deal directly with entrepreneurs and not concern itself with the working to influence a country’s ‘enabling framework’. This is a key point and something that we will return to in chapter 8.

However the Government of Ghana does support energy SMEs through various policies and state-funded investments and that end up contracting local SMEs. For example, the Government has policy to replace all kerosene lamps with either solar lamps or grid-connections. To this end the KERO-Fund was launched

in 2012 to finance this transition, using local SME manufacturers and distributors. This will also lead to significant fiscal savings for the Government as it currently subsidises the national kerosene market by a total of US\$ 20 million per year, thus offsetting the cost of the transition to more sustainable energy technologies.

4.3.2 Nationally available financing

When it comes to the central issue of finance, the workshop discussions and interviews centred on the question of ‘what has changed’, using the year 2000 as a temporal reference point. The general opinion was that banks in Ghana are more aware about environmental and social sustainability criteria now, with some banks, including the regional ECOBank, conducting environmental due diligence on all their loan approvals. However, while there is more awareness now regarding energy SMEs due to the number of such businesses operating in the country, the sector is still perceived to be relatively risky, which in turn continues to restrict commercial lending.

Even for ECOBank, which is widely viewed as the country’s leading bank in terms of lending to ‘green enterprises’, collateral is still very important and for more complex business (including most energy SMEs) that depend upon a longer supply chain, experience lower levels of business turnover and rates of return. For these businesses it is unheard of for commercial loans to be issued for less than 26% annual interest. Such rates render the majority of energy SMEs financially unviable, even for some LPG businesses that have witnessed higher rates of profitability and growth. Mark Ofori Kwafo from ECOBank Ghana commented during the workshop that there are “not enough” commercially viable small energy businesses in Ghana to create a demonstration effect for banks to see that this is a sector worth investing in, adding that their small size inhibits their commercial viability. However when compared to Tanzania and Zambia, there are numerous successful energy SMEs operating in Ghana, and so this argument appears to be an excuse that masks more structural objections that banks have with energy SMEs. Indeed the perceived lack of sufficient energy SME underlines the reality that commercial banks everywhere tend to overlook investments in smaller businesses that cannot harness economies of scale and, for the banks, imply relatively high transaction costs. From a business perspective Mrs. Clara Koranteng (M38) argued that banks in Ghana simply don’t want to lend to SMEs unless they have already made money and demonstrated commercial success, which refers directly to the development ‘catch-22’ that AREED and other programmes aimed to overcome.

ECOBank claims that it is willing to finance an SME that has won an important contract, without existing financial strength. For them (and presumably other banks) problems occur when SMEs apply for loans without any contracts lined up, thus exposing the bank to significant financial risk. This is the non-negotiable bottom line that dictates all investment decisions, even for banks such as ECOBank that want to be seen as investing in socially and environmentally sustainable small enterprises. In order to confront this reality, all energy SME programmes and projects (including AREED) have emphasised the importance of capacity building activities, making sure that entrepreneurs are fully informed about their markets in order to justify and negotiate commercial loans. Mr. Albert Eliason of Lighting Africa pointed out that many SMEs don’t keep basic records on sales and transactions, and that this is a problem for the banks when they need to assess a business’ past performance, profitability and outlook. Furthermore, Eliason argued that most of the SME entrepreneurs that he has worked with under the Lighting Africa project don’t want to listen to the free business advice that they are given, stating that “only two of the SMEs took advantage of that offer...the reason is that they know what they ought to do, but either they don’t feel it’s important or that somebody will just give them the money and get off their backs, and I think that’s the mentality.” As such,

Eliason claims that many of the entrepreneurs involved with Lighting Africa complain that the programme has not benefited them, because it hasn't provided them with cheap finance.

E+Co have been operating in Ghana since 2001 and the company maintains its position as the main lender dedicated solely to the energy SME sector. At the research workshop E+Co's country manager for Ghana, Mr. Albert O. Boateng, echoed many of the issues raised by Eliason and challenged other participants to consider whether they would risk investing their own money on a business venture that did not present a clear and well-developed and realistic business plan. Regarding the performance of E+Co's Ghana portfolio, Boateng confirmed that the company has invested in 13 separate energy SMEs, some of which were looking for capital to expand operations. Of these businesses, approximately 50% were LPG traders, 30-40% cook stoves and 10-20% solar home systems. However, E+Co's approach of managing its funds from the US meant that only a limited local capacity with regard to energy SME lending was built up through the AREED project. Following the relative success of AREED, E+Co moved to secure the custom of the larger players in the energy SME market, where risks and transaction costs are lower, and profits generally higher.

Indeed, Frank Atta-Owusu recalled that many of the businesses that approached AREED were applying for far more than the average US\$ 50-100,000 loans that were issued. This indicates that the programme was either misinformed about the appropriate scale of financial support needed for energy SMEs in Ghana, or reflects inflated and/or unrealistic ambitions on behalf of entrepreneurs. However there was clear agreement among those interviewed that when it came to the funding available for the guarantee funds under the AREED II facility (2007-2012) these were, at US\$ 50,000, too small to attract serious interest from the financial sector in energy SMEs.

Regarding the prospect of cooperation between banks in order to share the financial risk of lending to SMEs, Mr. Albert Eliason of Lighting Africa stated that "...no, this would only happen for very big deals like oil... and even if you [as a donor agency] have made funds available to the bank and say 'invest this', they won't do that and will put in place very stringent mechanisms for the intended beneficiaries, and not just for energy. There are too many projects where guarantee funds have been made available to the banks and the beneficiaries have been unable to access it because, as the banks will tell you, they are not free funds, and they have to be paid back...and they have to account for the funds, so when you look at it from their point of view it [the stringent lending practices] makes sense". Eliason added that "there is a certain dependency mentality within SMEs, to the extent that when they even have access to these funds they think it's free money."

Given the reality of the commercial banking sector's hesitancy in lending to energy SMEs, combined with the low level of 'preparedness' on behalf of SMEs, the most significant change in lending practices to support the energy SME market has come from the microfinance sector, especially with the issuance of end-user finance (EUF). While this is seen as an effective means to stimulate demand for RETs, especially off-grid solar PV systems, the micro-finance banks that issue such loans are charging upwards of 30% annual interest, which calls into question who the main beneficiaries of this arrangement are.

4.3.3 Business Models and Institutional frameworks

Given Ghana's relatively high rates of grid-connected electrification (>60%) it is unclear why the IFC selected Ghana as one of the pilot Lighting Africa countries, as compared to Kenya (the other pilot country) where electrification totals 22%. However Albert Eliason claims that at least 13% of the Ghanaian population will not be supplied with a grid connection before 2020, opening up a significant market for

off-grid technologies, though much smaller than in many other SSA countries. Despite the large number of SMEs operating in the market for solar PV technologies (including SHSs and solar lamps), it has witnessed less growth, when compared to efficient cook stoves and LPG. This is widely attributed to a decline in the levels of willingness to pay for SHSs, even in some rural areas, due to government's relative success in providing grid-supplied electricity. However demand for SHSs for back-up purposes, as opposed to primary energy, remains strong due to frequent power outages from the grid. A specific challenge for many solar businesses in Ghana is that their business plans are undermined by inconsistent investments in grid electrification, i.e., certain areas are prioritised ahead of official plans. Nonetheless the Ministry of Energy has mapped its electrification plans and so it's possible to know which areas are unlikely to get electrified in the next 10 years, for example, thus identifying the natural domain of SMEs to supply off-grid solutions.

Eliason argued that in order to achieve a significant role for SMEs in the diffusion of clean, modern, energy technologies it is necessary to involve a large corporate player to provide a mature network and platform on which the SMEs can retail their goods. He pointed out that this model would require a complex business management system in place to support SMEs, to make sure they are fully stocked and remaining profitable. In turn this would increase the SME's credibility with the banks, thus stimulating a virtuous circle of growth for energy SMEs. However this model remains untested and, though technically possible, it comes up against a variety of organisational challenges such as how to convince a big corporate player to work with smaller local businesses and how to equip the SMEs with relevant skills. Eliason provided an example from the Lighting Africa work, where they tried to convince GOIL (Ghana Oil: a major oil and gas company with a large network of refilling station) to distribute the solar lamps but they weren't interested, due to bad past experience with installations of poor-quality solar technologies. This issue highlights the importance of technology reputations, which is a particular concern for large corporations.

Regarding other energy technologies, the manufacture and marketing of efficient cook stoves has been more successful in Ghana than in either Zambia or Tanzania, as measured by the number of profitable SMEs operating in this market. In part, demand for these cook stoves has been driven by a lack of supply from LPG traders in more remote areas, revealing a higher level of willingness to pay for clean, modern, energy as compared to Zambia and Tanzania. However, as in the market for solar PV projects, there have been challenges regarding a lack of quality control and standardisation over what constitutes an efficient stove. In the LPG sector, the market has been largely unregulated and some less scrupulous traders have been reported cheating their consumers, mainly by not fully filling gas bottles, though this is understood to have not affected demand. Ghana currently imports all its natural gas but local production is likely to supply the market by 2014, where most LPG demand growth is expected to come from the transport sector.

Compared to either Zambia or Tanzania, there are more, and better organised, RET industry trade associations. Nonetheless, many stakeholders argued that more needs to be done to organise and represent clean and renewable energy technology businesses, especially when it comes to the task of lobbying Government for favourable reforms to taxation and policy support. Here, the Solar Industry Trade Association is regarded by many as a good start, but that there is a need for a nationwide umbrella association of renewable energy businesses. Beyond rhetorical support, however, there is no concrete evidence that this idea is being developed.

4.3.4 Human capacity

Drawing upon his experience with the AREED programme, Frank Atta-Owusu emphasised the importance of the skills and motivation of individual entrepreneurs in determining the success of specific energy SMEs. Citing the experience of Toyola, he claimed that "the technology is as good as the entrepreneur", adding

that in this case the entrepreneur had a clear idea of what he wanted to do, and was willing to take risks. In this sense Atta-Owusu was clear that entrepreneurs must be “hands on” and always actively involved in pushing the market for their products in order for the SME to succeed, thus revealing, as in the other countries studied, the importance of basic human capacity as a key ‘success factor’. While this is a rather obvious point, it is worth noting since the AREED selection process differed between countries where, in the case of Ghana, KITE focused its efforts on assessing the experience, skills and motivation of individual entrepreneurs in addition to the energy market or technology they wanted to pursue. As such, KITE was not only keen to support entrepreneurs that expressed a genuine interest in sticking with the energy sector in the longer term, but also considered the background and qualifications of the individuals, with a view to ensuring the development of strong business and administration skills. By comparison, various AREED-supported business in Zambia and Tanzania (many of which ultimately failed) appeared to be selected based on the quality or originality of the business idea, more than the individual behind it.

Boniface Taylor, Technical Director of Windfield Engineering, explained that Ghana has significant wind resources that could be commercially developed. To this end his company installed 6 x 60 metre wind speed testing masts in under the GEDAP project. Measurements have indicated up to 6.2 m/s average wind speeds in some areas of Ghana, though technical factors regarding grid connections present the most significant barrier. Taylor also stressed the importance of addressing the issue of technology standards and performance, as previously discussed. However he highlighted a human dimension behind this otherwise technical challenge, arguing that “the need for standards is very important because we have had some problems, some complaints, about renewable energy technologies...but many of the problems are technical, where proper load studies have not been conducted and so the right size of equipment is not used, and people don’t know how to use or maintain the technologies...” In other words, the proper application of RETs is essential and damage to their reputation often results from poor installation decisions and maintenance, both of which refer to essentially managerial issues.

4.3.5 Social and cultural factors

During the research in Ghana, various stakeholders repeated the idea that SMEs are permanently pleading for financial support from the government, grants and subsidised loans, leading to a dependency syndrome as previously explained by Eliason from Lighting Africa. The true extent to which this attitude dominates the SME sector is unknown, however it was not obviously apparent among the entrepreneurs that were interviewed. A vocal exception was Mr. Frimpong from Wilkins Engineering who was willing to share his advice to other energy sector entrepreneurs, stating first and foremost that “money is not the issue”, and that it’s not necessary to have contacts in Government to secure contracts, contrary to what other entrepreneurs commonly claim (however it should be noted that Frimpong used to work at the Ministry of Energy). Instead, he argued for the need for more commitment on behalf of the entrepreneurs, stating that he himself was “determined not to fail” and that being able to overcome failure is one of the keys to entrepreneurial success, along with perseverance. Furthermore he claimed that “Africa is poor because we lack vision” which is the kind of sound bite that could easily be misconstrued or taken out of context, and indeed for this research its value provides little analytical insight itself, though his comment is notable for the strength of the assertion.

In common with many energy SME entrepreneurs interviewed in the other countries, most of the Ghanaian entrepreneurs explained that they avoid borrowing from commercial banks, instead opting to self-finance their business through savings and/or from informal borrowing from family and friends. Once such businesses are established and require working capital to finance specific project, these entrepreneurs often prefer to operate on trust, using a mix of self-finance and client-finance. Boniface Taylor claimed that

he has never even considered going to a bank, due to the high interest that they charge, and explained that “it depends on the project, but in most cases I pre-finance [the work] with the little I have. But if it is huge and will demand more than what I have, then I come to an agreement with the client who pays a certain percentage and then we take the rest of the money after completion. It has to do with trust...but I personally always prefer to pre-finance if I can...” Insights such as these highlight the bottom-line reality of the cost of commercial financing in sub-Saharan Africa, and how this reality in turn shapes entrepreneurial attitudes, preferences and business strategies. In the case of Windfield Engineering, Taylor explained that his aim was to expand the business, especially into the solar water heater market, though not by borrowing from the banks. However, the financing and operating model described by Taylor, while internally rational, limits SMEs to operating on a contract-to-contract basis, thus restricting the scope for expanding their businesses.

4.3.6 Summary of workshop discussion on barriers in Ghana

The below-listed issues are a summary of the main ideas and arguments expressed by the local stakeholders that attended the one-day workshop in Accra.

	Demand-side issues	Supply-side issues
1		SMEs lack capacity to develop business plans and keep basic records on sales, cash flow etc. This is both a problem for banks and also government funds (BDSF) to support SMEs.
2		Few entrepreneurs in private sector know about the matching fund facility, so lack of communication is a barrier to progress
3		Idea that SMEs are permanently pleading for support, subsidised loans etc., leading to a dependency syndrome
4		The public procurement process favours bigger players, although there is no explicit discrimination. MinOE argues that capacity of SMEs must improved so they can compete.
5		ECOBank is willing to finance an SME that has won a contract, without financial strength. The problem is when SMEs apply for loans without any contracts lined up. SMEs should be fully informed about their markets in order to justify and negotiate loans.

4.3.7 Solutions

A wide-ranging debate over the relevant barriers and solutions was conducted at the Accra workshop (see annex 11.1.3 for a list of participants). Through open discussion on what actions could/would serve to benefit the Ghanaian energy SMEs sector, the following needs were agreed upon:

1. Clear policy goals established through a transparent stakeholder engagement process, thus minimising political risk, especially with regard to the continuity of the national electrification planning. The same should be done for cook stoves and LPG and CNG for the transport sector.
2. Government to define clearly where energy SMEs can and should operate, based on informed planning, in order to improve market stability for investors

3. Legislation and regulations to ensure quality control for energy products, including solar products, to be defined and pushed for by trade associations. Also to introduce a clear system of product certification and standardisation.
4. National renewable energy resource assessments at the local level to inform project appraisals and financial risk assessments
5. Back high-profile RET projects (for example solar lighting for public space) that demonstrate their effectiveness to achieve public buy-in
6. Targeted government support to create warehouses for sustainable energy technologies that can supply local businesses
7. Improved communication of government actions and taxation for product imports, with tax breaks for quality-approved products (see point #3)

4.4 Conclusions

As compared to Zambia and Tanzania, the concept and reality of 'energy SMEs' is observed to have made a more lasting impact and presence in Ghana. In particular, individual businesses supported by AREED have demonstrated commercial success in the LPG and cook stoves market, to the point that some banks are now actively seeking to invest in these businesses, for example Toyola (stoves) and Anasset (LPG). However the majority of these successes are concentrated in the LPG market, which was a technology 'ripe' for development in Ghana at the time that AREED first operated, i.e., there was both significant demand at the household level, and wholesale supplies available for distribution. The government of Ghana also encouraged LPG, although regulations have, since 2007, become tougher on SMEs seeking to start LPG operations, in particular with securing safety and environmental licensing.

Other energy sector programmes supported by the Ministry of Energy are now pursuing the enterprise-led approach, including Lighting Africa and GEDAP. As such, the explicit efforts made by KITE to engage the government in AREED, were key to raising the profile of the enterprise model approach into the policy community where it has had a lasting effect, at least in the ideational realm where the concept of 'energy SMEs' is now widely endorsed.

5. Senegal

Senegal is a Sahelian country located in western Africa. The population is estimated to be about 12.8 million (2011), with more than 58% living in rural areas. The population is unevenly spread across the territory with a strong concentration in the western part of the country and more than half of the urban population (54%) lives in the capital city of Dakar. High rural poverty and limited access to rural infrastructure and basic services has fuelled migration to urban areas.

Senegal is poor in natural resources. The economy is dominated by a few strategic sectors including fisheries and services, especially tourism. However, due to its geographic location and history as a strong trading centre, the country has an important industrial sector compared to the other countries in the region, including investments from multinational companies, though mainly French capital (UNDP, 2010; IRENA, 2012). In 2011, Senegal's GDP was US\$ 14.29 billion with a 2.6% rate of growth. The country's informal sector accounts for approximately 60% of GDP (World Bank, 2012).

5.1 Energy background

The energy sector in Senegal is facing significant challenges, including an extreme dependence on imported oil products. All fossil fuels are imported, including oil products used in the transport sector and for electricity generation, making Senegal very vulnerable to increases in the global price of oil products. In recent years, Senegal has experienced a deterioration in the finances of the national electric company (SENELEC), largely as a result of oil price increases. These issues have been exacerbated since 2008 and have precipitated a deep crisis in Senegal's energy sector that impairs broader economic and social development due to significant load shedding (World Bank, 2012).

In order to solve the country's energy crisis, the government of ex-President Abdoulaye Wade (2000-2012) adopted in 2011 the "Plan Takkal", an energy emergency plan covering the 2011-2014 period, which includes short-term emergency measures and medium term investments. In 2012, the new President Macky Sall made reform of the energy sector and the development of new energy policies one of his political priorities, focusing on the need to adopt an optimal energy mix, in order to reduce supply costs over the medium and long term through a policy of diversification—natural gas, hydropower, and renewable energies—as well as through regional integration.

The Total Primary Energy Supply (TPES) of Senegal in 2009 was 157.9 Petajoules (PJ) of which renewable energy accounted for 54.8 %. Biomass accounts for 54% of the country's energy supply and oil products for 40%. A mix of coal, hydro, natural gas and solar are the other energy sources that make up the remainder 6%. Electricity generation totalled 2,858 GWh in 2009 of which renewables, including hydro, accounted for 10.2% (IRENA, 2012). The use of traditional fuels—wood and charcoal—is putting great pressure on forests and contributing to a degradation of the environment. However Senegal has significant potential to develop new energy sources, including solar PV and concentrated solar technologies, as well as solid biomass, wind, hydro and liquid biofuels.

In 2009, 77% of households in urban areas had access to electricity, whereas in rural areas only 16% of households had access to modern energy services (REEGLE, 2012). Access to electricity is principally through SENELEC's grid. The rate of electrification is increasing both via new connections to grid and through small, off-grid systems. SENELEC is a majority state-owned company that is responsible for the production, transmission, distribution and sale of electricity through the national grid. In recent years, the national authorities have adopted legislation aimed at liberalising the sector by promoting private investments in generation capacity. However the high cost of electricity means that it is not possible to finance new connections through increased consumer tariffs, thus presenting a barrier to attracting private investment. Furthermore the scarcity of capital available to the State means that investment relies heavily on foreign donors (IRENA, 2012).

The Ministry of Energy has overall responsibility for the energy sector in Senegal. This Ministry has a division for renewable energies that is responsible for the management of the renewable energy programs such as the national biomass programme. Other key institutions working to harness the country's renewable energy resources are ASER (the Senegalese Agency for Rural Electrification) whose role is to promote the use of renewable energy and to bring technical and financial support to electrification initiatives in rural areas; and CERER (the Study Centre on Renewable Energy) which is a university institute dedicated to research into renewable energy in Senegal.

Since 2000 the energy policy focus of the national authorities has been on the contribution that the sector can make to increase well-being and eradicate poverty by providing basic 'social' services while taking into account environmental issues. To this end, the government adopted a National Strategy for the Development of Renewable Energies for Poverty Alleviation in 2003. This strategy aims to integrate renewable energies into other development policies, with the specific target of a minimum 15% renewable-based electricity production by 2025. In addition to this target, the government adopted the Renewable Energy Law in 2010 that includes a 0% corporate income tax break (normally 30%) for investors in renewable energy and on VAT (normally 7%) for renewable energy products and services (REEGLE, 2012).

5.2 Energy SMEs in Senegal

Senegal's informal sector accounts for about 60% of its GDP and SMEs account for approximately 90% of the value of business conducted in the country. As such, the government is aware of the importance of the private sector as a driver of development, and has taken measures to encourage informal SMEs to formalise their activities, starting with business registration.

The institutional framework for SMEs has been designed and implemented by the Ministry of Trade, Industry and Crafts (Ministère du Commerce, de l'Industrie, et de l'Artisanat), which contains a department dedicated to supporting Small and Medium Enterprises (SMEs). The role of this department includes the development of actions and policies to promote the creation of SMEs. Another key organisation is the Agency for the Development and Support of SMEs (Agence de Développement et d'Encadrement des PME, ADEPME), which is an autonomous administrative body but acts as a technical arm of the ministry. The role of ADEPME is to assist SMEs and to advise entrepreneurs wishing to start an SMEs in terms of procedures, opportunities, market analysis and good management.

The policy framework related to SMEs is built mainly upon the Law of SMEs Orientation (Loi d'Orientation des PME) adopted in 2008, which evolved from being an SME Charter, first adopted in 2003. The law commits public authorities to the task of promoting and developing the SME sector, the immediate business environment, and the strategic positioning of SMEs in the national and international economic spheres.

The law defines SMEs, mandates the development of supporting measures for formalised SMEs, and sets out the benefits that SMEs can receive from the state, as well as the obligations that they have to respect. In 2010 the government issued the Sectoral Policy for SMEs, which constitutes the strategic framework for the implementation of all the actions and measures for the development and promotion of SMEs.

In the following section we explore the extent to which specific businesses have demonstrated that energy SMEs are a viable means to provide scalable access to modern energy sources in Senegal, drawing upon the outcomes described during the workshop, in addition to desk-based research.

5.2.1 AREED supported energy SMEs

Senegal was one of the five countries that participated in the AREED project. The Energy Programme of ENDA, an international NGO based in Dakar, was the in-country organisation responsible for communicating the project and for co-implementing (alongside E+Co) the enterprise development service (EDS). Under the leadership of Mr. Secou Sarr, Director of the Programme “Energy, Environment and Development”, ENDA has many years of experience with conducting energy-related research and project implementation in Senegal.

Since the beginning of the project in 2000, 15 businesses have received financial and technical support in Senegal. Below are listed some of the SMEs that went through the EDS process under AREED in the country, and were issued with loans to either start up or expand their businesses:

- GIE Foyers Améliorés (GIE FA) – Dakar and other locations : fuel-efficient cook stove manufacture
- Montagrisol – Louga : manufacture of solar grinding mills
- Prosoleil – Saint-Louis : manufacture of solar water heater
- Vent et Eau pour la Vie (VEV) – Thiès: installation and maintenance of wind-powered water pumps
- Africaine de Maintenance et d'Équipement (AME) – Dakar: installation and maintenance of solar water heaters
- Energie R – Dakar: electronics for solar PV manufacture
- APROCER: ceramics for the manufacture of efficient cook stoves

As was the case with all of the AREED countries, most of the energy SMEs in Senegal were in fact urban-based businesses mostly due to the limited number of rural-based entrepreneurs that responded to the adverts for AREED support. However many of the urban-based energy businesses were aiming to supply the rural areas, including Montagrisol, VEV and APROCER.

5.2.2 Senegal energy SMEs: description of outcomes and contributions

Below follows a summary of energy SMEs that have operated in Senegal since 2002, both AREED-supported and non-AREED, describing both the ‘outcome’ (business activity and performance) and the ‘contributions’ (factors that helped in the set up and operation of specific businesses)⁵.

⁵ The information gathered represents what was available to the researchers, from various sources both primary and secondary, but does not claim to be exhaustive.

