Exploring Energy SME Financing in Emerging and Developing Countries

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PREFACE

"Exploring Energy SME Financing in Emerging and Developing Countries" is a contribution to the BMBF[1] funded research project "Climate Change, Financial Markets and Innovation (CFI)" of the Sustainable Business Institute (SBI). This study is based on the close cooperation between SBI, the Research Group Microenergy Systems of the Technical University of Berlin and MicroEnergy International (MEI).

Nearly one-fifth of the global population, or 1.3 billion people, lacks access to electricity (IEA 2011). Therefore, the SBI focused on the exploration of business models for off-grid electricity supply[2] and, in addition, the challenge of raising funds or, more specifically, the existence of a financing gap for local SME. In order to further explore the sector and its opportunities for private companies, the SBI conducted a workshop with private sector decision makers and other experts in April 2012 in Frankfurt, Germany. Key findings of the studies, interviews and the workshop were:

- Local companies in emerging and developing countries in most cases lack access to formal financial services and markets. Therefore, they are not able to provide adequate financial and maintenance services to their rural customers – a key issue for long term market deployment.

- The specific risk-return structure of local companies – low volume of refinancing need combined with high transaction costs – is difficult to handle for both public and private investors and credit agencies.

- Public support for pilot projects is often available. However, public support for scaling up, e.g. specific regulations or support programs, are rarely in place.

- Effective and efficient public support for market development should focus on facilitating (small) investments for local companies, reduce or reallocate fossil fuel subsidies[3], import tax reductions for quality products and grants not for customers but for special purposes such as public buildings and capacity building.

This study discusses and refines the identified issues, further clarifying the above mentioned funding gap that local energy SMEs in emerging and developing countries face. By considering the perspective of both, specialised funds and local companies, a significant funding gap between microfinance and commercial banks / funds is identified. Thereby the challenge is not the availability of capital in general but the amount of required capital that is in most cases too high for microfinance and too low for national and international banks. The authors find that current structures for funding are not adequate to meet the challenge of scaling-up private sector activities for energy access in emerging and developing countries. These findings have been discussed, refined and confirmed during a workshop at the conference "Micro Perspectives for Decentralized Energy Supply – 2nd International Conference" in March 2013 in Berlin.

[1] Federal Ministry for Education and Research, Germany

[2] Friebe *et al.* (2013)

[3] One interview partner suggested a voucher system that could be used by low income households to either buy fossil fuels or to pay back their solar home system.

The findings conclude that policy makers at the national and international level could address this gap by several measures such as credit subsidies (instead of grants), support for service infrastructure and competition based on quality of products and services (instead of price). Thereby, this study is a relevant contribution to the ongoing debate on public and private financing mechanisms including specific funds such as the “Green Climate Fund”. These funds are supposed to channel large amounts of funding towards the diffusion of climate friendly technologies, for example renewable energy technologies, in emerging and developing countries. This investigation suggests to explicitly address the challenge of scaling-up local companies with proven solutions in the field of access to energy. A structured dialogue between policy makers, private and public investors and technology providers could facilitate the quick implementation of suitable measures. For such a dialogue this study explores what should be discussed, who should be included in the discussion and how all stakeholders could be coordinated effectively to address the identified barriers.

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EXECUTIVE SUMMARY AND KEY RECOMMENDATIONS

Small and medium-sized enterprises (SMEs) distribute solar photovoltaic-based energy solutions to low-income populations in developing and emerging countries. Like many SMEs, these "energy SMEs" face a financing gap, i.e. a systematic absence of funding (Beck & Demirguc-Kunt 2006; Thampy 2010). Using case studies and interviews with energy SME funders, we confirm the existence of the financing gap and explore its causes and impact, as well as potential mitigation approaches. Our results reveal the specific challenges to obtain funding: the financing gap is mainly caused by information asymmetries between energy SMEs and financial institutions, high working capital costs due to international sourcing of product parts, high upfront costs in establishing service infrastructure, and reduced liquidity for energy SMEs offering end-user financing options.

As a summary, this study confirms and refines issues that were discussed during the CFI-Workshop in April 2012 in Frankfurt. The need for end-user finance and maintenance that was highlighted in the workshop is clearly confirmed by this study. However, the required investments in service infrastructure as well as financing services are an additional challenge for local companies. Therefore, this study refines our understanding of refinancing needs - the "financing gap" - that the workshop participants roughly estimated to be between USD 50,000 and USD 500,000. According to the workshop participants the most important reason for the financing gap is the unfavourable link between (low) investment sums and high transaction costs (e.g. through the complicated due diligence processes). This issue could be further refined. Moreover, this study specifies the call of workshop participants for policy makers to focus more on facilitating investments and less on grants. The latter is recommended only in very specific applications such as public buildings or due diligence cost. More specifically, this study reveals the following recommendations for enterprises, funders and policy makers to improve access to finance for energy SMEs (focus: solar PV) targeting underserved populations:

1) For enterprises and funders: Shift focus towards sustainable business models, particularly integrating end-user finance and after-sales services

Both funders and entrepreneurs confirmed the information asymmetries regarding technical quality levels of products in the markets. Both customers and investors tend to have less knowledge about technical aspects that determine the lifecycle of products, potentially leading to an adverse selection problematic. Entrepreneurs can, however, mitigate the risk of adverse selection by signalling quality to their customers and investors by offering end-user financing, incorporating after-sales services and even offering guarantees. With additional competencies, enterprises can compete successfully against low-priced products that may appeal to customers in the short term. Accordingly, funders need to adapt their screening processes, technical assistance and performance indicators to the requirements of such service-based business models rather than pure one-off product sales.

2) For funders: Innovate in investment screening and technical support services during the screening process

Funders reported that a major challenge in investing is the high cost associated with screening an enterprise and ensuring investment readiness. Reducing costs in these core activities

requires innovation in the ways that funders collect market data at the base of the pyramid, provide coaching to entrepreneurs and establish monitoring and evaluation systems. One financier stated that a substantial share of cost reduction can come from replacing face-to-face support with remote assistance through internet communication. Furthermore, funders could explore potential synergies with other stakeholders, such as firstly, scientific and educational institutions in order to reduce the costs of objective and rigorous market analysis, evaluation as well as monitoring and, secondly, local financial institutions in order to gain local knowledge on the market and to develop their competencies in the energy sector. The latter is key in order to better link specialized founders and conventional financial institutions. Generally, reducing risks based on more and better information emerged as a difficult but worthwhile effort for all stakeholders.

3) For policy makers: Encourage competition based on quality of services and customer satisfaction

Adverse selection of low quality products not only harms enterprises that sell higher quality products but also end users themselves as purchased products tend to break down more frequently. Consequently, when designing policy intervention to advance solar BoP markets, policy makers and donors should take into account the importance of promoting entrepreneurs for the establishment and growth of service provision infrastructure: Collection of payments on systems and provision after-sales services. Policies with respect to quality standards, guarantees, and other instruments should take this critical factor into account to maintain energy access in the long run.

4) For policy makers: Apply targeted subsidies that support establishing service infrastructures and consider undertaking credit subsidies and guarantees (plus capacity building)

As stated in the previous recommendation, policies need to address the adverse selection effect at the end-user level. Subsidies in particular are a very attractive mechanism for facilitating the creation of entire industries that catalyze rural electrification, as demonstrated by the examples in Bangladesh and Nicaragua. On the other hand, oversized capital subsidies (e.g. 2 year grant programs) have been criticized for leading to boom and bust cycles in market development instead of long term market development, e.g. through support for service infrastructure development. Policy makers should study the effects that different designs of subsidies can have on the development of energy SMEs and their ability to provide clean energy in a financially sustainable way. Consequently, policy makers require a more differentiated understanding of both the establishment of after-sales service networks and of end-user financing, in order to devise subsidy mechanisms that support long-term growth. Important levers seem to be firstly, public private partnership funds that leverage private capital through public grants for due diligence, co-investment or specific guarantees (credit guarantees, currency guarantees, …) or other mechanisms of risk-sharing and, secondly, framework conditions that help the whole sector such as import tax reductions or minimum quality standards. Each instrument requires a considerable amount of capacity and knowledge building with all involved stakeholders – especially but not only at the local level.