COSER (Compagnie Sahélienne en Energies Renouvelables): provider of equipments for rural electrification (solar, wind, biogas)

COSER is an engineering consultancy that provides technical support for the design of renewable-powered (mostly solar, wind and biogas) rural electrification projects (both off and on grid), as well as sourcing finance for project implementation. In addition to its project-based work, COSER also supplies electrification equipment to a variety of clients in rural areas. The business started in 2002 and was spearheaded by Mr. Abdoulaye Ba, an energy engineer specialised in renewable technologies. The business was a self-financed and started with the purchase of fifty 50 watt solar home systems imported from Germany. Mr. Ba first identified potential rural clients in Senegal through his own research in the Matam region where his grandfather was from, and where he knew there were people with money to spend (largely thanks to remittances sent by relatives living abroad). He started the business by providing a one-month trial period for solar home systems and if consumers wanted to continue using it, they must pay a 30% down-payment to keep it. The company employed a local contact to collect repayments from the local consumers. In 2010, COSER became a limited liability company (Ltd.) and as of 2012 the business has its African office based in Dakar and a European branch, based in Berlin. The company is mostly run by two fixed employees but operates through a network of technicians who are based in the villages. The business mostly seeks opportunities through various government, NGOs and foreign donor-backed project for rural electrification.

La Maison Solaire: installation and maintenance of solar home systems

La Maison Solaire was self-financed by the entrepreneur and set up in July 2011, based on a previous company called Sana Chips which commercialized solar systems in Dakar. The business started by identifying a need for solar energy in rural areas. La Maison Solaire employs 6 staff and focuses on the installation and maintenance of solar home systems in rural areas. Due to the challenge in reaching remote rural areas, the company waits to install a few systems at the same time to lower transport costs. They sell the solar home systems through end-user financing provided by microfinance institutions, backed up by the AREED II funds. SENFINANCE, a foundation set up through Swiss donor support and now operating as a private financial lender, holds the AREED guarantee fund. SENFINANCE lends to microfinance institutions at 8% interest and 12% is charged to consumers.

La Maison Solaire conducts its own studies into village demand for solar home systems and the “association of village chiefs” provides a vetting of local householders, providing informal (i.e., not legally responsible) advice to La Maison Solaire as to who are likely to be reliable borrowers. Local chiefs thus act as gatekeepers and provide a level of risk mitigation to the company. For example, La Maison Solaire has installed 400 solar home systems in 13 villages in the Fatick region which is approximately 140 km from Dakar, and in the rural community of Mbellacadio. In this case, the company has an agreement with ENDA (responsible for AREED in Senegal) to lend to the LE SINE, a local microfinance institution which in turn lends to the households to purchase the systems. La Maison Solaire purchases the solar home systems and makes a profit through economies of scale, where the system is sold to consumers for a fixed price, paid for by the microfinance institutions who charge consumers a monthly repayment rate. According to the manager of the company, this business model would be impossible without the guarantee funds from AREED.

SIFF (Sangomar Ice Fabrics and Fisheries): ice manufacturing for transporting refrigerated foods

SIFF, based on the town of Joal, was set by Mr. Lamine Ndour in 2010 with the aim of supplying ice to the fishing industry, manufactured through the use of clean energy sources. SIFF's ice factory uses a solar

PV system and a wind turbine as a backup to diesel-powered generation. The SIFF factory does not use any electricity from the power grid. The factory's daily production capacity is about 30 tonnes of ice per day and employs ten full-time staff. SIFF received EDS and a US\$ 38,888 loan from the regional Solidarity Bank (BRS), backed by guarantee funds from AREED. In addition the company benefits from an import tax waiver and was exempted from paying VAT for the first 3 years of operation.

Kayer: photovoltaic solar home systems installation and maintenance

Kayer was formerly a pilot project created by the Meckhé Peasants Union, seeking to promote the use of renewable energy as a mean to power rural development. The company, created in 2006 and based at Ngaye Mékhé, focuses on the installation and maintenance of photovoltaic equipment and systems. Kayer received technical and financial support from different organizations including SIDI (International Solidarity for Development and Investment), a company specialised in the financial and technical support of microfinance institutions. The company works in partnership with microfinance institutions with the aim of providing customers with adapted microcredits to finance their equipment. Since 2006 Kayer has installed more than 200 individual solar systems and 15 multifunctional solar platforms.

SAEB (Société Africaine d'Exploitation de Biocarburants): production, transformation, and marketing of agriculture products for biofuels production.

SAEB was the brainchild Mr. Daniel Vidal, a bio engineer, who had the idea of developing a company in the renewable energy sector while creating employment and providing access to electricity in rural areas. SAEB was set up in 2009 by three partners and is based in Dakar. In the beginning the company was self-financed and parts of its activities were made on a volunteer basis. The objective of the company is to produce, commercialize, import and export biofuels. In order to implement the first experimental activity of improved production techniques of jatropha (*Jatropha curcas*), SAEB received 200 hectares of land from the local authority in Mbane Commune. In addition, the company purchased unfarmed lands on which to experiment different production techniques. By doing so, they were able to develop within three years a reliable system to produce seeds and oil from jatropha with the aim fuelling motors of small private production units in rural communities (balers, multifunctional platforms, mini generators).

Today SAEB has its own plantations but also collaborates with local producers in Senegal as well as in Mali and Guinea. The sale of seeds and oil started in 2010 in a market characterized by a strong external demand (outside of Senegal). The company is using artisanal balers to harvest the jatropha seeds and although the quality of the products would be higher with industrial balers, the capital investment needed to acquire such equipment is beyond the company's reach. SAEB has received some support from national institutions such as MBERRS (the Ministry of Biofuels, Renewable Energies and Scientific Research) mainly to promote the company's activities in national and international events or medias. The company also collaborates with the Institute for Agronomic Research in Senegal which operates with oversight from the Ministry of Agriculture to conduct research into seed technology. The company has also entered into commercial negotiations with many foreign companies and has submitted a financing request under the AREED II facility.

ABS Group (Afric Building Services Group): manufacture of biodigesters

ABS Group was set up in late 2011 with the aim of manufacturing domestic biogas digester; however as of 2012 the company was not fully operational. . The company has been self-financed until now and is the first in Senegal to be certified by the National Programme of Domestic Biogas for the manufacture of

biodigesters. As well as manufacturing biodigesters to fit household needs, ABS Group also provides the hydraulic installation for the technology and supplies free maintenance for one year. The biogas is produced primarily from cow dung but peanuts shells can also be used, and is used for cooking and lighting. For this reason the company is mainly operating in the pastoral areas of Senegal, where appropriate organic matter is more freely available. ABS group has received support from the National Programme of Domestic Biogas for training their staff on biogas production and have collaborated with the ANCAR (the National Agency for Rural and Agriculture Advice) and ANEV (the National Agency of Eco-Villages) to manufacture biodigesters in different rural areas. Given that the price of biogas digesters is often too high for local rural customers, the ABS Group works with farmers' organizations to try to involve microfinance institutions to develop affordable end-user finance mechanisms.

5.2.3 Have Senegalese energy SMEs demonstrated commercial viability?

The previous section detailed the history of specific energy SMEs in Senegal, which enables us to address research question #1, i.e., to what extent have specific businesses demonstrated that energy SMEs are a viable means to provide scalable access to modern energy sources in sub-Saharan Africa? Based on the above-listed case histories, the following issues and trends can be observed in Senegal, some of which point to factors related to the 'enabling framework' which is explored in the subsequent analysis:

1. There is an overall good performance of energy SMEs in Senegal with many commercial successes
2. Energy SMEs are more often than not self-funded businesses
3. Energy SMEs are mostly dependent on market niches and face demand-side barriers to business scale-up
4. The demand for new technologies in rural areas is low due to a) a lack of knowledge of technologies on the part of households, b) a lack of financial resources to purchase the technologies
5. Microfinance institutions are key stakeholders in providing capital to rural businesses and households to purchase modern energy technologies
6. Where energy SMEs have failed, poor market research and marketing is often to blame

5.3 Analysis of outcomes, barriers and solutions

In this subsection we provide our substantive analysis of the Senegalese energy SME sector, based on the main issues raised by workshop participants, and elaborated upon by individuals during follow-up interviews. Here we first build upon the 'contributions' aspect of the specific energy SMEs in Senegal, i.e., to understand the key causal factors, or mechanisms, through which energy SMEs have experienced either success or failure, thus addressing research questions #2. We then address research question #3: what are the main, persistent, barriers facing entrepreneurs when setting up, operating and expanding energy SMEs in the identified countries? The analysis of the range of 'solutions' proposed by national stakeholders to overcome these barriers, is again based on the issues raised by workshop participants, and elaborated upon by individuals during follow-up interviews.

The overall focus of the analysis is on the specific circumstances in Senegal that have influenced, and continue to influence, outcomes (specific businesses) in the country's energy SME sector, including the

nature of relevant barriers to market development and expansion. As such is it useful to divide the issues raised by stakeholders into the elements of an 'enabling environment' that all countries have, to a greater or less extent favourable to the growth of energy SMEs.

5.3.1 Policy and regulatory framework

In recent years, the government of Senegal has shown a strong commitment to developing its renewable energy resources, legislating the framework law on renewable energy at the end of 2010⁶. Furthermore, renewable energy is widely viewed as an important means to enable rural development and poverty reduction. The government is also aware of the role of SMEs for human development and the contribution that they make to the economy, as evidenced by the adoption of a legal framework to promote the development of the private sector including SMEs, specifically the 2008 Law of SME Orientation (Loi d'Orientation des PME) and the 2010 Sectoral Policy of SMEs, as previously discussed.

However there is no specific reference to energy SMEs in the government's legal and regulatory frameworks, and indeed various barriers that directly hinder the development of energy SMEs can be identified in Senegal. For example, the government spends billions of CFA francs (West African Francs) subsidising the generation and distribution of electricity in Senegal. In 2012, because of high production costs and the rise of oil prices on the international market, the government allocated total subsidies of up to 120 billion CFA francs (approximately US\$ 248 million) to the state-owned SENELEC utility, with the aim of keeping the price of electricity at a level within the purchasing power of Senegalese households. In this context, while electricity prices are higher in Senegal than they are in the other countries studies in this report (see annex 11.13), the large public subsidies provided to SENELEC undermine the competitive advantage of energy SMEs providing both grid and off-grid RET systems.

It should be noted that Senegal relies strongly on fossil fuels in particular in its transport sector and for electricity generation, 100% of which are imported. In 2009, the cost of importing fossil fuels totalled approximately US\$ 1.1 billion, accounting for 23.2 % of all imports, thus heavily weighing down the country's balance of trade (IRENA, 2012). The need to reduce such high energy import bills is the main driver behind the government's policy to develop a diversity of domestic energy sources, including the uptake of various RETs, many of which are well suited to be supplied by SMEs.

The only case of subsidies provided to support modern energy other than fossil fuel in Senegal is for liquefied petroleum gas (LPG). For more than three decades, Senegal has had a policy of subsidising LPG supplies, with the aim of reducing demand for traditional fuels and their impact on deforestation. From the 1970s the Senegalese government started to subsidize LPG first through exemptions of customs duties on cooking equipment designed to operate on LPG. By the end of the 1980s, the government began to subsidize the LPG fuel itself. Both 2.7 kg and 6 kg bottles were subsidised until 2008. Ms. Aliou Lô from LMDB gas (Lobbou Mame Diarra Bousso), an LPG distribution company, explains that although poor households struggle to afford the upfront cost of purchasing an LPG cylinder and cooker, the subsidies helped grow the market and, consequently, there has been an observed reduction in deforestation in many areas. Indeed the market grown significantly and LPG technology is now the main cooking fuel for most urban and peri-urban households. The Senegalese experience with subsidising LPG demonstrates that switching to modern forms of energy can occur when effective and stable government policies are applied over medium to long term. However at the end of the 1990s, the LPG subsidy program was not considered sustainable due to the weight of subsidies cost on country's GDP. Based on the recommendation of International Monetary

6 Loi n° 2010-21 du 20 décembre 2010 portant loi d'orientation sur les énergies renouvelables

Fund (IMF), the Government committed to removing the subsidies, over time. In 2009 the Government reported that these subsidies had been totally removed (IISD, 2010; AFREA, 2011).

The lack of financial incentives was mentioned by various stakeholders as a barrier to the development of energy SMEs in Senegal and to the diffusion of renewable energy technologies in general. In the case of the electricity sector, there is for example no feed-in tariff support available to support renewable energy technologies. There is evidence of confusion regarding the rules on legitimate tax exemptions for energy SMEs, and so this is an area of government policy that requires clarity. In the case of SIFF, the ice manufacture, Mr. Ndour explained that the company benefited from a tax exemption on the importation of non-solar equipment and was exempted from VAT for the first 3 years from the beginning of the operation. However, in the case of Kayer, for example, the company does not benefit from either VAT exemption or tax exemption on imported solar PV equipment, which is the businesses main expenditure. In the early 1990s, the government of Senegal introduced tax and VAT exemptions for solar technologies, however this decision was abolished in 1999 after the common external tariff came into force within the West African Economic and Monetary Union which strove to harmonize fiscal policies between countries. According to Mr. Kassé from FESELEC if the authorities adopt incentive measures, these technologies – renewable technologies such as solar– will most likely develop. This observation is rather obvious and indeed the greater need appears to be, first and foremost, clarity regarding which markets and technologies are, in fact, exempted from various taxes since this basic question promoted contradictory answers.

Another challenge faced by energy SMEs mentioned by the stakeholders interviewed, is the problem of competition from foreign companies. This issue was usually associated with low quality control on imported equipment. Mr. Kassé from FESELEC explained that nowadays any company can apply to a call for tender issued by the government, with no process of quality control. This allows large international companies



Solar panel production at the SPEC plant, Dakar, October 2012

to subcontract poorly trained, low-cost local companies. The lack of quality control on equipment was also mentioned by Mr. Mamadou Saliou Sow of SPEC⁷, a Senegalese company manufacturing solar PV panels in Dakar. He argued that the national market is full of cheap and low quality equipment produced by national companies or imported by foreign companies. Although there is a Standards Association in Senegal and some norms have been established for example for solar energy, Mr. Kassé explains that there is a lack of logistical capacity to check the quality of the equipment installed and that there is a real problem of knowledge on behalf of customers about what constitutes good quality service. As with the other countries studies for this research, there is a clear need for Government to develop and adopt clear norms and standards on RET equipment, and to implement a programme of systematic inspection and quality assurance.

5.3.2 Nationally available finance

One of the main objectives of the AREED project was to demonstrate that energy SMEs can be economically viable so that local banks will see it as a safe sector, worth investing in. However in most cases this demonstration effect has not occurred and the banks in Senegal remain reluctant to lend to energy SMEs, charging relatively high interest rates when they do lend. From the perspective of the banks and other potential investors in energy SMEs, there are often high opportunity costs, whereby far higher and more secure rates of return can be achieved by investing in well-established businesses, revealing a broad trend across all the research countries.

There was wide agreement among stakeholders that it is difficult to access start-up capital in Senegal, where banks are very demanding with regard to documentation and collateral. For example, in the case of SPEC, a photovoltaic solar panels manufacture, collateral requested by the bank to start the company were up to 200% of the value of the loan. These included the provision of real estate and other personal assets from the company owners. Mr. Mamadou Saliou Sow, the director general of SPEC confirms: "Receiving support from the banks is still very difficult because banks do not like start-ups. As SPEC was the first photovoltaic solar panels manufacture in Senegal, it was a new experience for the banks, for whom the solar energy sector is new". The administrative process of requesting a bank loan is also, generally, very slow in Senegal. In the case of SPEC, it took one year to complete the request and receive the money. Mr. Sow states that "the – administrative - process is very slow. Six months can pass to finally receive a NO".

Interest rates are also relatively high in Senegal as compared to OECD countries, even on loans issued to expand SMEs that have a positive track record and performance. According to Mr. Issa Diop, in charge of partnership at BRS, the Regional Bank of Solidarity (Banque Régionale de Solidarité), which has been involved in the AREED project, "the bank lends money at a 12-13% interest rate. In the case of the partnership with ENDA – within the AREED project - the rate was about 10-11%". At such rates of interest a business has to grow relatively fast and secure a clear profit margin with which to pay off the principle debt, otherwise there is a risk that the company's finances become consumed by interest payments.

Another barrier referred to by stakeholders regarding the banking sector is the generally short loan-repayment periods, which tend not to benefit energy SMEs where the businesses cycle can be months or years, compared to the short turnover periods experienced by other businesses, especially those trading in high-volume, perishable goods. The banks' reluctance to provide extended loan periods acts as a major barrier for the renewable energy sector in particular as the return on investment is generally longer than for

⁷ SPEC: Sustainable Power Electric Company <http://www.solar.sn/>

other companies. Mr. Diop from BRS mentioned that “the bank tries to adapt the repayment period to the project but in general never goes beyond the medium term”.

In addition to these structural challenges inherent to the energy sector, which increase risk premiums and discourage banks from lending, there is still strong evidence in Senegal that the banks remain quite ignorant of the small business energy sector, and this contributes to the banks’ insistence on collateral. On this point, Mr. Diop from BRS stated that “energy SMEs is a new sector for the financial institutions... with a huge risk regarding the support of the SMEs”. As such, BRS’s experience with AREED remains unique in Senegal. However Mr. Diop recognizes that the energy SME sector has grown quickly in Senegal and that there is a strong demand for sector in this sector, stating, however, that “trust needs to be established” between the financial institutions and the SMEs before lending can occur on a larger scale. Regarding financial risk, Mr. Diop explained that “the SME must be able to meet the needs of the population. The problem is the purchasing power of the customer and the lack of cover behind it. The SME is exposed and thus the bank is exposed”. However the lack of familiarity of the banks with this sector is probably not the main cause of high interest rates and the short term lending periods, and the problems appear to be more structural. In this sense, Mr. Sow from SPEC mentioned that “the banks act in the short term and do not lend on a longer term basis because they do not have the funds to do so”.

Despite (or perhaps because of) the structural challenges facing the energy SME sector, the government in Senegal encourages the banks to support private initiatives in the energy sector. Mr. Diop from BRS explained that “the sector of energy SMEs is starting to interest the banks, who are responding to the government’s policies”. However he went on to clarify that “the bank – BRS – is not an expert in this sector”. Mr. Diop also considers that “many of the entrepreneurs working in this sector are not experts either” and so “support to banks, but also to SMEs, is necessary to develop relevant knowledge and experience in this field”.

In this context, Mr. Louis Seck, ex-Minister of Renewable Energies in Senegal, explained that, although the AREED facility has raised awareness, the “Government still lacks a lot of awareness about energy SMEs in particular. This is the key challenge”. In this sense, the need to raise awareness to all the stakeholders of the State was mentioned by most of the people interviewed, and furthermore that this lack of awareness translated into low levels of local financing provided to energy SMEs.

According to Mr. Kassé, president of FESELEC, the micro finance sector has grown rapidly in the last few years in Senegal, as a response to the low levels of interest from the larger commercial banks to lend to SMEs, generally. Mr. Sow from SPEC explained that although the conditions offered by the banks for a standard business loan are more attractive than the conditions made by the microfinance institutions, the microfinance institutions are more flexible and better adapted to the conditions of the rural world. Mr. Ndiaye from SENFINANCE, a private financial lender working with microfinance institutions to finance SMEs markets, explained that “micro finance institutions occupy a market which is not covered by traditional banks. These banks still consider this market as risky and not profitable enough. The banks do not work with rural micro finance institutions either”. As of 2012 there are only a few micro finances institutions (from many hundreds operating in the country) that work with traditional banks, but these institutions are relatively big and are the only ones considered as solvent by the banks. In this context, SENFINANCE together with bilateral and multilateral cooperation are the main sources of finance for rural micro finance institutions. It is interesting to note that although the energy SME sector is new for SENFINANCE, Mr. Ndiaye considers that this market constitutes a significant commercial opportunity that should be taken advantage of. With regard to the risk related to limited customer purchasing power, he states that “based on my experience, the payback by the customer is not a problem”.

5.3.3 Institutional framework

Aware of the importance of the private sector as a driver of development, the government has taken measures to encourage the development of SMEs in Senegal. Similarly, conscious of the contribution that the energy sector can make to increase well-being and eradicate poverty, and the importance of promoting the use of renewable energies as a national security factor to decrease the reliance on fossil fuel importation, the government has made the development of renewable energies one of its priorities. However, SMEs in general are still hindered by many institutional difficulties which act as a brake on their development and evolution.

It is worth mentioning that in Senegal, the Senegalese and foreign companies working in the electricity sector are brought together in the Federation of Enterprises in the Electricity sector (Fédération des entreprises du Sénégal dans l'électricité – FESELEC). FESELEC groups engineering, distributors and installation companies. Mr. Mor Kassé, the president of FESELEC, states that the difficulties related to the national environment define FESELEC's mandate, and that the organisation aims to give more power to its members regarding the objective fixed by the government, namely to provide enough energy with a better quality and lower cost; and ensure electricity services access to the populations and decrease the energy price volatilities. Given this remit, FESELEC is unique in Senegal, and there are no other organisations that group energy SMEs together. Furthermore, contact between SMEs addressing the same kind of technology is very limited in Senegal where companies tend to operate in isolation from each other, to the detriment of the sector as a whole.

However there are many institutions dedicated to the development of SMEs in Senegal, in general. The country has a ministry, the Ministry of Trade, Industry and Crafts, which includes the department of Small and Medium Enterprises addressing specifically the issue of SMEs. ADEPME also plays a key role by providing advice to SMEs in terms of management, strategies and market analysis. However, while these institutions consider energy SMEs as just a subset of SMEs, they are usually unfamiliar with the specifics of the energy market, its structural dynamics and the relevance of other government policies. Therefore the services provided by these institutions do not always match the special features and needs of energy SMEs. In addition there is a clear lack of knowledge by entrepreneurs on the services provided by the institutions, and so potentially useful contact and collaboration often goes unrealised. Furthermore, there are no structures in place to promote a dialogue between the institutions bringing the services and the entrepreneurs of SMEs. Consequently there is no flow of communication between parties and it is difficult to convey information and expectations from one side to the other side. Government representatives expect the entrepreneurs to approach them with the aim of clarifying their expectations, while the entrepreneurs expect the government to take active decisions and leadership to support the development of SMEs. According to Mr. Louis Seck, ex-Minister of Renewable Energies, "the State put the general framework in place; then it is the responsibility of the private sector to approach the State".

There are also a number of institutions and national programmes dedicated to the development of renewable energy, notably CERER (Centre for Studies and Research into Renewable Energy) at the University of Dakar and the National Program on Biogas (Programme National de Biogaz du Senegal) started in 2010. There are many examples of positive collaboration between SMEs and these institutions and programmes or with other scientific institutions. For example the technical staff of the ABS Group have been trained by the National Program on Biogas and SAEB developed a partnership with the Institute for Agronomic Research in Senegal to conduct trials on Jatropha seeds. However these institutions and programs usually provide technical support and do not address either the policy or regulatory frameworks, or the management aspects of SMEs.

More broadly-focused agencies such as ASER (Senegalese Agency for Rural Electrification) and CRSE (The Committee for Regulation of the Electricity Sector) address renewable energy as a central part of their remit. Mr. Ousmane Fall Sarr, head of the Studies and Information System Unit at ASER, considers that energy SMEs have a key role to play in the national programme of rural electrification and that this programme must facilitate the emergence of SMEs compared to larger companies. In this sense ASER encourages the participation of energy SMEs in the awarding and management of the grid concessions. However Mr. Fall Sarr explained that there is a general lack of technical capacity on behalf of SMEs entrepreneurs. On this issue, FESELEC confirms that the State encourages local entrepreneurs to become concessionaires and that there is a preference for the Senegalese companies within the call for tenders. ASER also promotes the participation of energy SMEs through local development initiatives, namely the Rural Electrification Local Initiative (ERIL). However in these cases FESELEC points out that ASER launches projects and looks for implementing entities to execute the projects. In this context “SMEs are only service providers for ASER”.

It is therefore clear that the institutional context in terms of SMEs and Energy is well developed in Senegal. However the problem is at the level of communication and synergies between these institutions, whereby there are entities working to promote SMEs but that they are not familiar with the energy or renewable energy sector, and on the other side there are entities addressing the technical aspects of the energy or renewable energy issues but are not familiar with the business challenges facing SMEs development. In this sense, there is a need to promote an inter-sector dialogue to bridge the information and support gap. Most stakeholders interviewed for this research identified the Ministry of Energy as responsible for initiating this dialog and in promoting the development of energy SMEs more generally. There is also a need to develop the communication between research centres and government ministries, to feed technical knowledge in to evidence-driven policy making.

5.3.4 Human capacity and knowledge

In the case of Senegal, as in other AREED countries, it appears that the energy SME sector has attracted a number of technology ‘enthusiasts’. Most of them have a scientific background (engineers or bio-engineers) and have often completed part of their academic studies (Master, PhD) outside of Senegal. Usually these entrepreneurs are driven mainly by their interest to develop a specific technology, as opposed to being primarily motivated to make money. In this sense, one can consider that the strategy for the development of their SMEs lack a certain business approach or aspect of financial motivation. These entrepreneurs may be able to identify a market opportunity and have relevant ideas on how to supply this market, yet lack strong business management skills.

In this context, it is worth mentioning that there are many international, donor-backed, programmes in Senegal which aim to strengthen the managerial capacities of SME entrepreneurs specifically involved in the energy sector. One example is the Global Village Energy Partnership (GVEP) which supports small energy businesses to grow in developing countries in order to expand energy access. In Senegal GVEP organizes training on business planning for energy entrepreneurs. PERACOD⁸ (Programme to promote rural electrification and a sustainable supply of domestic fuel), a German-Senegalese programme, also provides support services to small energy enterprises through EDS, similar to that provided by AREED.

An issue frequently raised by entrepreneurs consulted for this research as a barrier to the development of energy SMEs in Senegal is the lack of a qualified and skilled work force. Specifically, there is a lack of qualified

8 PERACOD - www.giz.de/themen/en/13591.htm

and/or skilled people to operate the new technologies or to ensure their instalment and maintenance. This issue acts as a barrier that hinders the diffusion of the technologies and thus the expansion of the SMEs. As such Mr. Fall Sarr from ASER states that there is a lack of technical skills in Senegal and mentioned the need to develop programmes to train technical experts on new technologies, and to develop a partnership with the ministry in charge of education to include vocational training on renewable technologies such as solar and wind. In concrete terms, one policy option is to develop a technical curriculum in high schools and universities about RETs and to raise awareness among young students about issues of sustainable energy and natural resource management.

5.3.5 Social and cultural factors

The main social or cultural issue raised by stakeholders consulted for this research with regard to energy SMEs in Senegal was the need to convince household consumers of the benefits of new energy technologies. The most important issue referred to is thus on the demand side. This factor can most easily be observed with regard to the high capital cost of renewable energy technologies vs. fossil fuel costs. It is an open question as to whether this is in fact a “true” cultural barrier, rather than a financial barrier that hinders consumers to invest in short or medium terms to purchase these technologies. However the need to further inform the population on the benefits of renewable energy technologies was an issue widely mentioned by stakeholders.

It is also worth mentioning that, contrary to findings from Zambia, Tanzania and (to a lesser extent) Ghana, the lack of ‘entrepreneurialism’, i.e., the apparent lack of a strong, dynamic business culture where ideas and plans are not effectively and efficiently converted into reality, was not identified as a barrier to the development of SMEs in Senegal.

5.4 Conclusions

Senegal has recorded a diversity of commercially successful energy SMEs, although the most notable growth has been witnessed in the LPG, cook stoves and off-grid solar PV markets. At the framework-level, it is clear that many of the economic, policy and institutional prerequisites for energy SME success were already in place in Senegal when AREED began to operate, apart from access to commercial finance. These prerequisites include relatively high electricity prices (due to the country’s dependence on imported primary energy resources); a relative scarcity of biomass fuel (especially in urban and peri-urban areas); government subsidies for LPG; and an entrepreneurial culture.

Given this context, the provision of concessional finance through the AREED programme was well received and enabled numerous entrepreneurs to set up profitable businesses. However the majority of energy SMEs operating in Senegal are, in fact, self-funded. Unlike Ghana where the concept of ‘energy SMEs’ was new, but took hold largely due to the AREED project, Senegal has a stronger SME sector in general and many energy SMEs were already operating in the country. Therefore the EDS element of concessional financing made a relatively smaller contribution to the outcomes documented in this chapter. In Senegal a more mature microfinance sector is playing a more significant role (as compared to the other countries studies in this research) in providing loans to rural businesses and households to purchase modern energy technologies, which in turn is helping to drive the energy SME sector.

6. Tanzania

6.1 Energy background

As with many of its neighbouring countries Tanzania has low levels of electrification totalling 13.9% in 2009 (IEA, 2011), where 39% of the urban population is estimated to have access to electricity compared to 2% in rural areas (CDKN, 2012). 58.5% of grid-supplied electricity is generated from hydro resources, 41.5% from thermal generation. However biomass energy, including all renewable and waste sources, makes up 87.7% of total primary energy supply in Tanzania, with petroleum products (8%), Natural gas (2.8%) and hydro-electric energy accounting for the remainder (REEEP, 2012). In both low-income rural and urban areas households and small businesses rely on biomass fuel for more than 95% of their cooking and heating energy needs, mostly in the form of wood fuel and charcoal (REEEP, 2012).

Tanzania has a National Energy Policy dating from 2003, which places and emphasis on developing the country's renewable energy sources and well as more efficient use of existing biomass. The main targets of the policy include:

- Developing domestic energy sources
- Promoting economic energy pricing
- Attracting private sector participation in the energy market
- Improving energy efficiency and energy reliability

In addition, the Rural Energy Act of 2005 established the Rural Energy Board, Fund and Agency responsible for promotion of improved access to modern energy in rural areas (REEEP, 2012).

6.2 Energy SMEs in Tanzania

In this section we explore the extent to which specific businesses have demonstrated that energy SMEs are a viable means to provide scalable access to modern energy sources in Tanzania, drawing upon the outcomes described during the workshop, in addition to desk-based research.

6.2.1 AREED supported energy SMEs

Tanzania was one of the five countries that participated in the AREED project. Since its inception, the project was facilitated by the Tanzania Traditional Energy Development and Environment (TaTEDO). Based in Dar es Salaam, TaTEDO was the in-country organisation responsible for communicating the project and for co-implementing (alongside E+Co) the enterprise development service (EDS). TaTEDO is a social enterprise specialising in research, development and the commercialisation of environmentally improved energy technologies, including efficient cook stoves, biogas, solar PV, biogas, sustainable and green

charcoal production, micro hydro power generation as well as wind. Mr. Estomih Sawe is the director of TaTEDO and a well-known advocate of energy SMEs in Tanzania.

The task of documenting the AREED-supported energy SMEs in Tanzania was somewhat hampered by a loss of computer data due to a theft at the TaTEDO offices. However, by reconstructing information from various sources, it is understood that the following businesses went through the EDS process under AREED in Tanzania, and were issued with loans to either start up or expand their businesses:

- BETL: Fuel substitution with biomass
- ENSOL Ltd.: solar PV distribution and installation
- Mona-Mwanza Electrical and Electronics: solar PV distributor
- RESCO Ltd.: solar PV retail and distribution
- Sustainable Energy and Environment Company (SEECO): efficient cook stoves
- Zara Solar: solar PV distributor

Most of these energy SMEs were in fact urban-based businesses mostly due to the limited number of rural-based entrepreneurs that responded to the adverts for AREED support. However, as was the case in Zambia, many of the urban-based energy businesses were also aiming to supply the rural market. Below follows a summary of some of the energy SMEs that have operated in Tanzania since 2002, both AREED-support and non-AREED, describing both the 'outcome' (business activity and performance) and the 'contributions' (factors that helped in the set up and operation of specific businesses).

6.2.2 Tanzanian energy SMEs: outcomes and contributions

This section corresponds to research question #1, i.e., to what extent have specific businesses demonstrated that energy SMEs are a viable means to provide scalable access to modern energy sources in sub-Saharan Africa? The following paragraphs document the specific energy SME outcomes and contributions in Tanzania⁹.

Sustainable Energy and Environment Company (SEECO)

SEECO sells improved energy-saving products such as charcoal stoves, charcoal ovens, wood fuel stoves, biogas, solar cookers, solar photovoltaic systems, solar lanterns and liquid petroleum gas (LPG). However the majority of their business concerns the manufacture and retail of efficient cook stoves, with premises on the outskirts of Dar es Salaam. SEECO was set up in 2001 by TaTEDO, primarily to develop efficient cook stoves, from the design stage to manufacture and commercialisation. The company sought to tap into the high demand for improved cook stoves, which has grown rapidly since the late 1990s. SEECO claims that more than 2 million households are already using efficient cook stoves in Tanzania, produced by a number of different, mainly small-scale, manufacturers many of whom are using low-quality materials and production processes. While this is an optimistic figure that cannot be verified, it is true that there has been significant investment by donor-backed programmes into the local manufacture and dissemination of efficient cook stoves in Tanzania.

⁹ The information gathered represents what was available to the researchers, from various sources both primary and secondary, but does not claim to be exhaustive.

SEECO is currently producing 500-800 stoves per month, of various sizes for both domestic and institutional use. The company sells about 60% of its products to Dar es Salaam markets with the remaining 40% is sold to inland rural regions and neighbouring countries. About 50% of SEECO's sales are done through agents who sell the products to end-users and stove retailers while the other 50% constitutes direct sales to end-users from selling points and market places. Filbert Shoo, Manager of SEECO, confirmed in 2012 that the company employs an average of 21 staff and that an average of 20 stoves can be made per person, per day. The stoves vary in design and size but retail for an average of US\$ 7-8 each, while SEECO also manufactures approximately 7 charcoal stove ovens per month which retail for US\$ 150 each.

SEECO was given a US\$ 120,000 loan by AREED in 2002, 100% managed by E+Co, having developed an ambitious business plan. However the company couldn't meet its demand projections and so decided to return US\$ 60,000 to E+Co, the remainder of the loan was paid back by 2009. E+Co provided a US\$ 170,000 loan in 2011 to expand the business. SEECO aims to mechanise its production processes, cutting metal with machines for smooth finish, plus expand output. They are (as of late 2012) planning to secure commercial financing from Twiga Bank though hasn't officially requested a loan.

SEECO operates as an independent company, though is majority owned by TaTEDO and is overseen by a board of directors. Given that TaTEDO shared the responsibility (with E+Co) for identifying and vetting entrepreneurial applicants to the AREED facility, as well as approving the business loans, this level of involvement with SEECO would appear to present a conflict of interest, though this was not recognised as an issue during the 2012 field research.



SEECO's production of clay linings for efficient cook stoves, Dar es Salaam, September 2012

Renewable Energy Services Company (RESCO)

RESCO is based in Dar es Salaam and imports solar equipment, designs and installs solar and battery backup systems throughout Tanzania. RESCO's clients are either private individuals, public institutions (through state tendering processes) or other businesses looking to purchase solar equipment. RESCO was registered in 2001, before the AREED facility was set up. However AREED provided EDS, mainly delivered by E+Co, though from RESCO's point of view communication was difficult with AREED and progress was slow. For example, RESCO's founder Mr. Mzumbe Mussa claims that financial support was supposed to come from AREED within 4 weeks of the business plan being completed, but that the finance didn't come until 2005, 3 years later. In the end, US\$ 63,000 was provided to RESCO by AREED, fixed at 7% for 3 years with a grace period of 6 months (i.e., no interest for first 6 months). As with most AREED loans RESCO could make its loan repayments quarterly, not monthly.

Mr. Mussa claims that it would have been possible to secure a commercial loan for the solar business in 2002, but only at much higher interest rates, backed up by more than 100% collateral. In fact the company tried to secure a loan from the CBRD bank, though it fell through due to tough conditions. Prior to securing the AREED loan, RESCO used to rely on one or two equipment suppliers who would provide their equipment on a 30-day credit cycle, creating high-risk chain of dependency that limited business expansion. As such, the AREED loan enabled RESCO to cut out the local middle men, giving the company more freedom to work with different suppliers. In 2010 RESCO secured a US\$ 120,000 loan for business expansion from E+Co at 11.5%, with no grace period, which the company plans to repay in full during 2013. Since 2002 RESCO has grown from 2 to 5 employees, in addition to employing technicians on a contract basis.

In 2008 AfriCARE contracted RESCO to supply solar systems to about 40 rural sites and generally RESCO see a growing demand for solar home systems (SHS) in Tanzania, mainly from private houses and public institutions in rural off-grid areas. SHSs are often being used in rural areas to charge mobile phones, for example charging 20 phones at a time for US\$ 30 cents per charge. RESCO also builds and sells electricity back-up systems (batteries + 240 volt inverters) for the urban market where power cuts have become more frequent. However RESCO sees the majority of its business growth in business-to-business trading, selling equipment to other solar developers. RESCO also has good relations with the REA which has contracted the company, through a public tendering process, to supply solar systems.

CLAPHIJO dried foods

CLAPHIJO was established in 2002, initially as a small kitchen-based enterprise, by Mama Clara. The company sources, dries and markets fruits and vegetables and secures its supplies from within a 30 km radius of Dar es Salaam, where farmers sell direct to CLAPHIJO direct instead of selling in the market. Mama Clara is from Tabora (a dry central region in Tanzania) and was already drying vegetables, so she had the idea of selling dried produce to Dar es Salaam market. According to Mama Clara, the initial inspiration for setting up the business came after she attended a course on solar drying techniques, organised by the Tanzanian state-operated Small Industry Development Organisation (SIDO). The business was initially self-financed and the first investment was in solar driers, processing mainly paw-paw fruit, mango and bananas.

In 2005 CLAPHIJO was approached by the College of Engineering Technology at the University of Dar to design an improved solar drier and signed a 4 year MoU to this end. At the same time CLAPHIJO secured contracts to supply solar-dried fruits to the Shirjee chain of supermarkets, as well as selling dried vegetables direct to customers in government offices. The company also supplied the larger South African owned

SHOPRITE supermarket chain for a few months but was forced to pull out as they were unable to meet demand. In 2009 the company won the Business Plan Competition organised by the Tanzanian Private Sector Foundation, receiving 50 million Tsh (US\$ 35,000). They used this prize money to invest in electric oven dryers, which is particularly useful on the coast where higher humidity inhibits the efficacy of solar dryers. In 2010 the company collaborated with the SME Competitive Facility (SCF) funded by the Danish aid agency Danida, securing an 80 million Tsh (US\$ 50,000) grant to build productive and human capacity within the company, materials and advertising. The company hired a marketing consultant who came up with the brand “Mama’s Favours”, with the aim of scaling up supplies to larger commercial outlets.

Alternative Energy Tanzania Ltd. (AET)

AET was set up in 2008 by Oscar Lema, who was previously responsible for managing the AREED facility at TaTEDO. The company is based 40 km outside of Dar es Salaam and is focussed on commercialising a variety of clean energy technologies throughout Tanzania, including solar lighting, efficient biomass cook stoves, fuel briquetting and LPG. The business was initially self-financed with US\$ 6,000 of personal savings and was inspired by Mr. Lema’s experience of working with AREED. In 2010 AET implemented a 12 month project to sustainable energy access to education and health social service sector institutions in rural Tanzania, with a total budget of € 117,000. Of this total, an €87,000 grant was provided by the Energy and Environment Partnership for Eastern and Southern Africa (EEP), financed by the UK, Finland and Austria and managed by the Development Bank of South Africa. An additional €21,000 grant was secured from the Canadian foundation Energy for Everyone and the balance of €9,000 was provided by AET. For the EEP grant, AET competed with 356 other applicants for 24 grants, 3 of which were given to Tanzanian SMEs. The project funds were used to purchase and install solar PV systems for 7 rural primary schools and 31 staff houses and 3 health clinics (refrigeration), and to finance capacity building for local maintenance of the systems. Lema claims the project has also raised awareness among local government to build-in energy requirements when developing their rural planning. 2 orphanages with 31 children were also supplied with LPG as part of the same project.

AET is focusing its short-term business plans on expanding the LPG distribution, through Oryx which is the main LPG distributor in Tanzania. Lema points out that LPG is a growth market in Tanzania and Oryx is heavily marketing its technology, focusing on the benefits of LPG gas over cook stoves, including the argument that it is cheaper than using charcoal stoves. For example, a 15 kg LPG bottle last an average family approximately 45 days and costs 54,000 Tsh (US\$ 33). By comparison the same family would consume 2 bags of charcoal which sell for 30,000 Tsh each (US\$ 8). LPG gas burners cost between US\$ 45-70, compared to US\$ 8-10 for a charcoal stove.

Although AET grew between 2008 and 2012, the company is now in need of capital to expand and has applied to E+Co for a US\$ 120,000 loan, but the application has been delayed and Lema maintains that the terms of the E+Co loan are not favourable. Lema has also approached the Diamond Bank for the expansion of LPG business, as well as exploring opportunities with other small banks that are willing to take risks. Lema claims he has problems securing a commercial loan as his house is not registered and so he can’t use it as collateral and maintains that in general the demands placed on SMEs by banks are very stringent.

ENVOTEC Services Ltd.

ENVOTEC manufactures efficient cook stoves and ovens, for both domestic and institutional use. The company was established by Mr. Mwambiyein 1998 as a self-financed sole trader, building just 1-2 stoves

per year, mostly for institutions such as schools and hospitals. In the late 1990s ENVOTEC planned to access the household stoves markets but faced challenges of marketing an affordable stove, plus competition from many other SMEs. Since 2000 Mr. Mwambije has expanded and secured grants and technical support from GTZ and the Rural Energy Agency (REA), and production has increased rapidly since 2007 and now employs 10 staff as of 2012, having achieved 25% growth in turnover in 2011. ENVOTEC secured a US\$ 13,000 grant from the government's Private Sector Fund in 2006.

The company now mostly builds and sells 'rocket stoves' for households and larger fuel efficient stoves and ovens for institutional use, which provide fuel savings of up to 60-80%, having made and sold 700-800 institutional stoves since 1998. The company also makes clay-lined stoves, using local materials which retail for 20,000 Tsh (US\$ 13) compared to the metal stoves which sell for 80,000 Tsh (US\$ 52). Nonetheless ENVOTEC does use finished steel products which it normally sources from China, at a relatively high cost. The company has plans to expand and has already procured a 7 acre plot in Bagamoyo (north of Dar es Salaam) to house an expanded production facility.

However, according to Mr. Mwambije, the company's main, ongoing, barrier to expansion is that of securing affordable capital, in addition to the local bank's requirement for more than 100% collateral. In 2012 Mr. Mwambije had applied to REA for a grant of US\$ 120,000 to expand the business, specifically to purchase equipment that will enable ENVOTEC to make "smooth-looking" products that compare with the imported goods, as opposed to the tin-bashed look of traditional stoves. However Mr. Mwambije was not confident that they would invest in his business as he sees the REA as more willing to invest in public awareness campaigns to use efficient cookstoves, rather than in local production capacity per se.

6.2.3 Have Tanzanian energy SMEs demonstrated commercial viability?

The previous section detailed the history of specific energy SMEs in Tanzania, which enables us to address research question #1, i.e., to what extent have specific businesses demonstrated that energy SMEs are a viable means to provide scalable access to modern energy sources in sub-Saharan Africa? Based on the above-listed case histories, and an analysis of the literature and stakeholder interviews, the following issues and trends can be observed in Tanzania:

1. There is a mature market of efficient cook stoves which has attracted significant interest from local entrepreneurs and donor agencies
2. There is a relatively strong solar PV market, though most demand comes from state or donor-backed projects, rather than private customers
3. Most of the surveyed energy SMEs were set up using the entrepreneurs' own private sources of funding
4. AREED and other programmes mostly supported already existing energy SMEs
5. Energy SMEs demonstrate a high dependence on subsidized loans and/grants in order to expand and commercial success
6. Relatively strong government support for energy SMEs, especially in the solar PV market for rural electrification

6.3 Analysis of outcomes, barriers and solutions

This section provides the substantive analysis of the Tanzanian energy SME sector, based on the main issues raised by workshop participants, and elaborated upon by individuals during follow-up interviews. It first builds upon the ‘contributions’ aspect of the specific energy SMEs in Tanzania, i.e., to understand the key causal factors, or mechanisms, through which energy SMEs have experienced either success or failure, thus addressing research questions #2. Here, we also address research question #3: what are the main, persistent, barriers facing entrepreneurs when setting up, operating and expanding energy SMEs in the identified countries? In answering this question, we include an analysis of the range of ‘solutions’ proposed by national stakeholders to overcome these barriers, again based on the issues raised by workshop participants, and elaborated upon by individuals during follow-up interviews. The overall focus of the analysis is on the specific circumstances in Tanzania that have influenced, and continue to influence, outcomes in the country’s energy SME sector, including the nature of relevant barriers to market development and expansion.

6.3.1 Policy and regulatory framework

The focus here is on ‘second order’ economic settings such as taxation, subsidies and import tariffs over which governments have greater, if not total, control and which can have a significant direct or indirect impact on the private sector.

The Tanzanian government has plenty of sustainable energy targets, strategies and policies, including a Biomass Strategy aimed at promoting the efficient use of biomass for cooking, which feeds into the “East African Energy Strategy” which aims for 15% total use of clean stoves technology by 2015. Tanzania is also party to East African Sustainable Energy for All, a lobbying activity in partnership with Practical Action. There is further, concrete, evidence of active government support for energy SMEs in Tanzania, mainly through the work of SIDO and the REA, which complements a whole host of donor-backed programmes and projects that provide both financial and technical support to specific energy SMEs, especially those aiming to harness renewable energy for rural electrification.

For example, the Ministry of Energy and Minerals (MEM) created a framework for Small Power Projects (SPP) to allow for, and encourage, the commercial development of SPPs using renewable sources to supply the national grid or local mini-grids, with a generation capacity of 100-10,000 kW. The framework builds upon the 2008 Electricity Act and aims to reduce the time and cost of negotiating such projects, in recognition of the huge potential that distributed, smaller-scale generation technologies offer the lower-cost and more immediate solution to increasing rural electrification.

The MEM also oversaw the Solar photovoltaic (PV) Clusters Project in Tanzania which aimed to reduce market barriers to solar PV as a means to increase rural electrification rates. The project was financed by the World Bank and sought to standardise high-quality systems, introduce bulk purchases to reduce costs, set up credit-financing and subsidies as means to accelerate PV penetration in Tanzania. The Tanzanian solar PV market grew rapidly from 100 kW_p in 2005 to 1.5 MW_p in 2009, though the levels of installed capacity remain a fraction of what is needed to make significant increases in rural electrification rates (Camco, 2012). Under current rules, owners of solar systems receive a subsidy from the REA of US\$ 2 per kW/peak installed capacity, although most observers agree that this is not enough to stimulate stronger demand.

Criticism was levelled at the government from various stakeholders interviewed for this research, primarily for its overall priority to push for grid-connected solutions to rural electrification over other lower-tech

energy technologies, including the efficient use of biomass energy. TANESCO, the state-owned electricity utility, is supposed to operate on commercial lines with many IPPs operating and demanding capacity payments. However market-based reforms have been slow and so as yet few small IPPs have been set up. Mr. Sawe of TaTEDO is critical of the government's focus on the grid-based approach to providing energy access and claims that energy SMEs have not received the support they should from the state as the government in Tanzania is "...more focussed on large-scale grid electrification... less than 5% of the government's energy budget is used to support the development and uptake of poor man's energy...", i.e., to promote the use of efficient, clean, biomass-burning energy technologies.

Similar observations were voiced by Mr. Mwambije of ENVOTEC, who added that the MEM is doing nothing in Tanzania to support local production of efficient stoves and that there is equally little interest or support from the Ministry of Natural Resources and Tourism, where both Ministries claim they have no budget to affect change. However it is understood that in 2009 the government took steps to limit the supply of charcoal by placing quotas on producers, which has increased the average price from US\$ 5 to 30 per 50 kg bag. In turn this is driving demand for fuel efficient stoves.

Addressing a related point, Mr. Mussa of RESCO argued that the Procurement Act of 2004 needs to be reformed in favour of SMEs, as current rules place inflexible demands on a businesses' ability to demonstrate financial stability. Arguing that these rules serve to benefit larger businesses, Mussa also stated that "there is no government support for the private sector... they want somebody who is already financially capable and has the management capacities, only then will they give you a job. That's what they want. But in terms of supporting enterprises, well that's not something that has been done by the government."

Furthermore, it was pointed out that the government's procurement rules of many donor-backed projects do not favour local suppliers, and often more expensive products are imported as a result of inflexible rules. In order to qualify for public tenders, local businesses need to be registered with the Contractors Registration Board, which is more difficult for SMEs as there are tough requirements regarding technical capacity. To be registered with the board you have to have a Full Technicians Certificate (FTC), so often SMEs are forced to invite individuals with an FTC in order to qualify for the bid. In exchange these individuals are normally given company shares. The only alternative is for SMEs to employ the professionals with the FTC, and work with them, in partnership, though the scale of contracts often makes this option commercially unrewarding.