1. INTRODUCTION

Despite decades of international efforts, energy poverty is still rampant in the developing world. Nearly one-fifth of the global population, or 1.3 billion people, lacks access to electricity (IEA 2011). Often omitted from such statistics are the one billion people that have poor access to grid electricity, i.e. a low quality, interrupted service that is subject to blackouts and systemic failures (AGECC 2011), such as those recently experienced in northern India[4].The statistics quantify the dismal energy situation of the majority of the global population. This one billion relies on fossil fuels and solid biomass to meet its daily energy needs. Besides the widely documented negative impacts of burning these fuels on human health and the environment (Canadell *et al.* 2009; WHO 2006), the poor also tend to pay much more for energy than their wealthier counterparts, not only in the absolute monetary cost per unit of energy, but also in terms of time expended for the collection of fuel, which can amount to substantial portions of the day (DFID 2002; IFC 2012a)[5].

The high energy cost per unit faced by the poor presents a concrete business opportunity for companies aiming to extend sustainable energy products and services to the base-of-the-pyramid (BoP) market, i.e. the nearly four billion people who live in relative poverty, earning less than USD 3,000 per year in local purchasing power (Hammond *et al.* 2007). The poor already spend USD 37 bn each year on low-quality, unhealthy energy solutions for cooking and lighting (IFC 2012a). Energy savings and energy efficiency, as well as the productive use of microenergy systems, can therefore ameliorate the financial situation and the livelihood situation of private households (Allderdice & Rogers 2000; Harsdorff & Bamanyaki 2009). Consequently, a multitude of companies, a substantial portion of them start-ups and most of them small and medium enterprises, have come up with innovative business models to provide cleaner, cheaper, more reliable energy alternatives. They target customers with no or only limited access to sustainable energy solutions and design their products and services around a range of technologies, including solar home systems, solar lamps, biogas digesters, efficient cookstoves, and hybrid mini-grids, among others, each of which differs in term of business model and comes with unique funding requirements. The falling costs of some of these technologies over the long term are stoking the flames of business innovation (Levai *et al.* 2011). The IFC (2012b) contends that 90% of households that currently lack access to modern sustainable energy can afford some form of lighting / electricity because they currently pay more per month for traditional and fossil fuel-based products. There are already notable examples of success in tapping into these under-served markets in creative ways, such as Grameen Shakti in Bangladesh and SELCO in India, which are discussed in this study. While the term 'energy SME' could refer in general to the companies described above and cover a wide range of technologies, here we define an 'energy SME' as an SME whose core business is the distribution or sale of solar photovoltaic-based energy solutions. They focus on solar results of mere practical reasons of comparability but also on high existing market potentials in many emerging and developing countries.

[4] Numbers are estimated to be even higher and are subject to on-going research within the Microenergy Systems Research Group.
[5] Further quantitative results are to be published by the Microenergy Systems Research Group.

Ensuring energy access is generally viewed as the task of governments and utilities, whose preferred method of energy delivery has historically been grid extension. However, grid extension and densification is only economically viable where a certain threshold of customer density exists with ability to pay and is therefore not carried out in sparsely populated or remote areas (Kaundinya *et al.* 2009; Nguyen 2007). Many governments have not yet enacted policies that specifically target rural electrification (Balachandra 2011). Recently, the UN General Assembly has declared the years 2014-2024 to be the "Decade of Sustainable Energy for All", calling for the urgent "need to improve access to reliable, affordable, economically viable, socially acceptable and environmentally sound energy services and resources for sustainable development" (UN 2013). The UN's "Sustainable Energy for All" initiative is designed to raise the issue of sustainable energy access on the agenda of development institutions, aid agencies, affected governments and the business community in order to increase their participation in achieving the targets, which calls for universal access to sustainable modern energy services by 2030 (Ki-Moon 2011). One of the key strategic tenants put forth by the UN, which is ubiquitously echoed by supporting organizations, is the need to involve the private sector, particularly SMEs, in a comprehensive approach to achieving the targets (UN 2012).

SMEs play an important role in job creation and poverty reduction (Ayyagari *et al.* 2011; Bauchet & Morduch 2012). "SMEs are seen by many national governments and international development organizations as important engines of innovation, economic growth, employment, and poverty reduction" (Bauchet & Morduch 2012: 3). However, despite their vital social and economic role, SMEs in developing countries face significant growth constraints that appear to be linked with a lack of access to finance (Beck & Demirguc-Kunt 2006).

This financing gap could be the result of an overall absence of resources or structural problems in distributing available resources. There is evidence that, on a global level, there are not enough international funds available to develop access to clean energy (Bhattacharyaa 2013). However, this absolute deficit does not sufficiently explain the specific challenges faced by energy SMEs.

They can only be drivers of economic development and provide access to sustainable energy in developing and transition economies if they receive access to appropriate re-financing. Four factors specific to their business might limit this access: high upfront costs, the need for customer financing, specific technologies with certain internationally-sourced components, lack of funder understanding, etc. (Kariuki & Rai 2010; Levai *et al.* 2011). This indicates structural reasons for the financing gap but so far very limited in depth research on this financing gap exists.

Having said that, this report builds upon the main hypothesis that there is a financing gap that inhibits the successful operation and growth of energy SMEs and which is related to the particular challenges faced by energy SMEs. It further enhances the understanding of this financing gap along the following research questions:

1. What is specific about energy SMEs, especially in terms of the challenges they face?
2. Can the existence of a financing gap for energy SMEs be confirmed?
3. If so, what are the reasons for this gap and how can the gap be bridged?

The remainder of this report is organized as follows: Chapter 2 analyses the existing literature regarding the existence of a financing gap, its influencing factors and key players involved in the field around energy SMEs. Chapter 3 briefly summarizes the methodology used for this report whereas chapter 4 presents the results according to each of the three main research questions. Chapter 5 describes measure to address the financing gap. Finally, chapter 6 concludes the report.

2. LITERATURE ANALYSIS AND CONCEPTUAL FRAMEWORK

2.1 Financing gap

A series of cross-country surveys done by the World Bank between 2002 and 2003 reveals that SMEs[6] worldwide are confronted by greater barriers to both local and foreign sources of debt financing than larger businesses, and are more dependent on internal funds and retained earnings to meet their financing needs (Cull *et al.* 2006). Ayyagari *et al.* (2007) echo this finding in their study, which indicates that small firms and ones in countries with ineffective institutions use less external finance than other enterprises. In another cross-country study, Beck and Demirguc-Kunt (2006) reconfirm that small enterprises have less access to formal sources of external finance. This, they conclude, offers an explanation for why SMEs face growth constraints in many countries.

Over the past few years, there has been a substantial amount of literature describing the existence of this financing gap for SMEs, particularly in developing countries (Banerjee *et al.* 2011; Edwards & Turnbull 1994). Whereas higher-end financing of large enterprises is taken up by conventional banks, private equity, and similar large-scale players, the lower end of the financing spectrum has been increasingly covered by microfinance institutions (MFIs). MFIs provide loans sized between several hundred dollars and a few thousand dollars to households and small and micro enterprises. However, there is still a financing gap between MFIs and the conventional players, which is reflected in the SMEs that are already too large to be served by MFIs, yet too small to approach conventional players. Consequently, Banerjee and Duflo (2011: 181) state that "finding ways to finance medium-scale enterprises is the next big challenge for finance in developing countries".