Mr. Mwakaheya, Director General of the REA, stated that the REA has been involved with SMEs since it was set up in 2008, including the provision of targeted subsidies for consumers of decentralised RETs, supplied by SMEs, and through the financing of mini-grids and energy for productive use. The REA provides matching grants and also lends money to SMEs for up to 15 years, including a 5 year grace period, issued through local banks such as the Community Rural Development Bank (CRDB). However the challenge, according to Mr. Mwakaheya is for SMEs to come up with their own equity. The REA provides its loan support to SMEs of up to 70% of project costs, issued through local banks. The REA lends to banks at 6% and the banks lend to SMEs at around 12%. The REA also awards cash prizes, mainly for lighting schools and clinics in rural areas. In 2012, Alternative Energy Tanzania, RESCO and TaTEDO were among 15 winners of US\$ 100,000 given to each SME to develop specific rural electrification projects, based on a detailed proposal. Mr. Mwakaheya claims that since the REA began work, rural electrification has increased from 2 to 6.6%. However Oscar Lema of Alternative Energy Tanzania maintained that progress with rural electrification has been too slow and the REA needs to work closer with local governments and

argues for the development of private-public partnerships (PPPs) as a means to finance and implement widespread, systematic electrification.

As is the case in Zambia, the Tanzanian government has removed import taxes and VAT on solar equipment in 2005. Mussa from RESCO claims that this occurred thanks to coordinated lobbying by a solar energy programme funded by the UNDP, which managed to convince a ministerial committee, which in turn influenced parliament to legislate a tax break. However there was some cheating in the system whereby car dealers tried to import car batteries and claim they are solar batteries in order to avoid taxation. The problem was exacerbated by the tax authorities' technical ignorance and so solar companies have often had to argue and defend their claims, adding bureaucratic delays. Nonetheless, the stakeholders consulted for this research maintained that it's now easier to set up a business in Tanzania, following reforms made to the registration procedures, also in 2005, so that SMEs no longer have to secure their licence to operate every year. Business registration now only takes approximately 30 days now and businesses are charged a fixed, one-time fee, of TSh 20,000 (US\$ 12). The government also reformed corporation tax, which used to be pre-determined, but now it's based on revenues and paid quarterly.

Aside from these streamlined processes and tax benefits for clean energy businesses, there were minimal references made by interviewees to any significant actions taken by government to support energy SMEs, including the issue of how to access affordable finance. Indeed Mr. Imanuel Muro, an Investment Officer at E+Co, claimed that the government's repeated political promises to provide widespread access to modern energy sources has, itself, created a barrier to stable and systematic energy planning.

6.3.2 Nationally available financing

As is the case with the other AREED countries studied in this research, the difficulty in accessing affordable finance was referred to as the most significant, structural, barrier to setting up and/or expanding energy SMEs in Tanzania. A fundamental barrier to financial liberalisation in Tanzania is that the National Bank, following the Banking and Financing Acts of 1991 and 2001, demands that Tanzanian banks secure no less than 125% collateral, when lending to households and smaller local businesses.

According to Mr. Ndunguru, Head of Investment-Banking at Bancorp Limited, energy SMEs are still not well known in Tanzania, though there is "more awareness" now by both banks and consumers. Mr. Ndunguru added that Tanzanian banks are weary of lending to businesses that don't have a strong history or track record, although any attractive, well-developed, business plan would likely receive interest from commercial lenders as "they want to do business". Indeed Mr. Ndunguru claims that the situation is changing now in Tanzania, and especially in the energy sector now that TANESCO no longer has a monopoly on power production (the law changed in 2010). As such, he claims there is greater interest among SMEs to act as IPPs, supplying electricity in mainly rural areas. Twiga Bank's involvement with the energy sector started when it was approached by TaTEDO to manage the guarantee fund supplied under AREED II, mainly to provide end-user financing for cook stoves. However, according to Mr. Ndunguru, the bank plans to specialise in lending to energy SMEs, to tap into what he believes is a growing market.

Although Twiga bank is state-owned, they are obliged to follow the rules on issuing only collateral-backed loans and added that the government collateral fund (mentioned by REA) is very bureaucratic and difficult for SMEs to access. In addition the borrower must pay a fee to access the government's collateral fund and so Mr. Ndunguru believes that demands for collateral do in fact present a significant barrier to accessing finance in Tanzania. However he claimed that repayment levels have improved in TNZ and are now "quite good", and that the risk of black listing is a strong incentive for businesses to repay their loans, adding that

Twiga has a 90% recovery rate in its business loans to SMEs. When assessing loan risk, Twiga is primarily concerned about the security of the supply chain, i.e., from where business get their materials. On the demand-side, Mr. Aluti Myenza, from the Institute of Management and Entrepreneurship Development (IMED), explained that formal savings rates are low in Tanzania, partly due to popular lack of trust in organisations and banks.

Mr. Sawe from TaTEDO highlighted the fact that most 'traditional energy' businesses (i.e., efficient use of cook stoves) operate within the informal sector, arguing that banks and MFIs simply don't want to lend to these businesses. On the other hand, Mr. Imanuel Muro, an investment officer at E+Co's Tanzania office, argued that access to financing is not, in fact, a problem in Tanzania. Instead, Muro maintains that the main problem is a lack of detailed understanding among entrepreneurs of their business plans, which they present to banks and other potential funders. As such, Muro argues that banks simply won't risk their portfolios on weak or incomplete business plans.

The issue of informal business operations relates to another structural challenge, on the demand-side, whereby there are limited financing options available to families and other small businesses that want to purchase energy systems that have a relatively high capital cost, such as solar PV. In Tanzania there is a small number of Micro-Finance Institutions (MFIs) and Savings and Credit Cooperative Societies (SACCOS) that are willing to provide loans for such investments, however such financing is usually only available to state employees and teachers, and so most private PV systems are bought with cash, from private savings. This financial barrier to demand-side growth was the target of the AREED-II facility (2007-2012) which sought to provide loan guarantee funds to national lenders, with the idea that they would lend to otherwise 'risky' customers and/or at lower rates of interest. Other initiatives, including the government's solar clusters programme, provide 20% subsidies on PV systems to farmers through the REA, with customers asked to provide another 20% as down payment and the remainder 60% is provided to the cluster as a loan through the local StanBik Bank. Mr. Mussa from RESCO sees E+Co as an expensive source of sector financing, however he stated that its US\$ loans are still cheaper than loans through local banks issued in Tanzanian Shillings.

Another financial barrier identified during this research has to do with access to capital for financing local manufacturing of energy products in Tanzania. Mr. Mwambije, director of ENVOTEC services Ltd., elaborated on the difficulties of competing with goods imported from China and India, which he claims are subsidised. Furthermore, Mwambije claims that neither the government nor the donor agencies are interested in supporting local manufacturing capacity, but rather are more focused on the least-cost, commercial, means to supply efficient cook stoves to the market, which often means suppliers are forced to import their products, undermining local producers. Indeed Mr. Mwambije claims that he turned down a loan offer from E+Co Tanzania, partly because they encouraged him to import lower-cost Chinese goods. This narrow focus on an SME's bottom line, promoted both by EDS programmes, donor and government policies, reveals a myopic emphasis on profit as the greatest force for good, as opposed to strategic, coordinated, investment in local human and manufacturing production capacity which would have far more valuable development implications for Tanzania, if they led to commercial success. The government's and donor's prioritisation of internal rates of return on SME investment would appear to miss important opportunities, especially in cases where local resources and skills are available for the manufacture of low-tech products, such as cook stoves.

In addition to insisting on collateral, most banks and MFIs operating in Tanzania tend not to recognise or value the past commercial performance of energy SME when assessing loan applications. However the situation has changed since 2007, partly due to the growth of the MFI sector, and even corporate banks are lending more to SMEs, increasing the level of competition in local financial markets. There is also

evidence of banks demonstrating more flexibility when lending to energy SMEs, such as the Diamond Trust bank which now performs due diligence on loan applicants, as opposed to rigid demands for collateral. On the government side, there is little obligation placed on the financial sector to lend to SMEs, hence small businesses have traditionally been forced to borrow money from family, friends or MFIs at higher rates. TaTEDO is managing a revolving fund called Sustainable Energy and Finance Access (SEFA) which has been registered as a private enterprise and includes manufacturing as one of its target sectors, although as of 2012 it had yet to invest in specific energy SMEs.

6.3.3 Institutional frameworks

In Tanzania there is more organisation between energy SMEs than is the case in Zambia, where companies meet to discuss issues of common interest through the Tanzania Renewable Energy Association (TAREA) (previously known as TASEA - Tanzania Solar Energy Association), which in turn has formal connections with the REA. The REA has significant resources to finance grid and off-grid access to electricity, as well as the promotion of efficient cooking fuels and stoves. TAREA is the main organisation that brings together and represents the renewable energy sector in Tanzania, acting as both a trade association and government lobby group. One of TAREA's main objectives is to "promote the local manufacture of Renewable Energy products and enterprise development in the Renewable Energy sector", thus recognising a central role for SMEs. Matthew Matimbwi from TAREA highlighted the importance of energy SMEs in Tanzania, stating that "due to the low rate of access to modern energy technologies, especially rural areas, SMEs work to disseminate technologies. There are a lot of rural areas that need energy service but lack supply chain. SMEs are the tools to disseminate the energy services in the rural areas. A study that was concluded in Nov, 2011 by the Rural Energy Agency shows how SMEs have contributed the increase of access to the electricity in the rural Tanzania from 2% to 6%."

In answer to the question of how, and to what extent, have various energy SME programmes influenced national energy policies to incorporate support for SMEs in Tanzania, Matimbwi cited the example of the Rural Energy Foundation, managed by the MEM to promoting energy entrepreneurship, with the backing of the Embark Foundation (Columbia University), Bidnetwork (Small of Business-University of Dar es Salaam) and the Support for Entrepreneurship and Enterprise Development (SEED) which mentors entrepreneurs, specifically in how to set up and operate rural energy businesses, mainly the distribution of solar PV and improved cook stoves. In 2012, 50 entrepreneurs received training, and the end of which they each receive seed financing of US\$ 10,000. This model, a combination of EDS and subsidised loans, closely reflects the AREED model set up in 2001 by UNEP. Matimbwi states that capacity building for energy SMEs in Tanzania has been conducted by a wide range of foreign NGOs and donor organisations, including SIDA, UNDP, The World Bank, SNV (Netherlands), GIZ and GVEP.

Related to the topic of RET sector-specific associations there exists, aside from TAREA, a "clean cook stoves and fuel alliance of Tanzania" forum which involves key stakeholders to discuss the necessary steps for promoting these technologies. However this alliance is not a trade association per se, and although they're pushing for fuel efficient use of charcoal and technologies to replace charcoal, their impact is understood to have been marginal, to date. Some observers argue that such broad stakeholder forums, often the outcome of NGO programmes, are useful for communicating ideas and arguments but tend not to produce a clearly-defined institutional 'check-list', to the commercial benefit of energy SMEs. Indeed, in cases where NGOs themselves attempt to set up energy SMEs, either private profit-making or community owned enterprises, results have been variable. On this issue Oscar Lema, Managing Director of Alternative Energy Tanzania stated, unambiguously, that "NGOs are unable to manage businesses".

During the stakeholder workshop organised for this research, the problem of ‘club proliferation’ was raised, whereby too many energy and development related committees, groups and associations are operating in Tanzania which duplicate efforts and waste limited resources, taking attention away from business activities. This is a curious contrast to the situation in Zambia where strong communication and coordination between energy SMEs was lacking. However stakeholders from the finance sector in Tanzania, including Mr. Ndunguru of Twiga Bank, generally agree on the need for a knowledge-sharing platform for the energy finance community in Africa.

In addition to the non-market institutions that serve to help or hinder the development and commercial success of energy SMEs in Tanzania, there are some structural, market, challenges facing the energy SME sector in Tanzania that can be broadly related to the ‘institutional framework’. Mr. Mussa from RESCO stated that these challenges include the cost of marketing, with the cost of media advertising, as well as face-to-face promotional work, greatly diminishing profits. Mussa also maintains that commercial success in the solar PV market is dependent upon having a strong rural distribution network, which is time consuming and expensive to build up.

6.3.4 Human capacity

Mr. Mwakaheya of the REA argued that there is not enough technical know-how in the Tanzania banking sector to enable them to assess renewable energy projects, and that this is a significant barrier to lowering bank’s risk premiums. The REA’s technical assistance to SMEs is provided by contracting local consultants and their support programmes are advertised in newspapers, to which they receive hundreds of applicants every year, indeed more than they can support, according to Mr. Mwakaheya. Similar shortcomings with regard to human capacity we raised by stakeholders at both the national workshop, and in follow-up interviews.

In the market for efficient cook stoves, Mr. Sawe (TaTEDO) suggested that there is strong demand for efficient stoves in Tanzania, but that there is a “human capacity gap” relating to generally weak business skills, especially for marketing and packaging products, with appropriate pricing. However he argued that key technical barriers have been reduced over the last decade where there is now more technical human capacity within Tanzania to install, repair and maintain more complex RETs, such as solar home systems and mini wind power. Sawe maintains that this technical capacity has been built largely by the market itself, with the help of the technical organisations like TaTEDO and the University of Dar es Salaam and some specific donor-backed energy projects that have been designed to specifically build technical local capacity to maintain installations.

TaTEDO is promoting mini-grid technology and has a goal of setting up 25 systems by end of 2012. The business and operational model varies depending on the place, but the principle behind each project is that they must operate along commercial lines, whether private or community-owned. TaTEDO works with the REA to identify the best potential locations for installing mini-grids, i.e., to understand the areas where grid electrification is unlikely to reach in the medium term. These mini-grids will be based on a Multi-Function Platform (MFP), fuelled by *Jatropha* oil, to connect 500-600 households. According to Mr. Sawe, the success of such platforms is determined more by effective management as opposed to hardware of the technology. As such, TaTEDO is focused on building local capacity to operate and manage the MFPs, though it faces resource challenges.

Mr. Aluti Myenza is a Trainer and Consultant IMED, based in Dar es Salaam. IMED was established in 2009 by Dr. Olomi who was previously the head of the Entrepreneurship Centre at the University of Dar es

Salaam. As of 2012 IMED has a staff of 8 which work with SMEs to provide capacity building and business skills training, as well as conducting consultancy and research. Myenza sees a big challenge in Tanzania with regard to the human capacity of SMEs, and offered this explanation based on what are, to his mind, cultural barriers: “In Tanzania it’s really hard to do business because of [a lack of] awareness. You see, we don’t like to learn, we don’t like to have the right skills for whatever we are doing. We want a quick reward, a short-cut. So we don’t want to invest in personnel or anything that would take us a long time, so most of the entrepreneurs, the SMEs, they don’t want to lose ownership and so aren’t open to training from external experts, even though they [the entrepreneurs] don’t have business skills”.

One of the key agencies that influence the business environment in Tanzania is the Tanzania Private Sector Foundation (TPSF). The TPSF was established in 1998 as an NGO (company limited by guarantee) and is owned by the main private sector trade associations, as well as some large corporate individual members and the Tanzanian Chamber of Commerce, Industry and Agriculture. They have 211 members, of which 40 are corporate members. According to Gabriel Landa, a Funds Manager at TPSF, the job of the organisation is to lobby the government on reforms favourable to the private sector, i.e., to influence policy. To this end, the TPSF hosts the Tanzania National Business Council which facilitates dialogue between the private sector and government and in the energy sector they are lobbying for further liberalisation of TANESCO.

However the TPSF doesn’t have direct day-to-day contact with SMEs and Landa maintains that there are few energy SMEs operating in Tanzania, which collectively have a marginal impact on energy access at a national level. For example, less than 10 energy SMEs were listed from a total of 400 applicants to the Business Development Gateway Competition organised by TPSF. The TPSF also runs the Cluster Competitions Programme (CCP) which is designed to increase the competitiveness of SMEs in Tanzania, although from a final list of 18 SMEs only one business could be defined as operating in the energy sector. The CCP has funds available to finance SMEs through grants, including to a food processing company called Serengeti Freshto finance the uptake of charcoal refrigeration technology in Arusha. However, Landa was keen to point out that grant money “is not sustainable” and that TPSF has plans to use its resources to finance a revolving fund where money is loaned up to US\$ 15,000 to SMEs at subsidised rates (approx 5%) and repayments are ploughed back into other projects.

As a separate form of ‘moral hazard’, Landa highlighted the risk that grants, as opposed to loans, for business can be counter-productive, stating that “we see grants as a kind of distortion... I can give you examples of businesses that have received grants 3 or 4 times, yet they don’t grow. With one grant he [the entrepreneur] buys a car. With another grant he builds a nice house. Then when he is asked how his business has developed, he points to the car and the house! But this didn’t come from the business, it came from the grants.” Similar ideas and arguments expressed by non-business stakeholders in Tanzania reveal the emergence of a strong ‘anti-aid’ discourse in Tanzania, which focuses on the need for entrepreneurs and project managers in receipt of donor-backed support to see such support as a means to an end, rather than an end in itself. As such this issue could be regarded as either a question of ‘human capacity’ or one of the social and cultural factors, which are explored in the next section.

6.3.5 Social and cultural factors

As previously detailed, it is axiomatic among many Tanzanian stakeholders that the demand for collateral from banks is made more complicated for entrepreneurs that don’t have formal land titles or documents that prove ownership of assets. However Mr. Mwakahesya of the REA stated that “...in fact, the bank of Tanzania has facilities to provide collateral to renewables, so companies can borrow money here... the problem is that they [the entrepreneurs] want free money!”

When questioned on what may account for the apparent lack of entrepreneurial culture in Tanzania, Myenza from IMED pointed to the importance of the country's legacy of collectivist economic development model known as 'Ujamaa', a brand of African socialism conceptualised and promoted by Tanzania's first president Julius Nyerere (1964-1985). Indeed many observers argue that there is a hangover of Ujamaa where a culture of entrepreneurialism was largely absent and bank loans were perceived as 'free money' and so repayments were notoriously bad. Myenza argues that a popular socialist mentality continues to discriminate against business in Tanzania and compared country to Kenya, which according to him, is ahead in this regard. Nonetheless, Myenza recognises that the Tanzanian government is creating an increasingly pro-business environment he believes that much of this is due to pressure from donors, and the conditions placed on donor support. With regard to education and the next generation of potential entrepreneurs, Myenza argues that there is a lack of 'soft skills' among SMEs in Tanzania and that university graduates are mostly looking for fixed employment, not thinking about setting up their own business or thinking as entrepreneurs.

On the demand-side, Mussa from RESCO argued that rural businesses tend not to think about, or value, the longer-term benefits of solar systems in relation to the fuel costs of diesel generators, i.e., that they're looking for fast returns on investment. The difficulty that energy SMEs face in convincing potential consumers to see the medium to longer-term benefits of investing in efficient stoves and RETs is not unique to Tanzania. Indeed there is a dynamic common to all the AREED countries where low and precarious income levels tend to skew household purchasing decisions in favour of low-cost capital goods at the expense of longer-term benefits through fuel-saving.

On the topic of the public procurement process in Tanzania, Landa of the TPSF argued that there is too much paperwork involved which puts off smaller SMEs whose administrative capacities are constrained. In addition, the government normally advertises its tenders only in newspapers and in government offices, thus restricting exposure to the benefit of a smaller group of entrepreneurs, mostly based in Dar es Salaam. Landa also elaborated on the "vicious circle" that affects SMEs in Tanzania whereby public contracts issued through the competitive tending process are only open to businesses that are formally registered, with a track record, stating that "I think the government doesn't realise that the private sector is very important, that they don't understand that it is business that drives the economy". On developing local manufacturing capacity, Landa of TPSF argued that the government is able to support this sector, stating that "...the government is the one that can engineer this thing... even if they don't want to put on some import restrictions, they can lay the foundations in the country to attract people to make business here...". When asked why he thought the SME sector isn't growing strongly in Tanzania, he pointed to the government's "...you know, it is very easy to transform the economy of this country... that the energy SMEs aren't growing in Tanzania, it's because of the lack of political will power." This line of argument, whereby observers place an emphasis on the role and responsibility of government to 'affect change' was prevalent among the stakeholders consulted for this research. Such argumentation is symptomatic of the deferral of responsibility, which was also strongly observed in Zambia, and can aptly be considered one of the main socio-cultural tendencies among energy SME stakeholders.

6.3.6 Summary of workshop discussion on barriers in Tanzania

The below-listed issues are a summary of the main ideas and arguments expressed by the local stakeholders that attended the one-day workshop in Lusaka.

	Demand-side issues	Supply-side issues
1	Efficient cook stoves are widespread in Dar as charcoal prices are relatively high. Approx 30,000 stoves are sold per month in Tanzania. The cheapest ones sell for 3,500 shillings to 15,000 shillings (US\$ 2-10).	The difficulty in securing access to affordable financing is the #1 barrier to energy SMEs
2	Charcoal production is growing in Tanzania, 1.2 million tonnes of charcoal being consumed per year. 300 hectares are being lost due to charcoal per day in TNZ	There has been limited 'trickle down' of various international initiatives to push clean/modern energy technologies
3	There is a disconnect between the small and large scale energy technologies and businesses	There is a disconnect between the small and large scale energy technologies and businesses
4	LPG only supplies 5% of the market in TNZ due to high prices and accessibility barriers	Entrepreneurs are unaware of energy business opportunities in TNZ, due to lacking of knowledge
5	The government's procurement rules of many donor-backed projects do not favour local suppliers, and often more expensive products are imported.	The situation with regard to energy SMEs has changed in TNZ since 2000, however policy remains broadly the same with
6	The REA is not dedicated to involving SMEs in its mainstream strategy for rural electrification	98% of the REA budget is given to TENESCO to finance electricity grid extensions, overlooking lower-cost opportunity to provide clean/sustainable energy through other, lower-tech options
7		Weak and/or minimal government support for SMEs: very difficult to convince them that SMEs are a worthwhile model that justifies their support
8		The Ministry of energy is responsible for energy demand and the Ministry of forestry responsible for charcoal production. However government rejects charcoal and wood as modern energy and so doesn't confront the issues. They're in denial about the reality of charcoal use in TNZ and so don't engage with modern/efficient technology, thus revealing a reality gap in TNZ.
9		AREED II model (to provide smaller loans to consumers to drive demand for sustainable energy products) has had limited success in TNZ, mainly due to a hesitant financial sector
10		Cheap, low-quality energy technologies (esp. solar) are being imported to TNZ which prohibits a level playing field

6.3.7 Solutions

A wide-ranging debate over the relevant barriers and solutions was conducted at the Dar es Salaam workshop (see annex 11.1.2 for a list of participants). Through open discussion on what actions could/would serve to benefit the Tanzanian energy SMEs sector, the following needs were agreed upon:

1. To reform the Banking and Finance Act of 1991 to create terms and conditions that are favourable to SMEs and allow more flexibility of banks to lend to SMEs, taking into account the importance of business track records and not such strict demands for collateral and/or high interest rates. This job should be led by the Ministry of Industry and Trade, with an important role for the TPSF and the Dar es Salaam University Entrepreneurship Centre, acting as a lobby group.
2. The REA should encourage the private sector in the provision of energy to rural energy sector, however the REA needs to reform the subsidises it provides to SMEs so they can sell their systems directly to customers, and not only through public tendering which is limited in scope.
3. Businesses need to keep records of their transactions and conduct in a formalised manner, as much as possible, including greater documentation of resources and asset ownership that would improve the chances of securing finance. The introduction of nation ID cards should improve formalisation and improve access to financing
4. 'After care training' (follow-up on training) should be provided by the training organisations, through use of role models and highlighting successes.
5. Government should establish local level representation for SMEs, down from the central government level. There is no representation at the local level to engage with SMEs, especially in the energy sector (apart from electricity, i.e., TANESCO).
6. To streamline and harmonise SME associations activities and goals
7. To appoint a dedicated desk officer for supporting SMEs in the different ministries

6.4 Conclusions

The energy SME sector in Tanzania shares some of the characteristics of the Zambian sector, though there are more examples of commercially viable businesses, some of which have been detailed in this chapter. To a large extent, this reflects the fact that the Tanzanian economy and population is approximately 3 times larger than Zambia's, but also because there are other donor-backed programmes that specifically seek to promote energy SMEs, including GVEP's Developing Energy Enterprises Project (DEEP) project (2008-2013). In addition there is more policy support from the state, in particular for the solar PV market and other off-grid RETs for electricity generation, which is benefiting from some liberalisation in the IPP rules, plus targeted support and investment from the Rural Energy Agency, set up in 2008.

These are all relevant contributing factors at the level of the enabling framework. However in terms of understanding what are the main contributing factors at the business level, the evidence gathered for this research suggests that successful energy SMEs have mostly been financed by the personal savings of entrepreneurs or by non-commercial, AREED-type, concessional loans and donor-backed grants. As such, there is little evidence among the businesses studied of commercial bank lending, i.e., there lacks evidence of a significant demonstration effect and access to affordable finance remains the single most important barrier to scaling up the energy SME sector. Consequently 'energy entrepreneurs' in Tanzania remain largely dependent on their own savings to either establish or expand their businesses, or on government and donor-backed programmes for both EDS and financial support.

7. Zambia

7.1 Energy background

Zambia, as with many of its neighbouring countries, has low levels of electrification, totalling 18.8% in 2009 (IEA, 2011) where 44% of the urban population is estimated to have access to electricity, compared to 3% in rural areas (e8-GEF-UNDESA, 2010). 96% of grid-supplied electricity generation is from hydro sources, however total primary energy supply in Zambia is 80.9% biomass, 11.3% hydro-electric and 7.6% oil-based products (REEEP, 2012). In both low-income rural and urban areas households and small businesses rely 95% on biomass fuel for cooking and heating, mostly in the form of firewood in rural areas and 75% charcoal in urban areas (REEEP, 2012). The heavy reliance on charcoal has led to widespread environmental destruction of forests surrounding the capital city Lusaka.

The Zambian government approved a revised national energy policy in 2008, which places an emphasis on developing new hydro-electric resources. The country's sixth National Development Plan 2011-2015 (NDP) provides specific goals for the energy sector, including increasing generation capacity by 1,000 MW compared to 2010 levels and expanding rural and national electrification to 15% and 40% respectively (REEEP, 2012). Other specific goals of the sixth NDP include:

- Implementing a cost-effective electricity tariff regime,
- Establishing an open and non-discriminatory electricity transmission regime
- Introducing and appropriate cost-effective renewable energy feed-in tariff (FIT)
- Promoting the use of biogas for cooking, lighting and electricity generation
- Increasing biofuel substitution for fossil fuels to 10%
- Developing a Biomass Energy Strategy, to improve the sustainability and effectiveness of biomass supply

Source: REEEP (2012)

7.2 Energy SMEs in Zambia

In this section we explore the extent to which specific businesses have demonstrated that energy SMEs are a viable means to provide scalable access to modern energy sources in Zambia, drawing upon the outcomes described during the workshop, in addition to desk-based research.

7.2.1 AREED supported energy SMEs

Zambia was one of the five countries that participated in the AREED project. The Centre for Energy, Environment & Engineering Zambia (CEEZ), based in Lusaka, was the in-country organisation responsible

for communicating the project and for co-implementing (alongside E+Co) the enterprise development service (EDS). Under the leadership of Professor Francis Yamba, CEEEZ has more than 10 years of experience with conducting energy-related research and project implementation in Zambia.

Below are listed the SMEs that went through the EDS process under AREED in Zambia, and were issued with loans to either start up or expand their businesses:

- KBPS Ltd. – Kitwe: Charcoal production from sawmill waste
- RASMA Engineering – Lusaka: Efficient cook stove manufacture
- Chavuma Waterfalls Ventures Limited (CWVL) – Lusaka: Energy efficiency
- Ubwato Enterprises – Lusaka: Efficient cook stove manufacture
- TSADC – Lusaka/Mazabuka: Solar bakeries
- RCI – Zambezi: Oil manufacturing from Jatropha
- Sylva Food Solution Limited – Lusaka: Use of solar driers for fruit and vegetables

As was the case with all of the AREED countries, most of the energy SMEs in Zambia were in fact urban-based businesses mostly due to the limited number of rural-based entrepreneurs that responded to the adverts for AREED support. However many of the urban-based energy businesses were aiming to supply the rural market, for example the manufacture of efficient cook stoves. According to E+Co (Eibs-Singer, 2004), a total of 21 investments were made through the AREED facility across the five countries in the first phase of the project. Of this figure, five of the investments had been written off. Of these five, four were in Zambia: KBPS; RASMA; Chavuma and Ubwato.

7.2.2 Zambian energy SMEs: description of outcomes and contributions

Below follows a summary of energy SMEs that have operated in Zambia since 2002, both AREED-supported and non-AREED, describing both the ‘outcome’ (business activity and performance) and the ‘contributions’ (factors that helped in the set up and operation of specific businesses)¹⁰.

KBPS Ltd.: Charcoal production from sawmill waste (Kitwe)

KBPS was based in the Copperbelt region and aimed to produce charcoal from forest waste (specifically, off-cuts from a Eucalyptus plantation) using efficient kilns and employed 10 women in the production and distribution of charcoal. The operation was initially successful, securing large contracts with local businesses. However the business folded within a year when the entrepreneur decided to stop the charcoal production and instead used the truck that was bought with the AREED loan for other purposes. The truck was then written off in an accident and then the AREED loan was likewise written off, with some cost recovery made through the sale of the damaged truck.

¹⁰ The information gathered represents what was available to the researchers, from various sources both primary and secondary, but does not claim to be exhaustive.



Charcoal production from forest off-cuts, using the 'half-orange' kiln, Copperbelt, Zambia

RASMA Engineering: Efficient cook stove manufacture (Lusaka)

The business was spearheaded by Mr. Rashid Phiri and focused on the manufacture and sale of efficient charcoal stoves, based on his own research and development which started in 1985. Seeking to expand RASMA's efficient cookstove production, Mr. Phiri applied for EDS and loan support from the AREED project, and was finally granted a loan of US\$ 18,000 in 2002. Mr. Phiri claims that he did not receive any support from the government or universities for his business; however he has given his stove designs to universities to test their energy efficiency, receiving feedback that has helped improve the designs. He also claims to have drawn inspiration for his designs by observing market traders using his stoves which he gave free of charge just to get feedback on the stove's real-world fuel demand and user friendliness. However the business could not meet its sales projections, due to the high and rising cost of stoves affected by the increase in the price of imported steel, combined with poor market research. AREED reclaimed and sold the truck that was bought using the AREED loan, then wrote off the rest of the loan.

RASMA is still active (as of 2012) in the research, design and manufacture of energy efficient stoves and ovens. Although RASMA has made and sold more than 3,000 stoves since 2002, the business is now mostly bespoke, manufacturing biomass stoves for commercial applications such as cooking in markets and ovens for baking and vegetable drying. The business is now operating at a lower-level of capacity and turnover than was planned when RASMA secured its AREED loan. Income now earned is partly used to invest in R&D, including stoves and ovens fuelled by sawdust which Mr. Phiri sees as a technology with huge potential to compete with charcoal, given the significant stores of sawdust waste available in Zambia.

Mr. Phiri set up RASMA on his own and is strongly motivated by environmental concerns, principally the rapid destruction of Zambia's forest for conversion into charcoal. Indeed, when discussing the potential of sawdust briquetting technology he claimed it could help "fight the war against deforestation", and that sawdust briquettes could sell for half the price of charcoal.



Mr. Rashid Phiri of RASMA Engineering at his workshop in Lusaka, September 2012

Chavuma Waterfalls Ventures Limited (CWVL): Energy efficiency (Lusaka)

CWVL received EDS and loan support from AREED and aimed to establish a sales network in Zambia for the supply and installation of Powerboss devices that conserve electrical energy in motors. CWVL acquired the sole dealership for the supply of Powerboss from Somar International and successfully supplied and installed Powerboss devices at the Intercontinental Hotel, National Milling and Nkana water and sewerage company. However the business encountered challenges when the health of the sole entrepreneur, Dr. Bob Sakahilu, began to decline until the business had to be closed down less than two years after the AREED loan was issued.

Ubwato Enterprises (Lusaka)

This business involved the manufacture and sale of efficient cook stove using a clay liner, based on the Kenyan 'ceramic jiko' design. However the business failed in 2004 after one of the partners abandoned the operation. As with RASMA, the rising price of imported steel (which is defined as a 'finished product') for the manufacture of cook stoves during 2003-2008 also eroded the profit margin for these stoves in Zambia.

Dread & Works Enterprise (Lusaka)

This business is owned by Lazarous Chewe, the other partner in the aforementioned Ubwato Enterprises and a previous 'student' of Mr. Phiri at RASMA engineering. The business focuses on the design and manufacture of efficient cook stoves of the 'jiko' style, plus larger 'rocket stoves' for schools and hospital kitchens. At one point Mr. Chewe was negotiating with the South African supermarket chain 'Shoprite' to market his stoves, and came close to brokering a deal but ultimately it fell through, partly due to challenges in packaging the stoves. Financial support, in the form of a grant, was provided by the ProBEC programme (GlZ) and the business now manufactures stoves on-demand, with some orders being placed through the HEDON website which is supported by various international NGOs and businesses, including GVEP, Practical Action, The Shell Foundation and Engineers Without Borders.

TSADC: Solar bakeries (Lusaka/Mazabuka)

The core activity of this business was to bake bread using solar bakeries acquired from TTT Inc holding group, a company based in Arizona, USA. While initially promising, the technology did not function well in Zambia due to higher levels of cloud cover, compounded by the fact that the ovens could not be adapted, for technical reasons, to operate on natural gas. The solar ovens were subsequently reclaimed by the manufacturers due to non-payment and the loan was refunded to AREED.

RCI: Oil manufacturing from Jatropha (Zambezi)

The project was started by Mr. Henry Ngimbu from the Zambezi district in North-western Zambia. The core business plan, supported by AREED, was to process biodiesel from Jatropha to be used in engines, especially for milling. However the business did not take off, due mainly to a lack of clear biofuel pricing in Zambia and the Jatropha crops were eventually cut down.

Sylva Food Solutions: solar dryers (Lusaka)

Sylva food solutions were established in 1986, selling vegetables to the urban market. However fresh vegetables have a short shelf-life and production is seasonal. In addition, some products were arriving to the market damaged and so for these reasons the company decided to invest in food drying technology to ensure stable production and delivery of foodstuffs from local, small-scale, farmers to the urban market. Solar dryers are a table-high raised surface where fruit and vegetables are placed and covered with a plastic sheet to trap heat which speeds up the drying process, and protects food from dust and other pollutants (see annex 11.10).

Seeking to incorporate and develop solar drying technology, Sylva foods applied for support from AREED and were eventually awarded a loan of US\$ 126,500 to invest in the development, manufacture and sale of solar dryers to its network of farmer suppliers. Sylva has made and sold approximately 1000 solar dryers sold since 2005 and have trained more than 9,500 farmers from all 10 provinces. The company employed engineers from the University of Zambia to come up with an optimal dryer design. The loan was paid back and the company continues to expand, adopting food processing technologies, packaging and exporting beyond Africa.

Subsequent to the AREED loan Sylva secured, with the help of the Ministry of Agriculture, a loan of US\$ 600,000 from the World Bank to expand the business' operations, managed by the private NGO AfriCARE. At the same time technical support was provided through DfID's (the UK's development department) Business Innovation Facility to conduct a market analysis through consultants that were placed in-house at

Sylva. IDE (International Development Enterprises, an American NGO operating in Zambia) also contributed to Sylva's successful expansion by helping them to identify the type of materials that were needed to set up the business and also supported a market linkages study, i.e., putting farmers in touch with the company. Training from IDE was provided for free.

Copperbelt Forestry Company (CFC): production of sawdust briquettes

In 2003 CFC approached the National Technology Business Centre (NTBC), a government agency that provides advice on appropriate technology use, sustainability assessments, business and market analyses. CFC enquired about the feasibility of developing sawdust briquetting technology. While there exist significant, low-cost, sawdust resources in Zambia, the CFC suffer initial setbacks due to a combination of poor marketing and management. Nevertheless, the company remains active (as of 2012) and has collaborated with a Swedish organisation Emerging Cooking Solutions to develop sawdust pelleting technology. CFC did not receive any EDS or loan support from AREED.

Solar Tech Ltd.

Solar Tech Ltd. grew from a family business focusing mainly on solar drying technology, and, to a lesser extent, supplies the solar PV market in Zambia. As of 2012 the company is operational and exhibits its products at trade fairs where interest is strong but the follow-up demand is weak, mainly due to the high capital cost vs. payback times, especially for solar PV technology. The company's main PV customers are NGOs that normally finance their investments through grants and so do not operate on commercial lines. To date Solar Tech Ltd. has not received any substantial external assistance or commercial loans.

CLEF Energy

CLEF Energy was set up by Chilumba Ngosa who spent many years living in the UK and was one of the Zambian nationals encouraged to return home by ex-President Banda¹¹. Mr. Banda pushed for expat Zambians to invest their financial and human capital in the country, offering them a 7-year 0% tax break, profit repatriation plus other incentives to invest in Zambia. As of 2012, CLEF is looking into various energy technologies and market opportunities, including the production of bioethanol from municipal solid waste for mixing with transport petroleum fuels, and grid-connected power generation from solar PV and wind. While Mr. Ngosa sees commercial potential for developing these energy sources, he is clear about the need for concerted support from government to help develop these markets. At the time this study was conducted CLEF was waiting for an official response from the government regarding proposals to implement a 'feed-in tariff' for grid-connected renewable energy technologies.

Muhanya Solar

Muhanya Solar was established by Mr. Geoffrey Kaila, initially motivated by his hobby interest in solar PV technology, 'tinkering' with solar panels. The business mainly focuses on supplying solar home systems (both PV water heating) to rural, off-grid areas and has installed 100-200 systems to date, including 17 projects completed through the public tendering process. The business is mostly self-financed from savings and, as yet, has not borrowed any money from financial institutions though Mr. Kaila tried to get financing from AREED but claims that AREED didn't support PV, although this was not the case. Other financial help has come from friends, lending money informally. The main business model is to put consumers in touch with micro finance institutions to borrow the money necessary to purchase the solar

¹¹ Rupiah Bwezani Banda was the President of Zambia from 2008 to 2011

water heaters or PV systems. Most of the technology is imported as finished products, and the job of Muhanya is to assemble, install and service the systems.

7.2.3 Have Zambian energy SMEs demonstrated commercial viability?

The previous section detailed the history of specific energy SMEs in Zambia, which enables us to address research question #1, i.e., to what extent have specific businesses demonstrated that energy SMEs are a viable means to provide scalable access to modern energy sources in sub-Saharan Africa? Based on the above-listed case histories (which are a mix of AREED and non-AREED), and an analysis of the literature and stakeholder interviews, the following issues and trends can be observed in Zambia:

1. Overall poor performance of energy SMEs in Zambia with more commercial failures than successes
2. Poor market research and marketing is a major cause of business failure
3. Self-funded business have demonstrated more success than those that secured external loans, including subsidised loans
4. Energy SMEs are, more often than not, overly dependent on market niches and face barriers to business scale-up through limited demand
5. Evident lack of government support for energy SMEs, revealing extensive scope for policy to create financial and non-financial incentives and benefits and incentives

7.3 Analysis of outcomes, barriers and solutions

This section provides the substantive analysis of the Zambian energy SME sector, based on the main issues raised by workshop participants, and elaborated upon by individuals during follow-up interviews. Here we build upon the ‘contributions’ aspect of the specific energy SMEs in Zambia, i.e., to understand the key causal factors, or mechanisms, through which energy SMEs have experienced either success or failure, thus addressing research questions #2. We also address research question #3: what are the main, persistent, barriers facing entrepreneurs when setting up, operating and expanding energy SMEs in the identified countries? This includes an analysis of the range of ‘solutions’ proposed by national stakeholders to overcome these barriers, again based on the issues raised by workshop participants, and elaborated upon by individuals during follow-up interviews.

The overall focus of the analysis is on the specific circumstances in Zambia that have influenced, and continue to influence, outcomes (specific businesses) in the country’s energy SME sector, including the nature of relevant barriers to market development and expansion. As such it is useful to divide the issues raised by stakeholders into the elements of an ‘enabling environment’ that all countries have, to a greater or less extent favourable to the growth of energy SMEs. The following five categories are adapted from Nygaard et al. (2012¹²), and best reflect the issues identified in Zambia:

- Government intervention and national macroeconomic conditions
- Nationally available financing

¹² See annex 10.10 for a table on “Enabling frameworks for technology transfer Source” from Boldt, J., Nygaard, J., Hansen, U.E., Trærup, S. (2012) Overcoming Barriers to the Transfer and Diffusion of Climate Technologies. UNEP Risø Centre,

- Human and institutional capacity
- Research institutions and technological capacity
- Social and cultural factors

7.3.1 Government intervention and national macroeconomic conditions

The wider economic ‘settings’ of a given country are of fundamental importance to any business, large or small, attempting to or already operating there. The impact of interest base rates, inflation and growth levels are the main factors that influence the business climate. However governments, especially those of smaller and less developed economies (thus covering most of sub-Saharan Africa) often have little influence over these primary factors. Therefore the focus here is on ‘second order’ settings such as taxation, subsidies and import tariffs over which governments have greater, if not total, control and which can have a significant direct or indirect impact on the private sector.

Import tariffs on various products have had significant impacts, both positive and negative, for many Zambian energy SMEs. For example production costs for RASMA’s improved cook stoves rose sharply along with the cost of imported steel, on which tax is paid in Zambia as it is considered a ‘finished product’. Over a period of just two years the cost of steel had forced RASMA to more than double the price of its stoves to approx US\$20 each, beyond the purchasing capacity of average Zambian consumers. Around the same time in 2008 the government introduced a tax waiver on solar PV technologies, all of which are imported. This provided, at a stroke, significant cost savings for companies such as Muhanya Solar, CLEF and Solar Tech Ltd. by reducing import tax from 15% to 0%.

Geoffrey Kaila of Muhanya Energy argued that local electricity market conditions in Zambia present a large economic barrier to the uptake of solar PV, stating that “...it is easier now to run an energy SME in Zambia... we have tax breaks for importing solar products, which includes PV panels, inverters, batteries and bulbs, and the price of panels has come down a lot. But the price of electricity in Zambia is too low and so consumers need to be subsidised in order to grow the solar [PV] market from the bottom up.” However solar PV and grid electricity don’t compete in the same market and so this argument and so this, in reality, is not a valid barrier to the PV market although it was heard from various actors in the solar market. Arguments can be made in favour of cross-subsidising from the grid to off-grid systems in order to create a ‘level playing field’, though this is not a viable option for Zambia’s indebted ZESCO utility.

In addition, because of heavy subsidies that cause ZESCO to be a loss-making utility, the company is caught in a classic public-services dilemma whereby its low tariffs are politically difficult to increase. Further, without some degree of market reform the electricity sector remains dependent upon government subsidises to finance investments, which are currently swallowed up by the cost of maintaining what is an ageing infrastructure. As of early 2013 Zambia has experienced a generation shortfall of approximately 70 MW, in a grid system that contains just 1,750 MW, 90% of which is hydro capacity (Bloomberg, 2013). Market reforms, including electricity tariff increases and/or the introduction of feed-in tariffs (FIT) targeting at RET generation would help close the generation gap and generate revenues for investing in grid expansion. This was one of the issues elaborated by Chilumba Ngosa of CLEF Energy who expressed his frustration with a government committee to discuss the FIT proposal, where progress is similarly slow and ineffective, stating that “there is too much talking and nothing is done!” Ngosa also explained that he has struggled to sign an MoU with the city council of Lusaka regarding a proposal to utilise municipal solid waste as a fuel source, with progress being blocked at every stage in the bureaucratic chain. Partly

for these reasons Ngosa argues for the need to decentralise some government responsibilities in Zambia since he sees central government as ineffective.

More generally, SMEs are currently taxed the same as large corporations in Zambia (6%) and there is a debate about whether SMEs should be given a tax exemption. However few stakeholders believe that such a reduction would make a significant impact in helping to overcome other, more fundamental, energy market barriers including electricity tariffs.

There was a general consensus at the Lusaka workshop that it is now (as of 2012) easier to set up and operate an SME in Zambia than it was 10 years earlier. This change was attributed to reforms initiated by the Banda government (2008-2011), which reflects the official importance the government places on SMEs as a driver of economic growth and employment. However there was also strong agreement among workshop participants that the drafting and implementation of energy policy is disorganised and convoluted in Zambia, and that this acts as a significant brake on the growth of energy SMEs which are in need of clarity on strategic priorities, market opportunities, incentives, targets and relevant standards for energy products and services. Indeed, among the stakeholders consulted for this research there was a dominant tendency to defer all leadership, decision making and problem-solving obligations to ‘the Government’. In the world of energy SMEs this reference to government would imply a key role played by the Department of Energy, within the Ministry of Energy and Water Development.

However it is clear, by its own admission, that the Department of Energy (DoE) has had very little interaction with energy SMEs beyond the market for efficient cook stoves. According to Charles Mulenga, Assistant Director at the DoE, the DoE contributes to energy policy making in Zambia and works with NGOs in the production and dissemination of cook stoves. It also conducts information campaigns, mostly billboards and flyers. Although Mulenga stated that he saw ‘potential’ for the widespread provision of solar PV lighting and charging in rural areas, through SMEs, the DoE has done little to facilitate the development of this sector. A notable exception is that the DoE supported, with funding from the Swedish development agency (SIDA), the establishment of Solar Energy Supply Companies (ESCOs) in the Eastern Province. When pressed on the boundaries of the DoE remit to support energy SMEs, Mulenga clarified that the DoE “...is not responsible for providing support to energy SMEs”, and that it would be a responsibility of the Ministry of Commerce. Such deferrals of responsibility, within government, reflect the degree to which there lacks a widely understood, coherent policy and strategy to support energy SMEs in Zambia, given that many of the energy SME entrepreneurs approach the DoE when seeking support from the government.

Indeed Zambia’s 2008 energy policy doesn’t make specific reference to SMEs, and so there is currently no official statement on the role and importance of energy SMEs to achieving the government’s wider targets of increased consumer access to sources of clean, modern energy. Mulenga stated that the DoE is “thinking about” supporting the LPG industry in Zambia, though no more information was provided on the topic. Mr. Tambatamba, director of the National Technology Business Centre (NTBC) stated that the government of Zambia is “pro business” and is trying to promote SMEs through workshops but that there is a constant need for mentoring small businesses in Zambia.

7.3.2 Nationally available financing

One of the main objectives of the AREED project was to demonstrate that energy SMEs can be economically viable so that local banks will see it as a safe sector, worth investing in. However, due to the low success rate of energy SMEs, this demonstration effect has not occurred in Zambia. Consequently the banks in Zambia remain mostly unwilling to lend to energy SMEs, charging relatively high interest rates when they do

lend. From the perspective of the banks and other potential investors in energy SMEs, there are often high opportunity costs, whereby far higher and more secure rates of return can be achieved by investing in well-established businesses like the importing of foodstuffs that provide a low-risk, fast return on investment.

There is wide agreement among stakeholders that it is difficult to access start-up capital in Zambia, where banks are very demanding with regard to documentation and collateral. Even when collateral is provided, Zambian banks are not willing to leverage their loans beyond the value of the collateral, meaning that asset-poor entrepreneurs are unable to secure capital beyond a limited range. Furthermore, interest rates are relatively high in Zambia as compared to OECD countries (though comparable with other AREED countries), even on loans issued to established SMEs with a positive track record and performance. There is no universal agreement as to the reasons why banks lend at higher rates to SMEs in general in Zambia (of up to 6% per month), though various stakeholders, including Mulambwa Imasiku, the director of the TDAU, suggested that trust was a major issue, stating that “SMEs are considered a risky type of business where you may lend to them today and tomorrow they have disappeared”. In the energy sector, the nature of the business cycles put investors off, where more complicated supply chains, prices and slower pay-back periods for capital-intensive technologies such as solar PV all conspire to increase the financial risks.

At the DoE, Mr. Mulenga emphasised the need for innovative financing for energy SMEs in Zambia, a widely held position. What ‘innovate financing’ could mean in reality goes undefined (other than being a euphemism for cheap money) but suffice to say that it refers to mechanisms that are fundamentally different from those that exist in practice. However, repeated reference to the term ‘innovative finance’ masks a more concrete, real-world, dilemma whereby commercial banks in Zambia (and indeed in most other countries in sub-Saharan Africa) are themselves unable to borrow money at low interest rates from international markets. As such, no amount of financial ‘innovation’ will allow for the provision of loans for SMEs at single-digit rates and relaxed demands for collateral that would be considered affordable and viable to help finance business start up and/or expansion. Nonetheless, some relevant ideas were discussed at the Lusaka workshop, including the possibility of creating a sector-specific investment fund contributed to by various banks and channelled through business associations that vet specific businesses (i.e., their members), providing a degree of assurance for banks. Such sector-specific financial risk sharing has taken place in South Africa where banks were encouraged, through strong leadership from the state, to lend to the country’s nascent solar water heater (SWH) industry; first to manufacturers and then to customers to support the demand side, mainly by agreeing to finance SWH systems as part of mortgage lending. Chilumba Ngosa of CLEF Energy argues that the financial sector needs support from the government, like the AREED mechanism but on a larger scale. To this end, Ngosa wrote to the Minister of Finance arguing that “the government should come up with a policy [to earmark funds for investing in energy SMEs] which they should share with the banks, and which in some cases they should guarantee, funded by green taxes”.