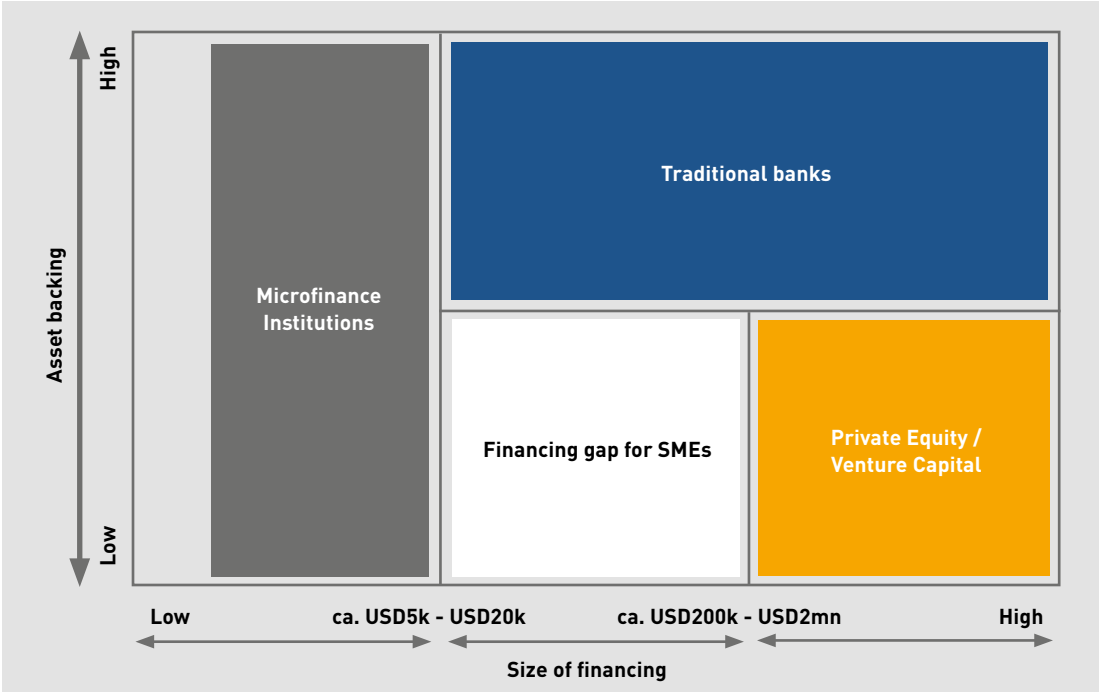
Based on previous research, we characterize this gap as starting from approximately USD 5,000 – USD 20,000 and reaching up to ca. USD 500,000 – USD 2 mn[7]. This is roughly in line with the World Bank's proxy for SME loan sizes of ca. USD 10,000 – USD 1 mn (Ayyagari *et al.* 2007). The starting and ending points of the gap may vary depending on the country context. The financing gap is particularly apparent for those types of financing that are not backed by assets. Interestingly, it extends even to asset-backed financing, i.e. financing mechanisms that employ assets as collateral, for example working capital loans with asset backing or loans

[6] The World Bank defines an SME as fulfilling at least two of three characteristics: (a) between 10 and 300 employees (b) assets between USD 100,000 and USD 15 mn and (c) annual sales between USD 100,000 and USD 15 mn.

[7] A Facet (2005) report states that only a very small segment of venture capital firms aim at the market segment of investment sized USD 20,000 to USD 500,000. A macro-screening of the sector indicates that a majority of MFIs, depending largely on the country of residence, provide financing up to a size of roughly USD 5,000 – USD 20,000. Dalberg (2008) identifies a "missing middle" where small and growing businesses face greater difficulties in accessing debt and equity financing in the size of USD 25,000 – USD 2 mn. Barreiro *et al.* (2009) define the upper edge of financing gap at ca. USD 2 mn.

fixed assets such as factories or property as collateral. Figure 1 depicts the financing gap as characterized in this report.

Figure 1: The financing gap for SMEs in developing countries



Formal microfinance activities have become mainstream in many developing countries, processing high volumes of small and micro loans (Armendáriz & Morduch 2007; Yunus 2004; Yunus & Weber 2008). Microfinance loans for entrepreneurs are designed for household businesses with established business models, allowing for short payback periods. They are not designed for the incubation of new business models and funding and development. Seed money or patient capital for an energy SME requires longer payback periods and larger investments than microfinance offers (Devine *et al.* 2010). Significantly, in many countries, MFIs tend to stick to urban and peri-urban markets, out of reach of the mostly rural poor. Commercial banks would be the middle way for loans starting at USD 5,000 because, like in developed economies, they often fill in the space of SME financing (Markson & Hokenson 2003). However, mainstream risk calculations and entrepreneurs' lack of collateral in developing countries makes them ineligible for such loans. Defining the upper edge of the gap is traditional private equity, where investments start at about USD 2 mn (Barreiro *et al.* 2009). Smaller investments are not economical for traditional venture capital and private equity firms due to high transaction costs (Dalberg 2011; De Ferranti & Ody 2009).

2.2 Influencing factors

Based on our research, the financing gap that affects SMEs targeting the BoP in general is the result of a convergence of disincentives for funders for three main reasons:
First, negative funder perceptions associated with rural BoP markets limit investment. BoP customers often live in remote, sparsely populated rural areas lacking basic infrastructure as

well as commercial, financial, and public institutions that support entrepreneurship in urban areas. Rural supply chains are underdeveloped in many countries, and BoP businesses tend to offer low margins with high transaction costs, especially where technical assistance is needed. Sometimes, there is a complete lack of awareness of promising business models on the side of the funder (Bellanca & Wilson 2012), especially when new business models are being pioneered (Koh *et al.* 2012). Even when the awareness exists, funders may be deterred by the non-transparent nature of many SMEs due to missing information and a lack of reporting systems that are necessary for screening and due diligence (Barreiro *et al.* 2009). In fact, financing constraints reported on the side of SMEs appear to be higher when there is less transparency regarding the credit histories of enterprises (Love & Mylenko 2003).

Second, there may be a mismatch between financial institutions' operations and services and the needs of SMEs. The usual requirements of financial institutions often cannot be met by energy SMEs, such as collateral, which small- and medium-sized energy entrepreneurs frequently do not have. In addition, financial products are not typically designed for BoP businesses. Loan periods for energy SMEs may be too short to correspond to the longer payback periods of the consumer loans taken by the SMEs' customers. Often, due diligence systems are not flexible enough to accurately assess SMEs. There may also be discrepancies between the requirements of the financial institution and the accounting and management processes of SMEs, such as the lack of a credit-scoring system tailored for SMEs (Beck & Demirguc-Kunt 2006; Berger & Udell 2006).

Third, the investment environment in some countries may be sub-par or even hostile. There may be a lack of instrumental policy or legal framework, political instability, or a history of armed conflict (Anderson *et al.* 2010). Therefore, financial markets are frequently underdeveloped; for example, they lack capital markets that offer exit opportunities to private equity firms (Barreiro *et al.* 2009). The confluence of any number of these factors increases the risk, real or perceived, of investing in SMEs at the BoP, leaving a financing vacuum that impedes the development and growth of these enterprises, and particularly, as will be shown, of energy SMEs.

Although studies exist that touch on factors contributing to the financing barriers that SMEs face, as cited above, until now, little academic research has been done on the precise nature of the financing gap plaguing energy SMEs (Beck & Demirguc-Kunt 2006; Dalberg 2011; Devine *et al.* 2010). Nevertheless, a selection of literature from industry specifically focused on the challenges faced by energy SMEs sheds some light on this specific financing gap and the factors that may constitute elements of the financing gap confronting these particular businesses. We describe these factors separately below and then summarize them in Box 1.

First, Levai *et al.* (2011) confirm the systemic absence of funding for energy SMEs, which we refer to here as the 'financing gap,' stating that this gap is the most urgent one across the entire energy value chain in developing countries. This financing gap is perpetuated by the perceptions and approaches of traditional financial institutions, on the one hand, and real business development challenges faced by energy SMEs on the other. Much like the commercialization of microfinance, now a multi-billion dollar industry, the energy SME sector must be tested over years or decades before it can become an attractive asset class to traditional investors (Levai *et al.* 2011). There are thus relatively few energy SME success stories, but the ones that do exist, such as that of Grameen Shakti in Bangladesh, underscore the vital role

which access to finance plays in unlocking an SME's potential to reach hundreds of thousands or even millions of customers. It is therefore crucial to analyze the barriers to accessing finance for energy SMEs (Grameen Shakti 2012; IDCOL 2012).

The industry-based reports go into further details about the reasons for the financing gap. For example, Morris *et al.* (2007) and Friebe *et al.* (2013) confirm that there is a great need for such customer financing in energy product / service distribution. This creates strains on the liquidity of energy SMEs striving to provide customer financing options and thereby amplifies the financing gap. Furthermore, this liquidity strain could create bottlenecks along the value chain, necessitating further funding (Lighting Africa 2010).