Added to the fact that there have been few business success stories in Zambia of entrepreneurs receiving soft loans from donor-backed programmes, various stakeholders also expressed the risk of ‘moral hazard’¹³ in the use of guarantee funds to stimulate commercial lending to energy SMEs. While guarantee funds aim to demonstrate to banks that energy SMEs are a worthwhile and low-risk venture that will yield results, they often have the opposite effect by increasing the chance of non-repayment as borrowers know that their loans are ‘covered’. This issue was put to Bernard Lusale, Financial Services Programme Coordinator, at the Micro Bankers Trust (MBT) who acknowledged that this was a possible risk, though

13 “Moral hazard describes behaviour when agents do not bear the full cost of their actions and are thus more likely to take such actions” (OECD, 2001). In other words, moral hazard refers to the tendency of actors to be more willing to take a risk when they know that the potential costs will be paid, at least in part, by other actors or agencies.

argued that it is a less significant factor when compared to the low levels of loan enquires on behalf of Zambian entrepreneurs, across all sectors.

As a separate issue, Lusale claims that SMEs are not approaching Micro Finance Institutions (MFIs) to borrow money due simply to a lack of awareness and information on the part of the entrepreneurs. Nonetheless MBT have a larger SME portfolio than 5 years ago, and see this as a growing sector of the Zambian economy.

In terms of how they view the energy sector, Lusale stated that the MBT are “enthusiastic” about the energy sector, indeed that they are happy to finance any project that appears to be commercially viable. The MBT provides loans of up to 50 million kwacha (US\$ 10,000), all of which are secured through collateral, divided into private or community loans, and typically lend at 60% interest per year. However, in defence of such high interest rates, Mr. Lusale explained that the MBT borrows from the Development Bank of Zambia at 12% per year, which is the lowest, subsidised, rate available to them. According to Lusale, all banks in Zambia prefer to lend to formalised tax-paying employees as they have a stable income and their repayments are automatically deducted from salaries. When asked about their lending criteria, Lusale clarified that MBT considers mostly legal and financial security and that they don’t screen their lending to SMEs against any sustainability criteria.

7.3.3 Human and institutional capacity

Primary research reveals that there are plenty of ideas and numerous activities going on to develop and diffuse new energy technologies in Zambia. However there is an apparent lack of awareness and coordination between the individuals and organisations within the energy SME sector, where similar efforts are duplicated and/or operate in isolation from each other, to the detriment of the sector as a whole. Of the five AREED countries, the energy SMEs sector is least developed in Zambia where just a handful of small businesses are operating, without any meaningful coordination or representation. For example the sawdust fuel technology and SME ‘incubator’ idea, which the NTBC already operates but which the stakeholders present at the research workshop were unaware of. Similarly, there are no renewable energy trade associations in Zambia, apart from biofuels, and there is minimal contact between small businesses and the DoE, while the Rural Electrification Authority (REA) is mostly focussed on grid-based work. The apparent lack of coordination in government to support energy SMEs can, to a large extent, be explained by shortcomings in human and institutional capacity.

The main issues raised at the Lusaka workshop, and during subsequent interviews, concerned the lack of coordinated or centralised marketing for specific energy technologies; a generalised lack of information for entrepreneurs regarding the energy sector; the need for SME incubators; follow-up support for energy SMEs to improve chances of commercial success. In response to a discussion of these issues, the workshop participants agreed that a high-level energy ‘taskforce’, with strong political leadership at the highest levels, should be set up in Zambia to identify the organisational gaps in the energy SME sector. As well as galvanising support for a clear energy SME national agenda, such a taskforce should conduct a market mapping of who should be doing what, in order to streamline current activities. Participants also agreed that government-sponsored courses for entrepreneurs on management skills, book-keeping and business planning would help fill an important capacity gap. However such open discussions can quickly descend into a ‘wish list’ of capacity needs, where it is all too easy to state that “it’s the government’s responsibility” to provide these services when, in reality, the government itself may lack the necessary human capacity and organisational capacities! This dynamic brings to light a deeper, intractable, development dilemma the implications of which are far wider than just the energy sector.

In the case of Zambia it appears that the energy SMEs sector has attracted a number of technology 'enthusiasts', that lack training in business skills and/or are not primarily motivated to make money. Mr. Phiri of RASMA Engineering is a good example of this and, by his own admission, is not motivated by making money and indeed he laughed when recalling that others do not consider him to be a businessman. Furthermore he was happy to know that his stove design is now being copied and sold in Namibia where consumers are willing to pay a higher price, though he will not receive any income or royalties.

At the DoE, Mulenga stated that there is a lack of awareness regarding business opportunities in the energy sectors, stating that "we see SMEs as important in providing access to modern energy... [however] we need to find ways to formalise the production of efficient cook stoves", citing the fact that 'mbaulas' (traditional, less efficient, cheap stoves) are still too common in Zambia. Such generalised statements from individuals that occupy positions of expertise reflect the level of the debate regarding Zambia's energy SMEs. However, Mulenga stated that the DoE would welcome the formation of trade associations on the basis that "it's easier [to work with trade associations] than working with individual businesses, who sometimes contact the DoE to lobby for their own, narrow, interests".

Thus far there is only one energy SME association, the Biofuels Association of Zambia. This association has presented the DoE with suggestions as to what is needed in Zambia to make the biofuel market take off and they are currently "assessing the proposals and working out what is viable". The DoE claims that it wants to set a price for biofuels but that the producers in Zambia are not being transparent about their production costs, and so a deadlock has occurred on that issue. Citing its activities to promote energy SMEs, the DoE hosts an "Energy Sector Activity Group" which includes a renewable energy (RE) sub-sector to discuss issues of market opportunities. The DoE also hosts an 'Energy Week' as well as trade fairs to demonstrate energy technologies, where they join forces with other organisation such as WASAZA which promote the use of Biogas Digesters in Zambia. However it is clear, from discussions with SMEs including Muhanya and CLEF that the level of sector coordination for energy SMEs is very low, and in the case of solar energy, there is no representation.

Mulenga explained that the DoE sees its role in supporting SMEs as one of responding to the needs of business, and so they are waiting for businesses to do something, to approach them, stating that "... we listen, assess what they have proposed and then try to get clarity on what it practical to implement, taking into account our capacities." This is a fundamental point which serves to underline the lack of clarity regarding the leadership and coordination of energy SMEs in Zambia, since many of the entrepreneurs interviewed claimed that they are waiting for the government to take decisions that help support various energy markets, revealing a fundamental organisational capacity gap.

Kenneth Chelemu is the Technical Director of International Development Enterprises (IDE) in Zambia, an NGO that works to build entrepreneurial capacities from the bottom up. Chelemu argued that it is important not to forget the demand-side capacity gaps, i.e., that Zambian consumers, especially in rural areas, must be trained in the management of energy technologies as a built-in aspect of all business activities, to ensure correct use and longevity. Chelemu summarised the relevant human and institutional capacity challenges, stating that "we employ Farm Business Advisors...their job is not only to identify business opportunities but also to advise farmers on basic skills on how to use and manage new technologies to help improve their livelihoods". Related to this is the government's Citizenship Economic Empowerment policy that pledges to provide support to indigenous businesses, though it is unclear what the exact, concrete mechanisms, are of this support.

7.3.4 Research institutions and technological capacity

In Zambia a key player linking SMEs to research and development is the Technology Development Advisory Unity (TDAU) which is a semi-autonomous, non-profit, organisation within the University of Zambia, associated with the Engineering Department. Set up in 1975, the main function of TDAU is to conduct R&D across various programmes, including renewable energy, water, construction, food processing and agriculture. Mulambwa Imasiku, the director of TDAU, defined the organisation as a key “agent” in the technology transfer chain, whereby they package and register their technologies with patents, charging a fee to those using them.

With regard to SMEs, TDAU contacts relevant businesses to tell them about a new technology, but also responds to solicited advice and consultancy. Imasiku argues that intellectual property is not respected in Zambia and widespread copying exists, which limits the incentives for private sector innovation. Within the energy sector TDAU’s work has focused mainly on mini-hydro (a 2.5 kW system was developed and installed at the Mutanda Mission; however this became redundant when ZESCO connected the mission to the grid).

TDAU stated an interest in developing sawdust briquetting technology and have signed a technical support agreement with a Tanzanian organisation, to this end. Mr. Imasiku sees potential to deliver sawdust briquettes via SMEs and that all the necessary factors are in place in Zambia to promote this technology, with their aim to support the development and uptake of small-scale ‘pelleting’ technology. However, given the extent of knowledge and discussions held elsewhere with entrepreneurs including RASMA and Dread Works as well as the NTBC, it is unclear why this technology is not already in common use. On this point Imasiku argued that entrepreneurs in Zambia are not aware of energy issues, that they’d prefer to make money with other businesses, mainly retailing, and so “...it’s left to the intellectuals and fanatics to look at energy technologies”. Imasiku added that TDAU is not business-minded and the intellectuals that take an interest in energy issues are mostly unwilling to take entrepreneurial risks and so TDAU does not function as an incubator for energy entrepreneurs, per se. This dynamic reveals one of the dominant issues voiced by various energy SME stakeholders in Zambia, where there are poor linkages between the SMEs and technical support organisations.

Mr. Phiri of RASMA Engineering is enthusiastic about the idea of producing sawdust briquettes as a substitute for charcoal. He plans to collaborate with TaTEDO in Tanzania on the technology for briquette making in 2013 and then conduct energy content tests. With a US\$ 14,000 machine to compress the sawdust he claims he can supply half of Lusaka’s cooking-fuel needs, substituting for charcoal, and undercut the price of charcoal. He recognises that consumers are unlikely to take to the new fuel source right away and so he plans to conduct demonstrations at market places. Further, he claims that the sawmillers are happy to give their sawdust away given its environmental burden, though he will have to transport the material into Lusaka. Although the concept is plausible, and indeed is something that was mentioned by various stakeholders, there is a conspicuous lack of hard data on both the supply and demand side that would feed into a rigorous business plan, which appears to reflect a lack of research and/or systematic market testing and so the sawdust briquetting concept. This lack of basic data reflects a poor research capacity and/or organisational capacity in Zambia, to coordinate a study that would provide necessary basic data on the commercial viability of the technology.

Mukombo Tambatamba of the NTBC described his organisation as “...a vehicle through which technology R&D can be commercialised in Zambia”. The NTBC has a staff of about 27, divided into the technology and finance departments. Its business development work intends to function as an ‘incubator’ for SMEs. The NTBC also documents technologies in use in Zambia, conducts market assessments and has a specific

programme for technology transfer. The NTBC also operates a Technology Business Development Fund, which issues calls for proposal, currently an annual fund worth approximately US\$ 160,000. The Finnish government is supporting technology innovation in Zambia through the NTBC, including in the energy sector. Therefore the NTBC holds, in theory, a key position in the Zambian institutional landscape for supporting specific energy SMEs and in otherwise influencing the process of public support available to SMEs with regard to technology commercialisation. The NTBC has access to a network of registered businesses through the chamber of commerce. Trade Fairs, the Agricultural Fair and the Business Executive Exhibition, are all concrete events in Zambia that put entrepreneurs in touch with business support agencies, such as NTBC.

In terms of its operational processes, the NTBC is mostly demand-led, i.e., they are involved with SMEs that approach them, though it sometimes contacts specific businesses and promotes its work at trade fairs. Mr. Tambatamba referred to Zambian energy entrepreneur whom the NTBC sought to support; a company called Tapera Bio Industries that aimed to produce transport fuel from vegetable oil waste, sourced mainly from restaurants. The entrepreneur had some initial support from the US embassy who promised to purchase the fuel. However the business failed to expand due to lack of financing, despite having developed what appeared to be a commercially viable technology, with a clear, if initially limited, market.

7.3.5 Social and cultural factors

The final set of issues which influence the outcomes of efforts to promote energy SMEs in Zambia can be referred to as 'social and cultural factors'. These are, by their nature, mostly intangible aspects but ones that can have a powerful effect on the implementation of any given plan, policy or business activity. There are two important issues, with regard to energy SMEs in Zambia, that were referred to repeatedly by the stakeholders consulted for this research.

On the supply side the main issue is one of weak 'entrepreneurialism', i.e., the apparent lack of a strong, dynamic business culture where ideas and plans are effectively and efficiently converted into reality. When asked why he thought Zambia has a relatively poor record on entrepreneurship in the energy sector, Mr. Tambatamba, director of the NTBC, stated that: "...from our own experience we need them [entrepreneurs]...but we are very bad entrepreneurs, generally. I think it also relates to our culture, yes. So you need to constantly be mentoring them, teaching them, checking on them." However 'entrepreneurialism' should not be confused with enthusiasm or passion, of which there is plenty among individuals working in Zambia's energy technology development research. Rather, entrepreneurialism involves the ability to spot commercial opportunities and pursue them in a clear, structured manner, thus being something that incorporates human and organisational capacities. Although it was not the main focus of questioning, some interviewees volunteered to explain why they thought Zambia lacks a strong entrepreneurial spirit, the most common argument being the 'hangover' of decades of state-led and planned economy.

On the demand side, the main social or cultural issue raised by stakeholders was the need to convince household consumers and small businesses of the benefits of new energy technologies. This issue is most easily observed with the uptake of new, more efficient, cook stoves, especially with regard to the high capital cost vs. fuel savings, where there appears to be a non-saving culture, combined with a mentality that results in consumers accepting high discount rates on energy-related expenditure. Mr. Phiri of RASMA Engineering summed up the challenge by stating that "it is difficult to convince people that if they spend more money today on something, that it will benefit them in the future...". While the prospect of distant payback periods is also a barrier faced by many RETs in developed countries, the challenge of convincing consumers to buy efficient stoves is strong in Zambia where an US\$ 8 stove provides a payback time of

less than 3 months for a typical family of four. However there are other ‘cultural barriers’ that may be more universal to the uptake of new energy technologies, for example efforts to convince rural consumers of the benefits of a human waste biomass digester, which hasn’t been successful in Zambia.

When questioned on what had been, in his view, the most significant social or cultural change in energy use in the last 10 years, Mr. Tambatamba spoke of the “mushrooming” of efficient cook stove businesses, though recognised that these have had mixed successes and a limited market penetration due partly to weak demand and relatively low charcoal prices in Zambia. The NTBC has acquired sawdust briquetting technology from China however Mr. Tambatamba explained that education and awareness is needed to change perceptions of sawdust pellets and was unaware of any SMEs hoping to develop the technology in Zambia, as he was unaware of TDAU or RASMA’s interest in the technology.

Asked whether he believes SMEs a viable means to the development and delivery of clean, modern energy products and services, Mr. Imasiku argued that “...yes, they are worthwhile but the barriers need to be overcome... more awareness to improve knowledge of energy SME opportunities, so need for greater information campaigns. There are also cultural barriers to entrepreneurialism and attitudes to community ownership which are equally important but harder to solve”. Similarly, Ngosa of CLEF Energy argued that education is the key to changing popular perceptions towards new and renewable energy technologies, and compared the challenge in Zambia with the education of school children towards recycling in the UK where he observed a powerful cultural shift over the space of a few years. Others referred to the need for modern marketing, using mass media, radio, TV etc., to change popular perceptions of energy use and to educate consumers on the benefits of energy efficiency and clean energy.

7.3.6 Summary of workshop discussion on barriers in Zambia

The issues listed in the table below are a summary of the main ideas and arguments expressed by the local stakeholders that attended the one-day workshop in Lusaka.

	Demand-side issues	Supply-side issues
1	Easy to set up a business in Zambia now, but knowledge of relevant processes is required i.e., there is little support for those that don’t know how to set up a business	Consumer knowledge is limited regarding benefits of investing in efficient cook stoves and other clean energy solutions
2	Government not proactively supporting entrepreneurs/SMEs	Consumers very short-sighted: prioritise short term costs over longer-term gains, i.e., willingness to pay for higher fuels costs over capital cost of purchasing equipment.
3	Financial sector is largely foreign-owned with low levels of trust in lending to local businesses, especially SMEs	Difficulty for rural households to secure affordable loans for purchasing low/medium cost clean energy technologies, including cook stoves and SHSs. Microfinance is expensive.

4	Lack of continuity in government policies and programmes to support SMEs	
5	Possible hangover from past socialist policies/mentalities means lack of entrepreneurial spirit in Zambia. There are 'trade schools' in Zambia that promote practical skills but mostly geared towards training future business employees	
6	Lack of project monitoring and follow-up to ensure successful management by funding agencies, NGOs and government	
7	Lack of coordination and information between market players	
8	Missing link between research and entrepreneurs (examples: the Western province has lots of biomass (cow dung) lying around, rotting, when it could be used to fuel a biomass generator to supply a mini-grid or IPP connected to the grid. Also sawdust waste, e.g., in the Copperbelt Province, goes untapped	
9	Challenge for energy SMEs to secure affordable loans to start or expand business	
10	No government targets to drive the support or coordination needed to encourage banks to finance energy SMEs	
11	Often little incentive to be a businessman in a country where ownership (especially in rural areas) is often viewed as communal in tribal culture	
12	Lack of capacity/resources to identify and develop business opportunities	
13	Government did have a scheme to provide soft loans to all/ any SMEs but that this was abused, i.e., people often failed to pay back	
14	Policy is often good but implementation is poor	
15	Prevalence of view that government or international aid-based financing is 'free money'	
16	The government provides import tax breaks for solar PV and solar batteries and low-energy lighting. However these benefits are only for imported technologies and not for materials needed for local manufacturing, such as the efficient cook stoves	
17	Legislative process is very slow in Zambia	
18	Committee to discuss the FIT is slow and ineffective	
19	Too much talking, not enough action!	
20	Electricity tariff in Zambia is too low, and tariffs follow political priorities and not economic sense	
21	Lack of capacity in banks and financial institutions to lend to energy SMEs. AREED invited banks to learn about the sector but their interest has been limited.	

7.3.7 Solutions

A wide-ranging debate over the relevant barriers and solutions was conducted at the Lusaka workshop (see annex 11.1.1 for a list of participants). Through open discussion on what actions could/would serve to benefit the Zambian energy SMEs sector, the following needs were agreed upon:

1. An energy task force to coordinate energy policy implementation
2. Formation of business associations to represent energy SMEs
3. SME business incubators and/or the institutionalisation of business support and capacity building for SMEs
4. Improved awareness at the community and individual levels to empower rural consumers to identify energy business opportunities. This should be responsibility of the energy task force and /or pro-business NGOs like IDE
5. Improved communication, awareness and clarity on market incentives and energy prices in Zambia
6. To spread financial risks through sector-specific funds financed by various banks, organised through business associations. This would, in turn, lower interest rates and relax repayment terms.

7.4 Conclusions

In Zambia the concept and practice of energy SMEs has not taken root to the extent that it has in other countries involved in the AREED project, with few examples of commercially viable energy SMEs in operation. This research has identified a few reasons that appear to explain this outcome, namely: the lack of a strong entrepreneurial culture in Zambia; an emphasis placed on supporting strong energy business ideas, including innovative technologies, as opposed to supporting strong entrepreneurs; poor communication and coordination between technology and business support agencies and individual entrepreneurs; and the lack of clear energy policies and targets and state-backed support for SMEs to supply the energy market.

In addition to these factors, the Zambian economy is characterised by capital controls and high interest rates that inhibit lending to the SME sector in general, which serves to compound the lack of a demonstration effect hoped for by the AREED project to trigger commercial lending to energy SMEs. Nonetheless, there is no shortage of entrepreneurs willing to enter the Zambian energy sector, and numerous markets and technologies were identified by stakeholders consulted for this research. However, given the strong presence of donor-backed programmes offering grants and/or concessionary loans to small businesses in Zambia, there is evidence of a ‘dependency syndrome’ that appears to undermine the commercial basis for promoting energy SMEs as a concept, and in practice.

8. Overall conclusions and ‘lessons learned’

In this section we identify the main lessons that can be learned from more than a decade of initiatives to support energy SMEs in various countries in sub-Saharan Africa, with a particular focus on the AREED project. Here, the overall aim is to analyse our answer to the question “what has changed?”

This research’s focus on the ‘contributing factors’ is a deliberately broader term that incorporates the internal ‘success factors’ for energy SMEs, about which much has already been written. Indeed, the research findings presented in this report reaffirm most of what has been concluded in previous studies, including Kolominskas (2003); Mehlwana (2003); Denton (2006) and Napier-Moore (2006). These studies identified the lack of access to affordable finance as the being the predominant, persistent, barrier to establishing and scaling up a commercially viable energy SME sector, emphasising the lack of strong policy support from governments, poor business skills capacity and the high cost of many RETs as related cause-and-effect barriers.

While these issues continue to characterise, to a greater or lesser extent, the energy SMEs sectors in the countries studied for this research, it is more relevant to revisit the main assumption behind AREED and other donor-backed programmes designed to promote energy SMEs. The assumption is that the solution to the aforementioned barriers would be overcome by a ‘demonstration effect’ whereby successful energy SMEs, supported by donor-backed programmes, influence the commercial financial sector to invest in energy SMEs, thus triggering a virtuous circle of growth and profitability. Experience drawn from a decade of AREED support across four of the project countries reveal both the presence (Ghana, Senegal) and absence, or weak presence, of this demonstration effect (Tanzania, Zambia). This is a central question, and one which was not the focus of previous research, presumably because the answer was not fully apparent prior to 2006 when the last substantial work was conducted.

Where there is an absence, or weak presence, of a demonstration effect a number of explanatory factors can be identified. These include, inter alia, the lack of an entrepreneurial culture; an SME ‘dependency syndrome’ perpetuated by grant-based support from governments and donor agencies; persistent shortcomings in business skills capacity; lack of clearly defined markets; demand-side barriers to purchase relatively high capital-intensive energy products.

Where numerous energy SMEs are in operation and thus where a valid demonstration effect can be identified, there is a perceived paradox that serves to undermine commercial interest in investing in energy SMEs. The paradox is that the donor-supported businesses that were issued with concessional and/or flexible loans serve to demonstrate that these businesses depend upon such concessional terms, i.e., that they could not survive in ‘the real world’. While this assumption is widely regarded as self-evident by private investors, there are in fact other, more concrete, factors that act to undermine the demonstration effect. These include, inter alia, relatively high transaction costs of investing in SMEs; the inherently complicated nature of energy sector SMEs with longer supply chains and slower pay-back periods for capital-intensive technologies such as solar PV; rigid rules regarding the need to secure collateral.

These factors can be understood as structural issues that conspire to increase the financial risk of investing in energy SMEs and thus are not the product of ignorance on the behalf of the banking sector, which was assumed to be case (hence the need for a demonstration effect) by donor-backed programmes such as AREED. In the countries studied for this research, these factors are compounded by the high opportunity costs for banks where higher rates of return can be secured from investing in high-turnover businesses, for example those trading in high-volume, perishable goods. There is also a more general challenge faced by a range of SME entrepreneurs where such individuals and businesses are considered by banks to have an inherently higher risk profile, a factor which, to some extent, appears to be the product of 'anti-SME' discrimination, where investors favour larger corporate players operating under licence, often backed by strong branding, reputation and/or political connections.

To summarise: while ignorance of the energy sector doubtless continues to drive commercial apprehension in investing in energy SMEs, there are compelling structural reasons expressed by stakeholders that serve to perpetuate the development catch-22 that programmes such as AREED aimed to overcome. In the light of these analytical insights, it is useful to appraise N'Guessan's (2009) review of AREED project summarised in section 2.1.1 which identified the need to "remove financial barriers to energy SMEs" and "focus on removing institutional barriers". The review also recommended that countries set up a "National Steering Committee to ensure the follow-up and involvement of local parties (both private and public)", targeting the energy SME sector, and the "need for further national capacity building". While these issues reflect, on an abstract level, the reality of the challenge in promoting energy SMEs, a more concrete summary of the facts better serves to illustrate 'what has changed' (and what has not changed) in the decade since AREED was established.

Here, one major point concerns the role of government. There is a predominant view among stakeholders, across the countries studied, that governments are ineffective in designing and implementing tangible support for energy SMEs, despite politicians often providing strong rhetorical support. This point highlights an important status quo, and an issue that was itself one of the key rationales behind supporting energy SMEs in the first place, i.e., to by-pass government in efforts to supply sustainable energy technologies to low income consumers by supporting SMEs. However, early experience with the practical challenge of supporting energy SMEs led observers, including Denton (2006) and Napier-Moore (2006), to consider the role and importance of an 'enabling framework' necessary for energy SMEs to function and thrive. While this issue would appear to present itself as a chicken-and-egg dilemma, the research findings presented here from Senegal, and to a lesser extent with Ghana's LPG market, do suggest that conducive economic and regulatory conditions are a prerequisite for scaling up the commercial success of energy SMEs. At the same time, one of the well-understood success factors for specific energy SMEs is the head start given to relatively mature technologies that are reliable, easy to understand and suitable for local distribution, thus presenting a 'low-hanging fruit' opportunity for SMEs. LPG and fuel efficient cook stoves are the obvious technologies that have proven to be most commercially viable, and indeed the failure to conduct in-depth market testing for energy products and services has been a major cause of commercial failure for otherwise well organised and motivated SMEs.

A major geographical outcome is that energy SMEs continue to mostly operate in, and supply, urban and peri-urban markets. As such, programmes (including AREED) that were originally intended to address the rural market, where traditional fuel use accounts for major social and environmental impacts, have largely failed. This is due to low levels of entrepreneurial capacity, higher transaction costs for supplying a dispersed rural market, and demand-side barriers for capital-intensive RETs. However this market focus is not unique to the energy sector and entrepreneurial talents and opportunities tend to dominate in urban areas, across all sectors.

Another key outcome, following at least a decade of targeted support to energy SMEs, is the predominant focus on an SME's bottom line, promoted both by EDS programmes, donor and government policies which reveals a myopic emphasis on profit as the greatest force for good, as opposed to strategic, coordinated, investment in local human and manufacturing production capacity which could have more valuable development implications. The government's and donor's prioritisation of 'private profitability at all costs' would appear to miss an opportunity, especially in cases where local resources and skills are available for the manufacture of low-tech products that are otherwise imported. However, this observation comes up against the previously-identified dilemma regarding the evident difficulty that governments have in shaping the enabling framework for a specific sector or market, which is understood to be a key requisite for success.

When considering 'what has changed', it is necessary to reflect upon the context in which energy SMEs operate, i.e., to ask whether the SME model continues, in theory and in practice, to be an appropriate means of supplying modern, clean and sustainable energy. In the case of Ghana, a country with relatively high levels of grid electrification and rising incomes, it is apparent that the energy sector is changing. There is a greater need for larger MW-scale energy solutions and mini-grids, which in the foreseeable future is likely to render obsolete the kind of technologies typically supplied by SMEs, such as solar lanterns.

9. Reflections on the methodology and future research

It is useful to briefly reflect upon the methodology adopted for this research, both for the sake of assessing this report and for the benefit of future research. A qualitative approach, based on the ‘outcome harvesting’ methodology, was chosen because it enabled a detailed identification of the key contributing factors in the outcomes of specific energy SMEs documented in the country chapters. Here we understand ‘contributions’ as feasible claims made by stakeholders in influencing, to a greater or lesser extent, the identified outcome. As such, these are essentially stories told by individuals about ‘who did what’ and so cannot be measured, documented or understood by quantitative methods.

However, in order to ensure that the outcome harvesting methodology is applied as scientifically as possible, it has to be conducted under similar conditions, and consistently. Here, practical and time constraints during the fieldwork undermined a full and honest application of the methodology. Specifically, it proved difficult in some of the workshops to secure full descriptions of individual businesses, and the main contributions to their operations, during the half a day that was available for this task and so, in some cases, partial primary data had to be substituted by secondary data collection. Furthermore, conducting an ‘Outcome Harvesting by Consensus’ proved more successful in the workshops where there was a diversity of participants, informed and able to discuss specific businesses (Zambia and Tanzania), and was less effective in the workshops where there were fewer participants and/or a less diverse mix of participants able to counter-balance individuals’ claims and stories (Ghana and Senegal).

In terms of future research, the findings presented in this report cover a broad range of issues, both with regard to the ‘success factors’ for the internal functioning of specific energy SMEs, and to the role and importance of the enabling framework within which they operate. However it is clear that the relationship between energy sector entrepreneurs and the financial sector remains of fundamental importance, as the lack of affordable finance is understood to be the principle barrier to energy SME sector expansion. Specifically, given the apparent lack of impact of the demonstration effects created by the numerous commercially viable energy SMEs operating in Ghana and Senegal (less so in Tanzania and Zambia), a more systematic investigation of what would motivate commercial banks to invest in energy SMEs is justified, expanding on the issues identified in this report. To a large extent this gap in the knowledge reflects the fact that too few interviews were conducted with representatives of the banking sector for this research. There could also be value in conducting a more focused study to document the ongoing performance of specific energy SMEs, with more than 5 years of experience, to assess changes over time. This could take the form of a survey-based study to provide quantitative data on market growth and performance that would complement the key contributing factors and market barriers identified in this report.

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11. Annexes

11.1 Workshop participants

11.1.1 Zambia workshop, Lusaka, 11th September 2012

1	Lilian Zulu	CEEEZ
2	Dominic Mbewe	CEEEZ
3	Nancy Serenje	CEEEZ
4	Kenneth Chelemu	International Development Enterprises (IDE)
5	Noole Mass	Zengo
6	Bright Chalwe	National Technology Business Centre
7	John Mboози	National Technology Business Centre
8	Rashid Phiri	Rasma Engineering
9	Bernard Lusale	Micro Bankers Trust
10	Mary Chiluba	Farmer entrepreneur (Kafue district)
11	Verelia Banda	Farmer entrepreneur (Kafue district)
12	Lufunda Muzeya	Ministry of Energy and Water Developmebt . Dept. of Energy
13	Lazarus Chewe	Dread and Works Enterprise
14	Mulambwa Imasiku	TDAU (Technology Development Advisory Unity - University of Zambia)
15	Chanda Banda	Sylva Food Solutions
16	Satnam Virdy	University of Zambia/Solartech
17	Leah Banda	Rural Electrification Authority
18	Chilumba Ngosa	CLEF Africa Energy Ltd.
19	Kaila Geoffrey	Muhanya Solar Ltd.

11.1.2 Tanzania workshop, Dar es Salaam, 18th September 2012

1	Mr. Imanuel Muro	E+Co Energy through Enterprise
2	Joseph Ndunguru	Twiga Bancorp Limited
3	Maimuna Itanisa	Twiga Bancorp Limited
4	Debora Kiwale	TUJIJENGE Tanzania
5	Anna Mulalo	TUJIJENGE Tanzania
6	Gabriel Landa	Tanzania Private Sector Foundation (TPSF)
7	Aluti Myenza	IMED
8	Mr. S. J. Mwambije	ENVOTEC Service Ltd.
9	Klaus Winkler	Tanzania Renewable Energy Association (TAREA)
10	Oscar Lema	Alternative Energy Limited
11	Filbert Shoo - Manager	Sustainable Energy Enterprise Company (SEECO)
12	Mr. Mzumbe Musa	RESCO
13	Eng. Hamisi Mikate	ENSOL Tanzania limited
14	E. N. Sawe	TaTEDO
15	Lilian Njuu	TaTEDO
16	Editruda Daulinge	TaTEDO
17	Shima Sago	TaTEDO
18	John Kirigiti	CLAPHIJO Ltd.
19	Clara A. Ibihya	CLAPHIJO Ltd.

11.1.3 Ghana workshop, 25th September 2012

1	Albert O. Boateng	E+Co, Ghana
2	Mark Ofori Kwafo	Ecobank Ghana Limited
3	Moses O Nyamekye	Ghana Microfinance Institutions Network (GHAMFIN)
4	Omane Frimpong	CEO, Wilkins Engineering
5	Mr. Seth Mahu	Ministry of Energy
6	Kofi Asante	CEO, ICR Engineering

7	Frank Yeboah Dadzie	ARB APEX Bank
8	Foster Adu-Dartey	Impact Energies, Ghana
9	Ishmael Edjekumhene	KITE
10	Charles Owusu Boateng	KITE

11.1.4 Senegal workshop, 2nd October 2012

1	Soda Ndongo	Ministère de l'industrie de l'artisanat et des PME
2	Papa Macodou Sall	Agence de Développement et d'Encadrement des Petites et Moyennes Entreprises (ADEPME)
3	Bamba Fall	GVEP international
4	Adam Nodji Bob	LA MAISON SOLAIRE
5	Lamine Ndour	SIFFS
6	Daniel Vidal	SAEB
7	Assane Dieng	KAYER
8	Mamadou Sow	Bourse Nationale de la sous traitance (BNSTP)
9	Mageye Ndiaye	Bureau de mise à niveau (BMN)
10	El hadji Mbaye Diagne	Comité National Changement Climatique (COMNAC)
11	Abdoulaye BA	COSEER (Compagnie Sahélienne en Energie renouvelable)
12	Ndongo Gueye	Afric Building Services
13	Secou Sarr	ENDA
14	Jean pascal corréa	ENDA
15	Mamadou Cisse	ENDA

11.2 Interview questions for country stakeholder experts/entrepreneurs

1. Is there really a need for or market for energy SMEs? To what extent are they the solution to providing access to modern energy technologies?
2. What kind of energy technologies or services are best delivered by SMEs?
3. Do you think there is more awareness, understanding and appreciation of energy SMEs in your country now then 12 years ago?

4. Do you think it's easier for an entrepreneur to get a commercial loan for setting up or expanding an energy SMEs?
5. How, and to what extent, have various energy SME programmes influenced national energy policies to incorporate support for SMEs?
6. What is the 'enabling framework' for energy SMEs in your country? Has this changed?
7. To what extent have the businesses supported by the programmes enabled a transfer and/or diffusion of sustainable energy technologies, either in a North-South direction, or South-South, including within and between African countries?
8. To what extent were the respective roles of the various social actors and 'change agents' involved in these programmes properly defined and understood by everyone involved?
9. To what extent did AREED and other programmes effectively engage with the local financial sector to promote increased awareness and understanding, aimed at eventual commercial loans for energy SMEs? If so, how?
10. Have small scale energy SMEs significantly influenced the national energy access policy in the target countries? Did/have international projects effectively engage with national governments in order to promote/scale up the concept of energy SMEs? If so, how?
11. How did/does AREED relate to similar activities operating in XXX, for example E+Co, GVEP, Shell Foundation? Did AREED cooperate or compete with these initiatives, or operate in isolation from them? Has there been any sharing of information between the programmes?

Questions for entrepreneurs

1. Did your business benefit for EED support?
2. Why did you approach AREED/GVEP for support when setting up?
3. What this EED support useful/relevant?
4. Did you try to secure commercial bank support first? If not, why not? If yes, what happened?
5. Do you still see a market for energy SMEs? What are the barriers/limitations?
6. Can you still make money from energy SMEs? If yes, what technologies or markets are best?

11.3 Interviews conducted for this research (Sept-Oct 2012)

	Name	Position	Organisation	Place	Date
1	Mrs. Chiluba	Farmer	Farmer	Shimabala, Kafue District	12-09-2012
2	Mrs. Ngulube	Farmer	Farmer	Shimabala, Kafue District	12-09-2012
3	Rashid Phiri	Entrepreneur	Rasma Engineering	Lusaka	12-09-2012
4	Mulambwa Imasiku	Director	TDAU (Technology Development Advisory Unity - University of Zambia)	Lusaka	12-09-2012
5	Mukombo Tambatamba	Director	National Technology Business Centre	Lusaka	13-09-2012
6	Hector Banda	Chairman	Sylva Catering	Lusaka	13-09-2012
7	Bernard Lusale	Financial Services Programme Coordinator	Micro Bankers Trust	Lusaka	13-09-2012
8	Chilumba Ngosa	Managing Director	CLEF Africa Energy Ltd.	Lusaka	13-09-2012
9	Kaila Geoffrey	Managing Director	Muhanya Solar Ltd.	Lusaka	13-09-2012
10	Charles Mulenga	Assistant Director	Department of Energy	Lusaka	14-09-2012
11	Kenneth Chelemu	Technical Director	International Development Enterprises (IDE)	Lusaka	14-09-2012
12	Musa Mzumbe	Managing Director	RESCO	Dar es Salaam	19-09-2012
13	S. J. Mwambije	Director	ENVOTEC Service Ltd.	Dar es Salaam	19-09-2012
14	Lutengano Mwakahesya	Director General	Rural Energy Agency	Dar es Salaam	19-09-2012
15	Joseph Ndunguru	Head of Investment- Banking	Twiga Bancorp Limited	Dar es Salaam	20-09-2012
16	Gabriel Landa	Funds Manager	Tanzania Private Sector Foundation (TPSF)	Dar es Salaam	20-09-2012
17	Filbert Shoo	Manager	Sustainable Energy Enterprise Company (SEECO)	Dar es Salaam	20-09-2012
18	Oscar Lema	Managing Director	Alternative Energy Tanzania Ltd.	Kibaha	21-09-2012

	Name	Position	Organisation	Place	Date
19	Aluti Myenza	Trainer/ Consultant	Institute of Management and Entrepreneurship Development	Dar es Salaam	21-09-2012
20	Albert Kwaw Eliason	Country Manager	International Finance Corporation/Lighting Africa	Accra	24-09-2012
21	Boniface Taylor	Technical Director	Windfield Engineering	Accra	26-09-2012
22	Omane Frimpong	CEO	Wilkins Engineering	Accra	26-09-2012
23	Frank Atta-Owusu	Services Manager	Samsung	Accra	27-09-2012
24	Kofi Duose	Operations Manager	Anasset LPG	Accra	27-09-2012
25	Clara Koranteng	Owner	M38 LPG	Accra	27-09-2012
26	William Aye-Addo	Managing Director	Syscom Energy Ltd.	Tema	27-09-2012
27	Moustapha Ndiaye	Head of admin and finance	Fondation Sen'Finances	Dakar	03-10-2012
28	Issa Diop	Head of Investment	Banque Regionale du Solidarité	Dakar	03-10-2012
29	Mor Kassé	Deputy Director General	African Electric Manufactures	Dakar	03-10-2012
30	Luis Seck	Ex-Minister of Renewable Energy (2010- 12)	Ephata Global Energie et Environnement Consulting	Dakar	04-10-2012
31	Ousmane Fall Sarr	Head of Studies and Information System Unit	ASER	Dakar	04-10-2012
32	Aliou Lo	Director	Lobbougas	Dakar	04-10-2012
33	Mamadou Saliou Sow	Director General	SPEC (Sustainable Power Electric Company)	Dakar	05-10-2012
34	Bamba Fall	ESME (Energy SMEs) West Africa Manager	GVEP International	Dakar	05-10-2012

11.4 Small and Medium-sized Enterprises (SMEs)

Definitions of SMEs vary from country to country, according to the size of the economy, the structure of its corporate sector and any relevant policy frameworks. However, SMEs are most often defined by the total number of employees, total investment and sales turnover. In Europe, the European Commission defines a 'micro enterprise' as one with less than 10 employees and either a turnover or a balance sheet total of up to €2 million. A 'small enterprise' has less than 50 employees and either a turnover or a balance sheet total of up to €10 million and a 'medium-sized' enterprise is defined as one with less than 250 employees and either a turnover of up to €50 million or a balance sheet total of up to €43 million (European Commission Recommendation 2003/361).

Many academics refute the use of purely quantitative measures for the definition of an SME, instead choosing to emphasise a company's organisation and behavioural characteristics, such as their degree of legal independence, small-scale decentralisation, generally flatter organisational hierarchy, higher degree of informality, smaller market power and lower level of technological sophistication (Biggs 2002; Senderovitz 2009; Brytting 1991). Storey (1994) elaborates on these qualitative definitions of SMEs, identifying key economic characteristics such as owning a small share of the market, the inability to influence price levels, a limited customer base and the general lack of performance monitoring. Further, control of SMEs tends to be the responsibility of just one or two people and provide products and services that are marginally different than those of larger firms, and SMEs are less likely to undertake research and development than larger firms or undergo significant structural change.

According to the African Economic Outlook for 2005, a qualitative definition of SMEs based on the profile of the individual entrepreneurs and their strategy is more relevant and useful than purely quantitative criteria, when analysing African economies. Here, 'micro enterprises' are defined as family businesses that use simple technology and perform activities for the subsistence of the enterprise, i.e., the family. 'Small enterprises' are those whose owners possess some managerial and specific technical skills. They may rely on family members but they are usually registered, pay taxes and may even participate in a professional organisation. 'Medium-sized enterprises' involve substantial working capital, specific technology and therefore a medium to long-term vision on the part of the entrepreneurs. Such medium-sized firms are mostly formalised and pay regular taxes (AfDB and OECD 2005). Within the African context, the definition of an SME also greatly varies, with basic quantitative definitions varying significantly between countries.

Defining organisation	Definition
African Development Bank	Max. 50 employees
Gov. of Ghana	Max. 100 employees
Gov. of Tanzania	Max. 20 employees
Gov. of Malawi	Max. 50 employees

Source: Gibson, 2008

A study conducted by Calice et al. (2012) in Kenya, Tanzania, Uganda and Zambia found that 69% of banks in the surveyed countries defined SMEs solely in economic terms where size of loan and company turnover are the key criteria. Only 19% of banks in the sample considered number of employees when lending to SMEs.

11.4.1 Contribution of SMEs to economic growth

In many developing countries, SMEs constitute a significant portion of the national economy. Therefore, much effort has been focussed on SME development as a means to fostering economic growth that is more labour-intensive, entrepreneurial and competitive (Ayyagari et al 2007). In the Republic of Congo, nearly 80 percent of enterprises employ less than five people. In Kenya, SMEs collectively employ around 3.2 million people and contributed about 18 per cent of total GDP in 2003. In Nigeria, SMEs account for 95 percent of the enterprises in the organised manufacturing sector and around 70 percent of industrial employment. In Morocco, SMEs account for 93 percent of total enterprises, 38 percent of production, 33 percent of investment, 30 percent of exports and 46 percent employment. Even in South Africa – a more developed economy – micro and very small enterprises accounted for over 55 percent of total employment and 22 percent of GDP in 2003 whereas small enterprises accounted for 16 percent of both employment and production and medium and large firms accounted for 26 percent of employment and 62 percent of production (AfDB and OECD 2005).

From a survey of 47,475 enterprises in 99 developing countries in the period between 2006-2010, Ayyagari et al. (2011) found SMEs to be the biggest contributors to employment, with firms of 5-250 employees employing a median of 66.38% of the total permanent, full-time employment. Enterprises that are younger than 2 years were found to represent only a mean of 6.75% of employment, while enterprises that were older than 10 years represented at least 48.12% of total employment in low income countries. It was found that SMEs with 5-99 employees and more than 10 years old have the largest proportional share of total employment compared to other size-age groupings. SMEs with less than 250 employees were also found to produce the most new jobs, with the median country generating 86.01% of new jobs over the studied period (Ayyagari et al 2011).

Tadesse (2009) maintains that the relatively low capital needs of SMEs foster an 'efficient use' of capital, which they highlight is a high-cost factor of production in most developing countries. They even make the case that SMEs are inherently more sustainable to the extent that they tend to make use of available local resources, i.e., local suppliers and customers, minimising transport needs (Tadesse 2009).

Some academics claim that SMEs have other advantages over their large-scale competitors in that they are able to adapt more easily to market conditions given their generally broadly skilled technologies and flexible organisation, meaning they can better withstand adverse economic conditions (Kayanula and Quartey, 2000). Since SMEs are generally more labour intensive than larger firms they therefore have lower capital costs associated with job creation (Anheier and Seibel, 1987; Liedholm and Mead, 1987; Schmitz, 1995). By the same logic they are more likely to succeed in smaller urban centres and rural areas, where they can contribute to a more even distribution of economic activity in a region and can help to slow the flow of migration to large cities. Due to the regional dispersion of SMEs and their labour intensity it is argued that small-scale production units can promote a more equitable distribution of income than large firms, although this claim is made without empirical basis (Kayanula and Quartey, 2000; Abor and Quartey 2010).

11.4.2 Financing SMEs in Africa

The lack of access to affordable finance is often cited as the most significant barrier to the establishment and expansion of SMEs in Africa, especially for businesses operating in new or relatively unknown sectors, including energy products and services (Denton, 2006; Mehlwana, 2003).

Using data from the World Bank's Enterprise Survey which covered 13,685 companies¹⁴ across 38 sub-Saharan countries, Kuntchev et al. (2012) categorised enterprises into four categories: 'fully credit constrained', 'partially credit constrained', 'maybe credit constrained' and 'not credit constrained'. According to this categorisation, Kuntchev et al. (2012) found that among small firms, 28.8% are fully credit constrained, 30.3% are partially constrained, 10.9% are maybe constrained and 30.5% are not credit constrained. Among medium firms, 15.4% are fully credit constrained, 27.3% are partially constrained, 21.2% are maybe constrained and 36.1% are not credit constrained. Among large firms, 10.1% are fully credit constrained, 19.5% are partially constrained, 29.2% are maybe constrained and 41.2% are not credit constrained.

Given the fundamental importance of finance in the setting up and running of SMEs, it is useful to distinguish the main sources of external finance. For the purchase of fixed assets (capital goods) there are two main types of finance: equity (where the investor buys a share of the company value) and debt financing. Debt financing can be divided up into 3 types: formal debt financing which includes banks and other financial institutions; trade finance which includes obtaining credit from suppliers or customers and; informal credit from family, friends and moneylenders.

Using the World Bank Enterprise Survey data, Kuntchev et al. (2012) found that of the small businesses in sub-Saharan Africa that obtained external financing, 6.3% took the form of equity, 48.5% was formal external debt, 17.4% semi-formal financing and 27.8% informal financing. As can be seen in table 3 (below) the share of formal external borrowing increases as the size of the companies increase, with the levels of informal financing falling to 7.8% for large companies. As Kuntchev et al. (2012) point out SMEs in sub-Saharan Africa rely much more on trade credit and informal sources of financing than businesses in other regions. Kauffmann (2005) characterises this high reliance on informal borrowing as unpredictable, insecure and offers little scope for risk sharing due to a local, regional or sector-based focus for lending.

The reasons for the high level of informal financing are not necessarily clear or obvious and vary between countries and sectors, and hence this issue forms one of the lines of enquiry in this research. However, Kauffman (2005) highlights that formal financial institutions in sub-Saharan Africa are generally less willing to lend to SMEs due to the high risk of default, insufficient competition, poor guarantees and a lack of information about SME's ability to repay loans (Kauffmann, 2005). Furthermore the financial sector in most African countries remains underdeveloped, shareholding is not commonly practiced and long-term commercial financing is virtually unheard of for SMEs. As such it is often left to non-banking intermediaries such as microcredit lending to 'fill the gap' in financing for African SMEs, however such intermediaries are limited in their ability to support customers when they expand (Kauffmann, 2005).

¹⁴ From this sample 8,612 companies were classified as 'small' with less than 20 employees, 3,682 were classified as 'medium' with 20 to 99 employees and 1,391 were classified as 'large' with more than 100 employees.

11.4.2.1 Table 1: Percentage of firms by level of credit constraint

Region	Firm size	NCC	MCC	PCC	FCC
Sub-Saharan Africa	All firms	32.2%	14.1%	29.1%	24.6%
	SME100	31.8%	13.2%	29.6%	25.4%
	SME250	31.9%	13.7%	29.4%	25.0%
	SME500	32.0%	14.0%	29.2%	24.8%
East Asia and Pacific	All firms	44.2%	19.0%	11.8%	24.9%
	SME100	44.4%	18.0%	12.2%	25.5%
	SME250	44.2%	18.8%	11.8%	25.2%
	SME500	44.1%	18.9%	11.8%	25.1%
Eastern Europe and Central Asia	All firms	41.3%	31.0%	18.1%	9.5%
	SME100	42.1%	29.3%	18.6%	10.1%
	SME250	41.8%	30.2%	18.3%	9.7%
	SME500	41.5%	30.7%	18.2%	9.5%
Latin America and Caribbean	All firms	42.0%	26.7%	21.9%	9.4%
	SME100	42.3%	25.2%	22.5%	10.0%
	SME250	42.4%	25.8%	22.1%	9.7%
	SME500	42.3%	26.2%	22.0%	9.6%
Middle East and North Africa	All firms	41.6%	3.7%	20.9%	33.7%
	SME100	41.9%	3.5%	20.6%	34.0%
	SME250	41.7%	3.5%	21.0%	33.7%
	SME500	41.7%	3.5%	21.0%	33.8%
South Asia	All firms	43.0%	18.6%	16.2%	22.3%
	SME100	43.3%	17.8%	16.3%	22.6%
	SME250	43.0%	18.4%	16.3%	22.3%
	SME500	43.1%	18.5%	16.1%	22.3%

NCC: Not credit constrained; MCC: Maybe credit constrained; PCC: Partially credit constrained; FCC: Fully credit constrained

Note: SME100 reference firms with fewer than 100 employees, SME250 reference firms with fewer than 250 employees, and SME500 reference firms with fewer than 500 employees. Countries are grouped per region according to the World Bank classification.