Second, there is evidence of a significant capacity deficiency on the part of financial institutions and investors with respect to knowledge or familiarity with the technologies employed by energy SMEs. Levai *et al.* (2011) stress the need for institutional capacity-building of financial institutions that wish to implement energy programs if small-scale energy business models are to become viable, indicating that the institutions' foray into energy SME lending requires specialized skills and processes. Kariuki and Rai (2010) report a lack of technological awareness among the staff and management of local financial institutions regarding the products of their potential clients, which contributes to the former's aversion to extending credit, and Barreiro *et al.* (2009) further confirm this. It can therefore be deduced, that the lack of technological understanding on the part of financiers may be a contributor to the financing gap.

Third, the difficulty of establishing the proper service infrastructure is a recurring theme in literature sources. Certain energy technologies, such as SHSs, require teams of technicians for installation and regular servicing. However, the costs incurred though operating this infrastructure in sparsely populated areas is prohibitive, making physical delivery and servicing of products a bottleneck to developing the market for clean energy (Friebe *et al.* 2013; Levai *et al.* 2011). This service infrastructure is crucial to the success of energy SMEs because it protects the viability of the energy SME by ensuring customer satisfaction (Kariuki & Rai 2010). However, especially where time-bound donor funds are involved, continuous financing for long-term maintenance services is difficult to secure (Devine *et al.* 2010).

Fourth, because some energy SMEs are forced to source components internationally, they encounter international trade issues. Import duties on certain products, such as the electrical components of SHS, may retard the development of energy SME markets. Furthermore, the process of importing requires complex coordination, most often with legal-binding agreements, between various companies involved in manufacturing, shipping and warehousing, which, according to anecdotal evidence, represents a barrier for some SMEs (Levai *et al.* 2011).

Last, energy subsidies are another example of a policy-related risk that can drastically affect the success of energy product distribution. For example, in India, kerosene is heavily subsidized by the government, so the cleaner alternatives, such as solar lamps, are inevitably more expensive, incentivizing customers to use kerosene lamps and not favor innovative energy SMEs (Levai *et al.* 2011). Because energy SMEs are dealing with both energy sources and frequently foreign-made technologies that might include specific import duties, they are subject to greater political risks compared to other SMEs that rely on local manufacturing. Moreover, the IEA (2011) and Devine *et al.* (2010) stress the importance of establishing the right political framework in order to enable energy access provision in developing countries,

as the sector is greatly affected by policies on the national and regional levels, including grid extension and subsidies.

Box 1: Potential factors that contribute to the financing gap

1. Energy SMEs run a high risk of falling into liquidity traps because they pay suppliers up-front and at the same time grant their customers gradual payment (financing) for products.
2. Energy SMEs are a unique sector that requires specific technical and sector experience and understanding. Funders also require this sector understanding when desiring to invest into it.
3. Energy SMEs have difficulties in setting up a network of dealers or individuals to service and maintain products for customers.
4. Energy SMEs very often source internationally, leading to increased complexity in handling international trade issues (import bureaucracy, tariffs, etc).
5. Energy SMEs are subject to significantly higher policy risks than other SMEs (e.g. decisions on extending the electricity grid, subsidizing different types of energy, etc).

While this body of literature gives valuable insight into the probable causes for the financing gap for energy SMEs, it provides only a disjointed and incomplete picture of the nature of the financing gap and its root causes. The literature tends to illuminate either isolated aspects of financing difficulties vis-à-vis sections of the business value chain or describe challenges of energy SMEs in multiple sections of the value chain without delving deeply into the nature of the financing challenges. This report aims to address this deficit by making a comprehensive investigation of the financing gap over the entire value chain of solar PV energy SMEs. Although this sector is still in its infancy, much can be learned from the collective experiences of financial institutions and energy SMEs which have begun to address the gap.

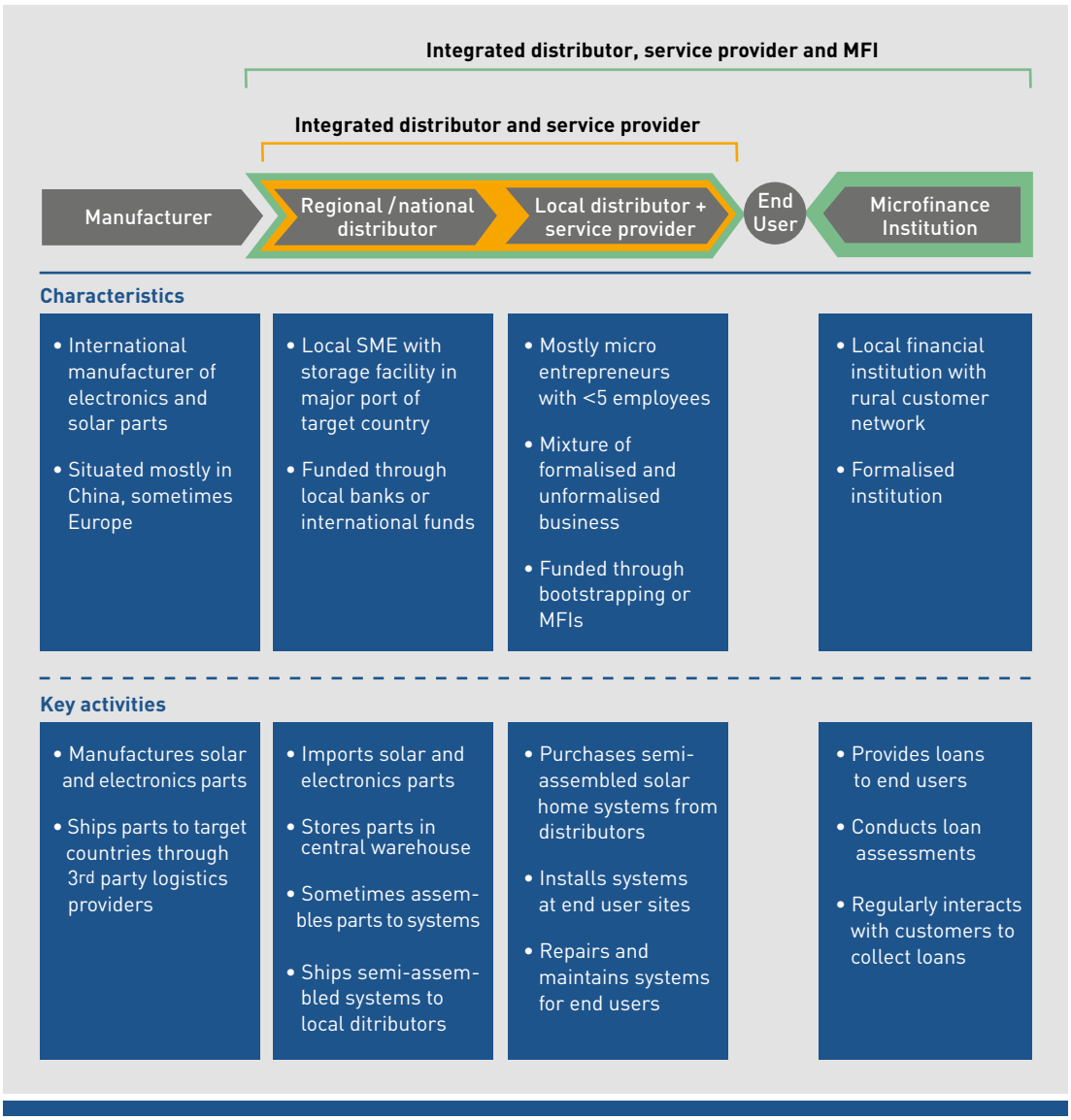
2.3 Identifying the players

Bringing solar products and services to the base of the pyramid is a strenuous task that requires the participation and interaction of several different players, each with their particular functions. The players described here have been identified based on MicroEnergy International's practitioner experience in the field and are supported by literature (Levai *et al.* 2011). For simplicity, we divide all participating actors into two groups: (1) those that are directly involved in the provision of products and services, which make up the direct BoP solar energy value chain, and (2) those that play key supporting roles by providing financing and setting policy frameworks.

Actors that provide products and services

A string of players makes up the BoP solar energy value chain, starting with manufacturers, followed by system integrators, regional and / or national distributors, local distributors and service providers, and at times also involving MFIs or other end-user finance components. Energy SMEs, depending on their business models and level of vertical integration, may fill one or more links in the value chain. The following section will describe the characteristics and key activities of these players as they relate to the value chain. These are summarized in Figure 2.

Figure 2: Value chain in the solar BoP market



We differentiate between the following actors in the BoP solar energy value chain:

- Manufacturers — Manufacturers produce the products or components that energy SMEs introduce into their markets[8]. Depending on the technology, SMEs may source domestically, as is sometimes the case for certain components of SHSs, or internationally. PV panels, inverters and other specialized electronic components for solar systems are almost always manufactured internationally, usually in China, but also in Southeast Asia and Europe. This requires the products to be shipped to the country of destination via a third party logistics provider.

- Regional / National distributors — The regional / national distributor is a local SME that that links the local distributors with the imported energy products and components, often employing an 'over-the-counter' business model in which end-user sales are left to others. The goods are received at the port of entry, warehoused in bulk at a centalized storage facility and sometimes partially assembled by the distributors or system integrators, businesses that purchase components from manufacturers and assemble them to fit local needs. The goods are then shipped out to the local distributors. Regional / national distributors are in most cases formalized businesses located in urbanized areas and are often financed via local banks or international funds. Zara Solar in Tanzania is an example of this type of distributor.

- Local distributors and service providers — Local distributors are the key element linking the energy technology to the end-users. This entails purchasing the semi-assembled components from the upstream distributors, and either selling them in local markets from a retail shop or transporting them to the customers, installing them on site, and sometimes includes servicing and maintaining the systems for the end-user. For example, Naco Solar in Uganda acts as a local distributor. In contrast to regional / national distributors, local distributors can be micro-enterprises (less than five employees) and might operate informally.

- Microfinance Institutions — MFIs are, in many cases, the only formalized financial institutions that are willing or able to lend to the customers of energy SMEs or small informal local distributors. Focused on loan volume, MFIs create an expansive client base with whom they interact on a regular basis to collect loans and engage in marketing activities. Some MFIs have built up extensive infrastructures to carry out these operations and have amassed vast amounts of customer data. In some cases, MFIs form partnerships with distributors to offer energy products to their existing customer network. Such MFIs sometimes go beyond the financing of products to selling them as well, contracting local partners to handle the sourcing of parts as well as installation and servicing of the systems. Examples for this model, in which MFIs are local distributors of energy products, are Fondesurco and Caja Huancayo in Peru. However, these two MFIs are still an exception in this respect (Mohiuddin 2006).

[8] e.g. Schneider Electric in France, Solarworld in China, and Phocos in Germany.

As shown in Figure 2 above, distributors may well be integrated into several stages of the value chain. In practice, we see different forms of integration taking place. Focusing on importing and distributing products to local retailers carries a lower relative risk and may allow for scaling up and potentially distributing to far-off regions. A significant motivation for this may lie in the reduction of coordination and control costs through this approach. An example of this is Zara Solar in Tanzania, which installs larger systems in its core regions on its own, but reaches the rest of the country by selling to independent retailers. Integrated distributors and service providers not only handle the imports, but also the local distribution and servicing of products. They face more governance and internal control issues. However, in theory they can also have much greater outreach to rural areas. Tecnosol (2012), for example, is taking this approach to some extent. Finally, the completely integrated player unites importing, assembly, servicing, and end-user financing under the same roof. The most cited example for this is Grameen Shakti, which has managed to achieve the largest scale in the energy SME sector to date. SolarNow Uganda is currently adopting this approach with a franchising model for selling and servicing through micro distributors.

Actors that facilitate market development

Energy SMEs operate in a complex environment in which a range of different actors have different stakes and specific functions. According to Devine *et al.* (2010), this list includes, but is not limited to, governments, financiers of varying types, overseas development institutions, consultants, suppliers, and end-users. The players directly relevant to understanding the energy SME financing gap are financiers and public authorities:

- Financiers — a variety of financial players is linked to the financing gap and is briefly outlined below, beginning with those with the closest proximity to the SME. For reference purposes, the different financial players are grouped and labeled according to their respective roles vis-à-vis energy SME funding.
  - Local financial institutions — Typically domestic enterprises, local financial institutions are mostly commercial banks, who target local markets with business financing and at times consumer loans, but may also include, to a much lesser extent, venture capital and private equity.
  - Funders — This group consists of impact investors as well as venture capital funds, often headquartered overseas. Depending on their objectives, they aim to maximize the financial, social and/or environmental impacts of investments. Often their approach lies at the border between traditional investment and philanthropy, providing technical assistance to develop businesses to become investment grade. Funders apply both conventional financing mechanisms like direct equity and debt and innovative financing mechanisms such as credit guarantee schemes, factoring, and provision of funds to MFIs.
  - Investors — This refers to the institutions that refinance funders, generally a mixture of private profit-driven investors and official development assistance (ODA) institutions, including philanthropic foundations, bilateral donor organizations, multilateral development banks, and other large international organizations. Historically associated with large centralized energy projects, i.e. large hydro, nuclear and thermal power, these institutions have in recent years acknowledged the importance of energy SMEs with respect to providing sustainable energy access.

- Public authorities — National and, to a lesser extent, local governments have the task of ensuring an investment environment that is conducive to energy SMEs. Such a policy framework may include a range of policy instruments, such as energy access targets, tax incentives, and subsidies for renewable technologies, to name a few. Public authorities can also provide direct financial assistance, such as grants, special funds and guarantees. Traditionally the energy sector has been highly regulated. However, since the electric grids often do not extend beyond urban and peri-urban areas, government regulation outside these areas is also rather rare. In our interviews, policy risks and risks related to interactions with government are generally seen as relatively low by both funders and businesses in the sector. However, the potential roles that governments can play in shaping the sector should not be underestimated. The cases of Bangladesh and Nicaragua show that governments can participate actively in unlocking the potential of solar energy for businesses at the BoP.

Systematic development and growth of energy SMEs requires that the different financial players and governments provide a comprehensively supportive environment to meet the unique needs of these enterprises. Financing gaps are formed when players are not able to fulfill their functions, are not coordinating effectively with each other, or are simply missing from the equation.

3. METHODOLOGY

Our approach to understanding the financing gap is to directly target the players that confront it every day: energy SMEs and their funders. In-depth interviews with both sets of stakeholders will illuminate the gap from different perspectives, pinpointing the nuanced challenges that specifically affect the energy SME sector and specific links in the value chain, as well as describing current efforts to overcome the gap. Here the scope of the report and the research procedure will be briefly outlined.

Scope

This report investigates energy SMEs. The specific size of SMEs, as defined in the introduction, differentiates energy SMEs from energy service companies (ESCos), as well as the fact that energy SMEs include not only service providers but also distributors of energy products. For practical and analytical reasons, we limit the scope of this report to energy SMEs that sell solar photovoltaic systems to customers with unstable or no grid access, particularly those at the base of the pyramid. Solar SMEs also serve as useful models for analysis because they potentially face financing barriers at any of the links in the value chain, from sourcing technologies to financing end-users. For the remainder of this report, reference to 'energy SMEs' or simply 'enterprises' implies solar PV energy SMEs.

Procedure

The report is carried out in multiple phases. First, based on the literature analysis, potential factors that contribute to the financing gap were developed and listed in Box 1 in Chapter 2.2. Second, two sets of questionnaires were drawn up, one for the funders and one for the SMEs, designed for a semi-structured interview format. The funder questionnaire attempted to determine what makes energy SMEs unique with respect to other SMEs that target the BoP and what impacts these differences have on financing. Another section addresses details about funder activities, the amount of resources dedicated to the activities and the challenges involved in carrying them out. The energy SMEs questionnaire aimed to elicit their particular financing challenges along the various stages of development. Third, semi-structured interviews were conducted (see Appendix for a list of interview partners). Interview partners were identified and contacted through the Microenergy Systems' professional network. Fourth, the raw data was analyzed in an iterative process and compared to the hypotheses derived from the literature. Subsequently, preliminary conclusions were drawn. These findings could be discussed and refined in detail at a workshop with 30 participants comprising founders, entrepreneurs and academia. This workshop was part of the conference "Micro Perspectives for Decentralized Energy Supply – 2nd International Conference" in March 2013 in Berlin (Wiese & Steidl 2011).