11.4.2.2 Table 2: Credit constrained status across firm sizes

Region	Firm size	NCC	MCC	PCC	FCC
Sub-Saharan Africa	small(<20)	30.5%	10.9%	30.3%	28.3%
	medium(20-99)	36.1%	21.2%	27.3%	15.4%
	large(>=100)	41.2%	29.2%	19.5%	10.1%
East Asia and Pacific	small(<20)	46.5%	14.9%	11.0%	27.7%
	medium(20-99)	42.8%	23.9%	12.6%	20.7%
	large(>=100)	41.6%	41.3%	4.4%	12.7%
Eastern Europe and Central Asia	small(<20)	43.9%	24.7%	19.5%	11.9%
	medium(20-99)	38.4%	37.3%	17.8%	6.5%
	large(>=100)	34.5%	47.4%	14.5%	3.7%
Latin America and Caribbean	small(<20)	43.4%	22.1%	23.8%	10.7%
	medium(20-99)	40.0%	30.6%	21.5%	7.9%
	large(>=100)	42.2%	38.0%	14.9%	4.9%
Middle East and North Africa	small(<20)	41.4%	1.6%	21.0%	36.0%
	medium(20-99)	47.0%	22.9%	16.4%	13.7%
	large(>=100)	30.5%	16.9%	36.1%	16.6%
South Asia	small(<20)	43.1%	15.8%	16.6%	24.5%
	medium(20-99)	45.5%	25.6%	14.3%	14.6%
	large(>=100)	35.2%	33.6%	17.2%	14.0%

Notes: Countries are group per region according to the World Bank classification. In the Middle East and North Africa only the Republic of Yemen is included due to lack of data. The size classification is as follows: small – 5 to 19 employees; medium – 20 to 99 employees; large – 100 and above employees.

11.4.2.3 Table 3: Sources of external financing for the purchase of fixed assets

Region	Equity external financing	Equity external financing	Formal external debt	Semi-formal financing	Informal financing
Sub-Saharan Africa	small(<20)	6.3	48.5	17.4	27.8
	medium(20-99)	6.4	59.1	21.2	13.3
	large(>=100)	7.8	71.1	13.3	7.8
East Asia and Pacific	small(<20)	18.7	53.1	9.6	18.5
	medium(20-99)	16.6	59.1	9.4	14.9
	large(>=100)	14.6	74.3	8.3	2.8
Eastern Europe and Central Asia	small(<20)	68.4	N/A	31.6	N/A
	medium(20-99)	57.7	N/A	42.3	N/A
	large(>=100)	60.0	N/A	40.0	N/A
Latin America and Caribbean	small(<20)	18.7	49.7	23.5	8.2
	medium(20-99)	11.6	60.6	21.9	5.9
	large(>=100)	9.4	74.4	13.8	2.5
Middle East and North Africa	small(<20)	0.0	N/A	67.8	32.2
	medium(20-99)	28.6	N/A	66.9	4.6
	large(>=100)	5.3	N/A	94.7	0.0
South Asia	small(<20)	27.5	69.9	1.8	0.8
	medium(20-99)	24.1	72.7	3.0	0.2
	large(>=100)	20.1	74.6	4.9	0.4

*(Kuntchev et al 2012)***11.4.3 Government support and ‘enabling frameworks’**

While SMEs dominate economic activity in most sub-Saharan African countries, the explicit business policy and regulatory frameworks developed by governments tend to focus on supporting large corporate-driven economic development. In many African countries the challenge is to diversify the economic and administrative support towards SMEs in addition to the large-scale industrial development pursued in the post-colonial decades (Späth, 1992). A review of existing literature on the topic suggests that a number of pre-existing conditions are necessary to support SME development, including:

- A stable macroeconomic environment, including rational interest rates, tight control over inflation and competitive exchange rates

- A pro-business trade regime that minimises import restrictions (including tax waivers for targeted imports of strategic value to domestic business) and favours a gradual reduction in import tariffs
- Incentives to save and direct savings into investments such as a lower tax rate on initial profits that allows firms to retain more earnings
- Reforms to simplify and minimise the cost of business registration and formalisation, including decentralised administration
- Targeted policies that facilitate business transactions such as infrastructure development

Beyond establishing the correct macroeconomic and industry-specific settings, effective government support for SMEs also requires public agencies to perform a facilitating and mediating role between the main interest groups in order to overcome the range of non-financial barriers that exist at the sector level. This can include awareness raising activities, information sharing and simple communication of ideas and opportunities of mutual interest to SMEs and their consumers. Such activities constitute the intangible assets of human capacity necessary to make markets work, beyond the more easily measured financial barriers.

Other functions that can and should be performed by governments to support SMEs and their markets concern regulations aimed at levelling the playing field between businesses, including product testing and certification to ensure quality control. In defining quality control and certification governments can also support local SMEs that would otherwise face stiff competition from low-cost and low-quality imported goods.

11.4.3.1 Government Financing

Some African Governments, such as in Kenya and Ghana, have attempted to remedy the lack of access to finance for SMEs by supporting the growth of smaller commercial banks and rural banks, so as to bring traditional banks and SMEs closer, both geographically and business-wise. In 2005 South Africa passed two laws to encourage the expansion of savings and loan institutions (so-called second-tier banks) and co-operative banks (third-tier banks) as well as deregulating the banking sector to allow for more flexible terms on loans to SMEs. In many African countries commercial banks, mostly under pressure from governments, are also setting up their own micro-credit services, targeting at SMEs (Kauffmann 2005).

Governments can also intervene more directly in the financing of SMEs through the provision of subsidised credit facilities or guarantees that can either be managed by commercial banks to encourage the lending with more flexible (soft) repayment conditions and lower interest rates, or directly by a government agency responsible for supporting SMEs and/or a particular business sector. The need to steer available funding towards SMEs has been a perennial challenge, and one which requires clear and consistent support from governments (ECA, 2002).

11.4.4 Key Non-Financial Success Factors for African SMEs

In its study 'Enhancing the Competitiveness of Small and Medium Enterprises in Africa', the United Nations Economic Commission for Africa (ECA) (2002) identified other key success factors – either internal or external to SMEs – that are most relevant to the African context. While these factors are generic and cross-sectoral, they are relevant and fundamental issues that provide a useful starting point for informing the analysis energy SMEs for this research:

1. Technological capabilities and education
2. Marketing capabilities
3. Clusters, network and expansion

11.4.4.1 Technological Capabilities

The UN-ECA defines technological capabilities for SMEs as the “knowledge, skills and efforts required for firms to bring about an indigenous process of technological development” as a means to increase business productivity and innovation. In concrete terms, this refers to the implementation of quality controls, production scheduling, preventive maintenance and improving established technologies or creating new technologies (ECA, 2002).

The ECA quotes research carried out in Tanzania, Uganda and Zimbabwe that shows the most technologically advanced, productive and competitive SMEs are those run by well-educated entrepreneurs who, more often than not, inherited entrepreneurial knowledge and skills from their families or from employment experience and/or working abroad. Further, it was found that the entrepreneurs of well-performing companies in these three African countries paid higher salaries and spent more resources on training than the other companies (ECA 2002).

11.4.4.2 Marketing Capabilities

Marketing is an essential capability for all businesses, but one that is often lacking among otherwise well-managed SMEs in less developed countries. This includes the establishment of a marketing channel from production to the buyer, either through direct sales or retailers; organising relevant and economical logistics, i.e., transport of goods to market; branding and advertising and after sales services. The ECA (2002) argues that these issues have traditionally received less attention from policymakers and researchers alike, where the emphasis has been improving product design and manufacturing. The ECA report argues that the importance of product marketing is most acute for businesses aiming to export their products, however in an increasingly open global market place even SMEs aiming to supply only the local market need to improve their marketing capabilities given that they are often forced to compete with imported goods which often come highly packaged, advertised and connected to a local distribution network.

11.4.4.3 Clusters, networks and expansion

Business clustering, i.e., the sector-specific and/or spatial concentration of small enterprises, has been studied in various contexts and there is a consensus regarding their potential benefits. These include the creation of positive externalities, inter-firm cooperation and a focal point for targeted policy support. McCormick (1999) argues that clustering can be of particular value to less developed countries as they enable risk sharing between businesses and the pooling of limited capital and entrepreneurial skills within a defined space and infrastructure. However cases from around the world show that clusters tend to achieve significant growth only where trade networks are built up to connect production to markets, and where intangible assets such as high levels of trust are key to sustaining mutually beneficial relations between businesses operating in the same market (Brautigam, 1997; Knorringa, 1996).

In Africa business clusters have developed, but with mixed success. McCormick (1999) documents cases such as Ghana’s metalwork cluster in Suame and South Africa’s clothing cluster in Western Cape as having led to positive externalities for SMEs, namely access to markets, labour market pooling and technological

learning. Less successful cases include Nairobi's garment cluster in Eastlands and the metalworking cluster in Kamukunji which developed weak linkages and few technological spillovers (ECA, 2002). Various explanations are put forward to account for these differing outcomes, including the observed tendency for clusters that are limited to supplying local markets to experience 'involutionary' and not evolutionary growth, and that clusters that have strong distribution networks or are well connected to distant markets by traders tend to achieve higher incomes (Pedersen, 1997).

Related to the role and importance of business clusters and networks is the size factor of SMEs in determining their success. Many SMEs in African countries are set up and operated by individuals that, according to Rogerson (2000), pursue low-return activities where the barriers to market entry are low. Numerous studies have found that one-person businesses are the least efficient and profitable and that those entrepreneurs who recruited workers were more likely to survive, leading to a virtuous circle of expansion.

11.5 World Bank Enterprise Surveys

"The Enterprise Surveys are an ongoing World Bank project in collecting both objective data based on firms' experiences and enterprises' perception of the environment in which they operate". Survey covers 113 countries

Fully credit constrained

FCC firms have no external loans because loan applications were rejected or the firm did not even bother to apply even though they needed additional capital.

Partially credit constrained

Partially credit constrained companies include those that:

- a. Used external sources of finance for working capital and/or investments during the previous fiscal year and/or have a loan outstanding at the time of the survey, and either:
- b. Did not apply for a loan during the previous fiscal year and the reason for not applying for a loan was other than having enough capital for the firm's needs. Some of these reasons may indicate that firms may self-select out of the credit market due to prevailing terms and conditions, thus some degree of rationing is assumed or;
- c. Applied for a loan but was rejected.

However, firms in this group manage to find some other forms of external finance and, consequentially, they are only partially credit constrained.

Maybe credit constrained

Includes companies that:

- a. Used external sources of finance for working capital and/or investments during the previous fiscal year and/or have a loan outstanding at the time of the survey;

- b. Applied for a loan during the previous fiscal year

Not credit constrained

Includes companies that:

- a. Did not apply for a loan during the previous fiscal year;
- b. The reason for not applying for a loan was having enough capital for the firm's needs.

As firms in this group have had access to external finance and there is evidence of them having bank finance, they are classified under the possibility of maybe being credit constrained as it is impossible to ascertain whether they were partially rationed on the terms and conditions of their external finance.

Source: World Bank

11.6 Enabling frameworks for technology transfer

Enabling environment elements	Relevant government policies (examples of areas of influence)	Barriers addressed (examples)
National macroeconomic conditions	<ul style="list-style-type: none"> -Trade policies and laws -Tax , subsidies, and tariff regime policies -Regulation of financial sector institutions -Public investment policies -Commercial law and practices 	<ul style="list-style-type: none"> -lack of adequate financing options e.g., high cost of capital and interest rate -High inflation rate and high price fluctuations -Balance of payment problems -High import duties -Unstable currency and uncertain exchange rates
Human, organisational, and institutional capacity	<ul style="list-style-type: none"> -Capability building programs of governmental agencies and institutions -Initiatives to efficiency in government procedures and processes -Promotion of industry associations, networks, organisations, and alliances 	<ul style="list-style-type: none"> - Lack of functioning legal institutions -Lack of coordination between governmental agencies -Lack of stakeholder/community participation in technology choices -Lack of specialised governmental agencies

Enabling environment elements	Relevant government policies (examples of areas of influence)	Barriers addressed (examples)
Research and technological capacity	<ul style="list-style-type: none"> -Technical standards, certification, and codes -Public funded research and development and training programmes -Support for testing and demonstration facilities (including training programs) -Monitoring capacity enhancement programs -Property rights regimes policies 	<ul style="list-style-type: none"> -Lack of technology nurturing sites -Limited capacity to install, implement, operate, and maintain technology -Insufficient specialised expertise in technology, practice, or organisational system -Lack of institutions or initiatives to set standards
Social and cultural	<ul style="list-style-type: none"> -Information dissemination, outreach, and awareness raising campaigns -Targeted assistance to promote early adopters and technology front runners -Promotion of public-private partnerships -Education policies 	<ul style="list-style-type: none"> -Limited awareness, trust, or acceptance in the suitability/reliability of the technology -Aesthetical considerations of users technology (e.g., products lack appeal) -Community resistance to technology or practice -Tradition, social esteem, pride, laziness and religious belief discouraging technology adoption

Source: Boldt, J., Nygaard, J., Hansen, U.E., Trærup, S. (2012) *Overcoming Barriers to the Transfer and Diffusion of Climate Technologies*. UNEP Risø Centre, Denmark

11.7 Solar dryers in Zambia

Zambia, along with many other sub-Saharan African countries, has experienced a rapid diffusion of solar drying technology in recent years. Solar dryer are essentially a table whose main feature is a plastic sheet covering the fruit or vegetables which, combined with air flow, reduces their drying time to one third, compared to conventional drying (simply lying products in the sun) and minimises the risk of food contamination from dust and bird droppings etc. Food drying greatly reduces post-harvest losses as dried vegetables can be stored for months, into the next season. All vitamins and minerals are preserved through drying and dried vegetables are mainly boiled when prepared for meals.

Mrs. Chiluba is a farmer in Shimabala, Kafue District, approximately 45 km outside of Lusaka. She owns 7 hectares of land, slightly less than the average for small-holder farms in the region, and practices conservation farming. She acquired a solar dryer in July 2012, for which she took out a loan with the Micro Bankers Trust (MBT), which in turn received credit guarantees from the AREED II facility. The solar dryer was manufactured by Sylva Foods and was sold for 3.5 million Kwacha (approx US\$ 700). Sylva Foods promote solar dryers mainly for quality control and sanitation reasons and provide a guaranteed market for the dried vegetables produced using the solar dryers, paying an average of 8-10,000 Kwacha per kilo of dried vegetables which they then package and sell to supermarkets. MBT provided the loan at



a 30% annualised interest rate, which has to be paid back in 1 year at 350,000 Kwacha(US\$ 70) monthly repayments.

It takes an average of 3 hours to dry vegetables under direct sun, using the solar dryer. The estimated maximum capacity of the solar dryer is 2 kilos of dried vegetables, per drying. Assuming there are 9 hours of direct sunshine per day then the farmer would be able to produce a maximum of 6 kilos of dried vegetables per day, with a maximum value of 60,000 Kwacha (US\$ 13). Assuming 25 days of direct sunshine per month then this equates to 1.5 million Kwacha (US\$ 300), which would appear to make the solar dryer a worthwhile investment, though the figures are based on optimistic assumptions of almost constant drying throughout the month.

Solar drier built and sold by Sylva Foods, Shimabala, Kafue District, September 2012

At the time this research was carried out, Mrs. Chiluba had yet to produce and sell any products to Sylva Catering, but plans to dry lemons, okra, eggplant (aubergine), sweet potato, spinach, pumpkin leaves, paw-paw and mango, among other fruits and vegetables. Mrs. Chiluba learned about the solar dryer technology through one of IDE's Farm Business Advisors or 'go-to' men, who told them about a workshop where the technology was being demonstrated. No literature was provided to explain the technology, just verbal explanations. Mrs. Chiluba understands that the best product to dry and sell is 'chibwabwa' (pumpkin leaves), and although she claimed that the drying process itself is simple, the produce must be soaked first in hot, then cold water before they can be dried, which takes time and energy. Although she

has access to electricity in her home Mrs. Chiluba mostly uses charcoal under a traditional (non-efficient) stove to boil water, for which she pays 30,000 kwacha (US\$ 6) per 25 kg bag.

Mrs. Ngulube is a neighbour of Mrs. Chiluba in Shimabala and was similarly informed about the technology and the business opportunities it could provide her, and also took a loan through the MBT to purchase the drier, on the same terms. Mrs. Ngulube has 7 daughters and 28 grandchildren living with her on just 3 hectares of land. They have to rent land from neighbours to be able to grow enough food and raise animals, both for subsistence and sale to local markets. Mrs. Ngulube also practices conservation farming and claims to have increased her annual maize yield from 25 x 50kg bags to 230 x 50kg bags. Mrs. Ngulube explained that demand for dried vegetables has increased in Zambia due to health campaigns in the light of increased blood pressure and diabetes.

11.8 Energy SMEs that were awarded loans under AREED in Ghana

No.	Name of Organization/ Firm	Project	Year of Sub. Pro.	Year Approved/ Disbursed	Amount Requested/ Approved	Training Programme	Status
1	AB Management	Energy Efficiency; Power Factor Correction, Industrial	2001	2003	US\$ 120,000/ US\$122,400	Participated in AREED entrepreneurs training programme from 14th to 16th February, 2001 in Accra	Successful
2	Anasset	LPG Retail and Marketing Company	2002	2002	US\$ 38,000	One on one training sessions with KITE Officials	Successful
	Anasset II		2007	2007	US\$ 225,000		
3	Fee-Hi Ventures	LPG retail	2004	2004	US\$ 27,000/ US\$ 33,500	One on one training sessions with KITE Officials	Successful
4	Gladymmanuel I	CFLs	2002	2002	US\$ 200,000 /US\$70,000	Participated in AREED entrepreneurs training programmes	Successful
	Gladymmanuel II		2004	2004	US\$ 150,00/ US\$50,000		
5	Lambark Gas I	LPG Distribution	2004	2004	US\$ 70,000/ US\$109,746	Participated in AREED entrepreneurs training programmes	Successful
	Lambark Gas II		2006	2007	US\$ 250,000		

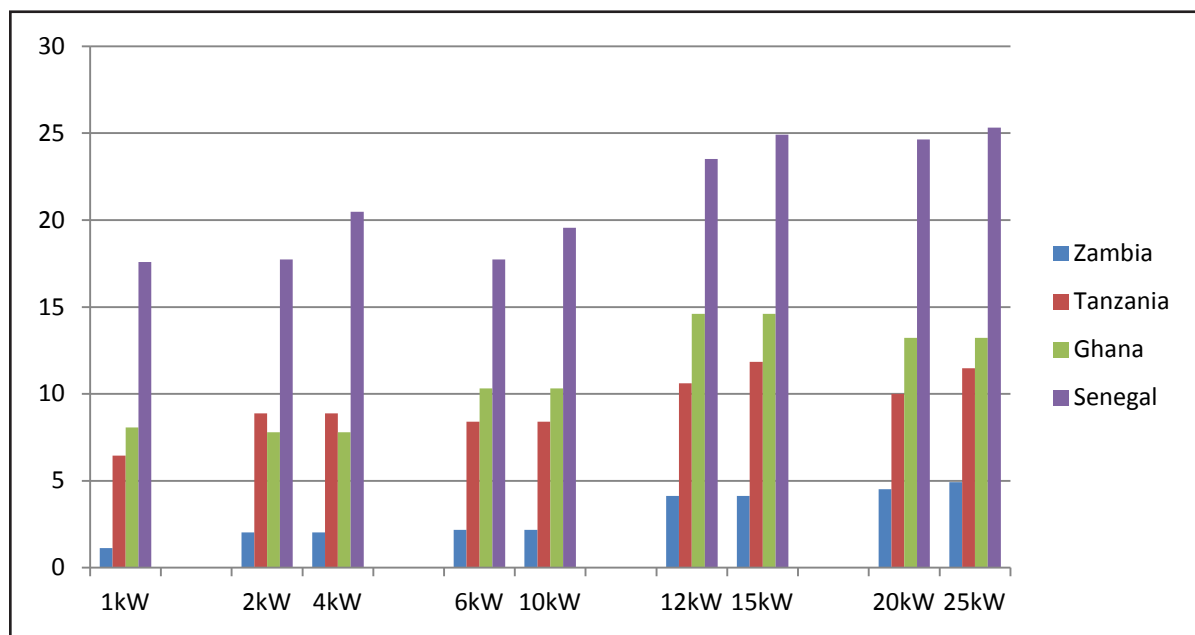
No.	Name of Organization/ Firm	Project	Year of Sub. Pro.	Year Approved/ Disbursed	Amount Requested/ Approved	Training Programme	Status
6	M-38	LPG Distribution	2004	2004	US\$ 59,000	Participated in the AREED entrepreneurs training programme	Successful
	M-38 II		2007	2007	US\$ 50,000		
7	RKA	LPG Stoves	2005	2005	US\$ 173,469/ US\$104,080	Participated in the AREED entrepreneurs training programme	Successful
8	Trans-Legacy Ventures	LPG Stoves	2002	2002	US\$ 20,000	Participated in the AREED entrepreneurs training programme	Successful
9	ABARA Gas	LPG Distribution	2005	2006	US\$ 211,00/ US\$ 102,990	Participated in the AREED entrepreneurs training programme	Successful
10	Bansim Binara (BBE)	LPG Distribution	2005	2006	US\$ 86,451/ US\$ 46,000	One on one training sessions with KITE officials	Successful
11	Power World I	Energy Efficiency	2006	2006	US\$ 77,912	One on one training sessions with KITE officials	Successful
	Power World II		2006	2006	US\$ 70,000		
12	Toyola	Biomass Cookstoves	2006	2006	US\$ 70,000	One on one training sessions with KITE officials	Successful

No.	Name of Organization/ Firm	Project	Year of Sub. Pro.	Year Approved/ Disbursed	Amount Requested/ Approved	Training Programme	Status
13	WilkinSolar	PV Solar Home Syster & Solar Water Heaters	2005	2006	US\$ 127,000	One on one training sessions with KITE officials	Successful
14	Best Solar	PV Solar Home Syster & Solar Water Heaters	2007	2007	US\$ 45,000	Participated in KITE training programmes	Successful
15	NorthLite	Solar Lighting Products	2011	2012/2012	US\$120,000/ US\$50,000	Enterprise Development Support to entrepreneur	The approved amount is yet to disbursed

11.9 Electricity tariffs 2010 in Zambia, Tanzania, Ghana and Senegal

Electricity tariffs (2010)(cents US/kWh)			Zambia	Tanzania	Ghana	Senegal
Social tariff (E=100kWh/month)	1kW		1,13	6,46	8,07	17,58
Single phase domestic usage	2kW		2,04	8,88	7,8	17,74
(E=200kWh/month)	4kW		2,04	8,88	7,8	20,47
Triphase domestic usage	6kW		2,18	8,4	10,32	17,74
(E=600kWh/month)	10kW		2,18	8,4	10,32	19,56
Commercial usage	12kW		4,13	10,61	14,61	23,52
(E=1 800kWh/month)	15kW		4,13	11,84	14,61	24,91
Semi-Industrial & motive power	20kW		4,52	10	13,22	24,63
(E=2 500kWh/month)	25kW		4,92	11,48	13,22	25,31
Medium voltage	250kW		4,72	9,91	14,06	20,09
(E=35 000kWh/month)						

OECD average household tariff = 14,5 cents UD/kWh (WEO, 2012)



Source: www.updea-africa.org/updea/DocWord/TarifAng2010.pdf



This report presents the findings of primary research carried out in Ghana, Senegal, Tanzania and Zambia which revisited the main assumptions behind the African Rural Energy Enterprise Development (AREED) initiative (2002-2012), and other donor-backed programmes, designed to promote small and medium-sized energy enterprises (energy SMEs).

These assumptions were (1) that the lack of affordable local financing presented the most significant barrier to setting up and expanding energy SMEs, and (2) that this barrier could be overcome by a 'demonstration effect' whereby successful businesses, supported by donor-backed programmes, could in turn influence the commercial financial sector to invest in energy SMEs, thus triggering a virtuous circle of growth and profitability.



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