Data

We divided our interviewees into two groups: those affiliated with SMEs and those affiliated with funders (in current or former employment or ownership relationships).

The interviewees are currently or were in the past affiliated with the funds shown in Table 1 or the companies shown in Table 2.

Table 1: Funder Profiles

FUNDER	GENERAL PROFILE	MAIN SUPPORT ACTIVITIES	TECHNOLOGIES
Arc Finance	- Founded in 2008 - Headquarters: Calgary, Canada - Employees: < 10 - Current projects in Africa (Kenya, Ethiopia), Asia (Afghanistan, India, Philippines) & Latin America (Haiti)	- Refinancing support to MFIs and other financial institutions investing in micro energy-related fields - Technical assistance to financial institutions for establishing energy lending programs	- SHS - Solar lanterns
E+Co	- Founded in 1994 - Headquarters: New York, United States - Employees: 19 - Formerly active in Asia, Africa & Latin America - Focus recently shifted to Africa	- Mostly loans sized ca. USD 50,000 - USD 500,000 at rates of ca. 7%-13% - Financing for product businesses (energy SMEs) and project financing - Technical assistance in business planning, market/ demand analysis	- SHS - Improved cookstoves - Water filtration systems
GVEP	- Founded in 2002 - Headquarters: London, United Kingdom - Employees: 34 - Africa & Latin America (work in 19 countries)	- Provision of guarantees to MFIs and distributors for loans to micro entrepreneurs - Capacity building for MFIs to enable lending to micro energy enterprises - Technical assistance to micro enterprises	- SHS - Solar lanterns - Solar phone charging - Small hydro - Biodiesel
HIVOS	- Founded in 1968 - Headquarters: The Hague, Netherlands - Employees: 265 - Active in Africa, Asia & Latin America (26 countries)	- Grants, soft loans to energy SMEs - Technical assistance (legal, technological, market research, management) - Assisting in deal flow with other funds	- SHS - Biogas
SolarNow	- Founded in 2008 - Headquarters: Kampala, Uganda	- Integration of sales, credit and distribution in one approach: - In-house sourcing and distribution of products - In-house end user financing with a 1-year payment plan and monthly collections - In-house quality control & system monitoring - Establishment and coordination of affiliated dealer network (micro-enterprises)	- SHS - Solar lanterns

Besides funders, we conducted interviews with three solar PV enterprises focused on Solar Home Systems (SHS) targeting customers with no or unstable access to electric grids: Grameen Shakti in Bangladesh, Tecnosol in Nicaragua and Zara Solar in Tanzania. These companies are relatively established solar energy businesses that have already moved past the initial stages of development and have secured several rounds of financing to build their businesses. Focusing on established energy enterprises allows for a more thorough analysis because they have the ability, due to years of accumulated experience, to provide meaningful insight into challenges faced at different stages of business development, from creating the business model to scaling up operations. Additionally, these SMEs can convey experiences of successfully coping with the financing gap along each stage of development. The data on the case studies is summarized in Table 2.

Table 2: Business model and history of energy SMEs

ENTERPRISE	BUSINESS MODEL	FINANCING AND BUSINESS DEVELOPMENT HISTORY
Grameen Shakti Bangladesh	- Sale of SHSs and, to a lesser extent, biogas plants and improved cookstoves - Integrated distribution, service provision and end-user financing - Local distribution via rural branches - End-user financing of 24 or 36 months. Paid in monthly installments after down payment. - Cost of after-sales service included in repayment rate	- Founded 1996 as not-for-profit - Initial funding secured from Grameen Trust, Stitching Gilles and other donor for total of ca. USD 140,000 in grants - Slow but significant increase in sales: over 3,500 SHS installed by 2000 - Grameen Bank covered losses,USD 44,000 expenditure over income by 2000, with interest-free loans - Convinced investors of sustainability of business case; secured ca. USD 4 mn in grants, mostly from USAID, and over USD 850,000 in soft loans from IFC and Stitching Gilles, loan guarantee by Grameen Bank - Capital used for expansion. Revenues doubled immediately. By 2001, 6,700 SHS sold. - In 2001, financial sustainability achieved, thereafter profits reinvested in growth - By 2006, sold nearly 80,000 SHSs - Secured subsidized loans from government of Bangladesh to scale up operations. Refinancing of government by multilateral funders boosted funds - By 2010, over 500,000 SHSs sold

ENTERPRISE	BUSINESS MODEL	FINANCING AND BUSINESS DEVELOPMENT HISTORY
Tecnosol Nicaragua, Panama and El Salvador	- Sale of SHSs and, to a lesser extent, wind, hydro and solar-thermal systems - Importer, national and local distributor, local service provider - Mostly cash-based sales, but in the process of integrating end-user financing capabilities	- Founded 1998 with 12 SHSs, purchased with USD 9,000 of founder savings - Banking crisis in early 2000s resulted in small lines of credit at very high interest rates - Lack of financing options from commercial and national banks led founder to secure personal loan from former employer, Nicaraguan Electric Company - Access to grants from Nicaraguan government to subsidize cost of SHSs to end-users. Grants also financed marketing campaigns. Sales skyrocketed. - As part of the same program, Tecnosol established partnerships with local MFIs who received subsidized financial support from the government to extend end-user financing - In 2011, sales declined 30% after government program, underwritten by World Bank, expired and funds dried up - Nicaraguan microfinance sector faltered, disrupting further attempts at MFI partnerships. Between 2006 and 2009, Multilateral Investment Fund (MIF) provided Tecnosol USD 700,000 in grants and soft loans to build up its in-house microfinance capabilities, including implementation of a monitoring system and funds to provide consumer loans with repayment periods of 5 years. - Currently working to secure USD 500,000 of funding to fully develop in-house microfinance capacity
Zara Solar Tanzania	- Cash sale of SHSs and components - Importer and national distributor. Local distribution through rural shops and freelance technicians/ distributors, responsible for after-sales service.	- Founded 1998 as spin-off of electronics import/ retail business, Mona-Mwanza Electrical and Electronics (MMEE) - In the early 2000s, lacking collateral, MMEE secured a loan of USD 50,000 at 7% interest from E+Co, who helped develop the business plan - In 2004, E+Co disbursed a second loan of USD 100,000 at 8% to expand operations - The third loan of USD 200,000 at 8% from E+Co in 2007 came with the condition that Zara Solar become independent of MMEE. One year of due diligence was carried out on the newly independent Zara before the loan was disbursed. - A series of awards provide additional capital: Lighting Africa Award USD 20,000), the Lighting Tanzania Award (USD 100,000) and the Ashden Award (USD 60,000) - Commercial loan of USD 100,000 (equivalent in local currency) secured at 18% interest with founder house as collateral - Fourth loan of USD 500,000 from E+Co offered, but turned down due to preference to proceed with own capital

4. FINDINGS REGARDING THE FINANCING GAP FOR SMEs

The results presented in the following section are largely based on the interviews with funders and energy SME case studies and are supported by literature where possible. In addition to the challenges generally faced by SMEs at the BoP, the results of the interviews with management of energy SMEs and funders reveal that energy SMEs face a specific financing gap due to the unique set of challenges described in the following sections. In a nutshell, interview respondents confirmed factors 1-4 (from Box 1) on the challenges of energy SMEs, namely that they:

1. run a high risk of falling into liquidity traps because they pay suppliers up-front and at the same time grant customers gradual payment (financing) for products
2. are a unique sector that requires specific technical and sector experience and understanding. Funders also require this sector understanding when desiring to invest into it
3. have difficulties in setting up a network of dealers or individuals to service and maintain products for customers, and
4. very often source internationally, leading to increased complexity in handling international trade issues (import bureaucracy, tariffs, currency risks, etc).

Factor 5, namely that energy SMEs are subject to significantly higher policy risks than other SMEs (e.g. decisions on extending the electricity grid, subsidizing different types of energy, etc), received mixed results. Some interview partners found policy risks for energy SMEs not to be substantially higher than in other sectors. Factors 1-4 are explored in more detail in the following sections. In summary, our main findings for the origins of the financing gap in the solar PV SME sector are:

- There is a substantial working capital gap for solar PV SMEs, which is present even in some cases where financial institutions are provided credit guarantees.
- A major cause of this financing gap lies in the financial institutions' limited capability to assess investment opportunities in the sector.
- The relatively small size of the sector is preventing financial institutions from building up internal expertise of the sector.
- Enterprises in the sector face great challenges in establishing infrastructure for servicing and dealing with supply chain risks.
- Enterprises often lack capabilities to absorb larger amounts of financing in ways that will enable them to scale up successfully.

> "Again, the greatest challenge is securing capital. Funding for energy for the BoP is a very, very small amount. This funding should be more concentrated on local entrepreneurs. The big thing is making them efficient by giving them working capital so that they can buy enough product to sell it for a good price." – funder

4.1 The working capital gap

Firstly, the interviewers confirm that energy SMEs in particular face a working capital gap, which is in line with previous research indicating that energy SMEs are among service providers in rural and peri-urban areas that suffer from a lack of access to working capital that is generally available to larger service providers (Kumar *et al.* 2010). The gap is substantial, encompassing relatively large financing sums, which, according to one interview extends up to more than half a million US dollars. One funder indicated that working capital loans are withheld even in cases where the entrepreneur can supply collateral.

> "Dealers often lack the ability to move large quantities because of a lack of working capital financing and tight payment deadlines to suppliers. Their manufacturer gives a 30-day payment deadline after arrival of products, the dealer then gives the micro-dealer a 15-day payment deadline, who then often has to give user financing to customers." – funder

Reaching more customers and increasing sales means offering end-user financing, which, for many potential customers at the BoP, requires a relatively long loan period of years rather than months. On the other side of the supply chain, the component vendors often require up-front payments or maximum 30-day payment terms. Distributors thus find themselves in a natural liquidity trap and are forced to operate on a small scale, frequently being deprived of the ability to achieve higher profits both in absolute terms and relative to sales. Interviewees indicated that solar energy SMEs typically source components internationally, which means they face a high fixed ordering cost that increases the unit costs disproportionately when placing small orders. On the other hand, only once they scale up are they able to benefit from spreading their overhead costs over a larger amount of sales. Tecnosol provides an example of the kinds of financing challenges faced by energy SMEs along the path of business development and demonstrates the importance of the funders that are working to bridge the financing gap (see Box 2).

> "Even after the businesses had already grown into USD 500,000+ sales per year, they still did not get financing from local banks. It was a continuous problem. Despite the foreign funds put into local banks - many banks had available lines from KfW, IFC for renewable energy and energy efficiency - the banks would not deploy those funds." – funder

4.2 Information asymmetries

Interviewees state that the second major reason for the gap is the high uncertainty associated with financing the energy SME sector. They confirm that funders of energy SMEs require a unique sector understanding and that local financial institutions have little to no knowledge of the technology, the products, or their application and required services in the field, leading to a substantial information asymmetry. The interview partners highlight that product and service quality is considered key to the long-term success of energy SMEs. Generally, product quality is seen as having severe effects on an enterprise's ability to generate demand in the long term. In cases where financial institutions finance the end user, product quality is even perceived as one of the main factors affecting the default rate on credits.

The fact that financial institutions tend to lack the know-how to assess product quality appropriately has already been addressed, for example, by the IFC with regards to the solar lighting industry in sub-Saharan Africa (Lighting Africa 2010). However, according to interviews, financial institutions also lack the means to assess the energy SME services with respect to technology, i.e. installation, repairs and maintenance. This reveals another facet of the quality dilemma in which the product is not the issue, but rather the ineffective or non-existent servicing of the product. Whereas quality problems regarding the product are ultimately the responsibility of the manufacturers, quality issues associated with service are tied to the SMEs, an important distinction that most financial institutions are not able to make due to limited technical know-how.

Box 2: Tecnosol – challenges along the path of business development

The experience of Tecnosol, a Nicaraguan energy SME, provides insight into the financing difficulties faced by energy SMEs along the different stages of business development. As Tecnosol has undergone processes of vertical integration, this case also demonstrates the importance of funder support across the entire value chain.

Tecnosol's founder, Vladimir Delagneau, like so many SME entrepreneurs, worked multiple jobs in order to sustain himself while launching the business. His first purchase of inventory in 1998 was twelve SHSs for USD 9,000. Commercial banks and the Nicaraguan national bank were reluctant to lend him money to expand the business because his fledgling enterprise did not fulfill the banks' requirements. Delagneau therefore turned to his former employer, the National Electric Company, to finance the first market trials of the product. The banking crisis in the early 2000's tightened credit, and further attempts to secure financing from the traditional banks left Delagneau with only a small, short-term revolving credit line with a very high interest rate.

Tecnosol received technical assistance sponsored by USAID in the form of a market study and further development of its business model, which catalyzed access to a USD 100,000 loan from E+Co that enabled the company to purchase inventory and expand the business (USAID 2003). By this time, the company had set up a network of distributors that functioned as quasi-franchisees to reach customers in the rural areas. A series of larger loans from E+Co over the next few years was invested mostly in working capital. The increase in inventory allowed Tecnosol to provide its distributors credit to scale up operations.

In 2003, Tecnosol took part in a subsidy program, PERZA, offered by the Nicaraguan government and supported by the World Bank, enabling the company to offer its systems at a cheaper price, thus greatly boosting sales. The same program provided funds for local financial institutions and MFIs to support SMEs. The company secured micro-credits to further scale up the local distributors.

By that time, Tecnosol had begun to experiment with end-user financing to further increase sales. Partnerships with local MFIs proved complicated. Concessional financing from the Inter-American Development Bank enabled the company to develop its end-user financing capabilities and offer customers loan repayment periods of up to five years. After the end of the program, Tecnosol retained a small consumer financing capacity, which it aims to develop into a fully integrated microfinance arm. Facing a new set of financing hurdles, and with E+Co no longer operating in Central America, Tecnosol is currently seeking financing to add microfinance capacity to its solid track record.

Our interviews with funders reveal that financial institutions perceive this high risk in the energy products because they have trouble differentiating between products of high and low quality. Such a lack of technical know-how makes many financial institutions blind to adverse selection problems in which low quality products are sold because of their lower cost per unit. Energy SMEs that sell products of this caliber may experience a greater number of repair issues or even credit defaults due to low product quality, the operating costs of SHS are often underestimated. Risks for financial institutions also extend to end-user financing, where quality issues can contribute to credit default (IEA 2002). Once a product fails, its benefit to the end user vanishes, and the end user either becomes unwilling or unable to repay the loan. Unless the quality of products and especially services is ensured, financial institutions will always face this risk. The experience of the funders has shown little effort on the side of these institutions to engage in understanding quality issues regarding products and service provision, let alone enforce quality standards on products or services.

> "If you look at MFIs in, for example [place omitted], you see that firstly they are very distrustful of solar energy solutions because the market is extremely fragmented. How do they know that a micro-entrepreneur like [name omitted], who has a very, very small shop, will provide proper after-sales services? Will they ensure a warranty on the products? It's a huge credit risk. What if they are going to compromise on the quality of the components, so that the components break down in four months, which happens a lot." – funder

The interviews indicate that perceptions of high risks related to technology failure also persist because many energy SMEs have not developed enough of a track record with their product portfolios, a negative bias that has been observed in previous studies (IFC 2012b; Rogers *et al*. 2006). If SMEs were able to demonstrate product and / or service quality through documented usage over several months and years, they might reduce the perceived high risk of their businesses and thus be more able to convince financial institutions to invest in them. On the other hand, even educating banks about the technologies, demonstrating the quality of products and proving the effectiveness of service may not prevent the market from being flooded with cheap, low quality products (IIED 2012b; Lighting Africa 2010). Funders and businesses around the world lament the risk of losing market share to such low quality products, which in turn also carriers a negative perception about all energy products to the end users.

> "Energy is an unclear sector with lots of organizations. Therefore, no one wants to put their money there." – funder

According to funder interviews, a financial institution, which typically does not have expertise in solar products, perceives the solar systems market and the different levels of product quality to be highly non-transparent. Accordingly, financial institutions (1) are hesitant to invest in a business that they don't understand, (2) may perceive that SMEs sell low-quality products or fail to deliver necessary services to the customer, and (3) might be hesitant to give end-user financing due to a natural conflict of interest between the enterprise (interested in increasing sales by reducing prices at the cost of quality) and financial institutions (interested in decreasing the default rate through decreasing cases of product failure).

> "Energy SMEs being a very unique type of SME, people sitting in a bank or a stock exchange often don't have a good understanding of what they are."– funder

4.3 Size of the sector

> "The main difference between energy SMEs and other SMEs is that they are not very common, the energy SME market is relatively small; as a result, energy SMEs are often not very well understood by the financial sector."– funder

Beyond working capital and information asymmetries, our interviews indicate that financial institutions tend to regard the energy SME sector as relatively small and, hence, rather unattractive. Given the substantial information asymmetry with regard to the quality differences, many financial institutions appear to perceive the energy SME sector as too small to justify the high costs associated with reducing such information asymmetries via building up in-house sector expertise. The energy SME market, although it has been developing for decades, is still a new, small niche market in the eyes of traditional investors, one which involves unconventional business models that combine product and service businesses (Barreiro *et al.* 2009). This lack of standardisation in business models is a major barrier for growth. As an example, the microfinance sector shows impressively what kind of growth opportunities can be created by standardisation measures (Morris *et al.* 2007).

While some financial institutions, such as banks, have begun to involve themselves in the sector, these efforts are still in the early stages and activity has thus far been limited (IFC 2009). Moreover, interviews indicated that mainstream information on this market is uncommon and energy entrepreneurs often lack the know-how to actively approach financial institutions to pitch their businesses. This is one reason that, without a scoping presence on the ground, many energy SMEs simply do not show up on the radar of funders and financial institutions (IFC 2012a).

4.4 Challenges in servicing and supply

The interview results further confirm that setting up and maintaining service networks is a critical challenge for energy SMEs and that sourcing products internationally leads to supply uncertainties and increased import complexities. In fact, funders stated that providing after-sales services is critical for a long-term business. While delivering a product to the doorstep of the end user and providing installation are already significant challenges, establishing and maintaining a long-term service relationship with the customer adds an additional, distinct challenge altogether, such as training of technicians to ensure the operational integrity of the systems (Wiese & Steidl 2011) and thus the SMEs themselves. It requires trustful relationships with local service enterprises or employees and may sometimes even require a completely different revenue model, such as Grameen Shakti's service model, where all servicing is already included in the pricing of the loan installments paid by the end user. Moreover, these challenges again require greater managerial capabilities from the entrepreneurs.

4.5 Lack of capacity of SMEs

> "There's lots of money but no deal flow. A major challenge is identifying investments, identifying strong entrepreneurs and building them up to be confident to engage in the business." – funder

Finally, lack of technical capacity was identified by interviewees as one of the most consistent contributors to the financing gap. Especially young energy SMEs and SMEs aiming to integrate value chain activities with which they have limited experience, such as providing end-user financing, face the difficulty of limited technical capacity. This echoes research on energy product manufacturers aiming to build rural supply chains, which asserts that manufacturers struggle to find energy SMEs with the capacity to engage in distribution activities, including inventory management and product maintenance (Aron *et al.* 2009). As will be demonstrated by the experiences of the funders and SMEs in this report, building the capacity of these enterprises is often a long and involved process that requires substantial investments over a period of time, but which only begin to pay off later, once the developed capacity facilitates revenue flow or at least a strong business case.

5. MEASURES TO ADDRESS THE FINANCING GAP

In the interview phase, several different approaches that funders, ODAs, government and SMEs employ to solve or circumvent the financing gap in the energy SME sector emerged. These approaches are classified into four distinct categories which are explored one by one in the following sections:

1. Development organisations build sector knowledge in financial institutions in order to increase their capacity to assess technical and supply chain risks of energy SMEs. Often this approach is coupled with subsidies and risk-sharing schemes for financial institutions.

2. Specialized funders for energy SMEs that operate on multinational and global scales with specific sector knowledge, which they then use to make targeted investments in seed financing, growth financing and working capital financing using debt and equity.

3. Energy SMEs can become attractive to funders when incorporating end-user financing in their business models. By offering financing options to their customers, market demand increases, which in turn pushes the attractiveness of the investment case for potential financiers.

4. Policy-makers and official development assistance programs create market interventions through subsidies, quality assurance mechanisms and transparency schemes. Such measures can attract financiers by increasing returns, decreasing quality risks and supporting market transparency.

5.1 Building sector knowledge in financial institutions

The most obvious solution to address the financial institutions' lack of sector knowledge is to build this expertise and awareness through trainings and capacity building programs. Several funders and consultants employ this approach in tackling the issue of information asymmetries, among them Arc Finance, MicroEnergy International and the Global Village Energy Partnership (GVEP). For example, Arc Finance and MicroEnergy International help build partnerships between financial institutions, particularly MFIs wishing to expand their portfolios to include energy credits, and energy SMEs in search of financing for end-user credit schemes. They provide a range of technical assistance that includes training for the management and staff to understand energy products and design appropriate loan products. Of the types of technical training these institutions offer to SMEs, they provide training on after-sales services and maintenance that address the issues of risks associated with service quality. GVEP mentors energy SMEs and provides technical assistance to MFIs, implementing an innovative arrangement between the two parties that ensures the product quality (see Box 3 on GVEP's approach).

Box 3: GVEP – building financial sector institutions

The Global Village Energy Partnership (GVEP) is an international organization of energy SMEs in Africa, Asia and Latin America that funds and mentors entrepreneurs. GVEP recognized the lack of technological know-how as a major barrier to financing because of risks associated with product and service quality. GVEP addresses the latter challenge through integrated technology training. As part of its mentoring program, entrepreneurs are trained in the proper handling of solar technology. A system of internationally recognized quality standards ensures that the entrepreneurs sell only validated products. Significantly, GVEP also provides targeted technical assistance to local financial institutions, an innovative approach that is designed to enable bank management and loan officers to assess the risks of various solar products. This training consists of raising the financial institutions' awareness of the range of products on the market. GVEP connects the financial institution to its pipeline of pre-screened entrepreneurs, all of which adhere to product quality standards endorsed by the IFC. The capacity-building effort goes hand-in-hand with financial guarantees offered to both players. By utilizing its two-pronged approach of technical assistance and financing in order to target this traditionally weak link in the supply chain, GVEP bolsters the long-term stability of the local solar energy market.

Financial institutions are wary of incorporating new types of business such as loans for solar products. The process of convincing and demonstrating the bankability of solar products is a long-term gradual process, as corroborated by the experience of SELCO, an energy SME in India whose business model is based on partnerships with rural banks (IIED 2012c). In the case of GVEP, closing the contract with financial institutions for solar loans took as long as four or five months. Banks apparently still need further incentives to engage the sector. Hence GVEP provides them loan guarantees, 50% of each guarantee paid as a cash deposit, the other 50% in the form of assets. Even with the combined offer of capacity building and loan guarantees, most banks propositioned by GVEP seemed rather uninterested; of the approximately 40 banks approached, only six or seven engaged in providing solar loans. Although it would not be fair to interpret these results as a failure, they underline that building sector knowledge in financial institutions and providing guarantees by themselves are not sufficient to enable lending to energy SMEs. The issues of supply chain complexities and entrepreneur capabilities remain vital factors to be addressed.

5.2 Financing through funders with sector expertise

In the past 10 years, we have seen a string of specialized funders being established that are unique among other funders and impact investors. Aware of the problem of the financing gap for energy SMEs, they adopt unique approaches to providing both financing and technical assistance (see Figure 3 for an overview of the various forms of support provided by these funders). The funders interviewed, all specialized themselves, identify two prominent aspects in their different approaches that work to bridge the gap. First, they face decreased information asymmetries compared to other financial institutions because they have a much deeper knowledge of the energy SME sector as well as the associated technologies and business models. Second, they provide technical assistance to build up entrepreneurs' skills and knowledge of the sector, empowering them to follow successful business models. Because many energy SMEs are start-ups whose founders often have limited experience and underdeveloped entrepreneurial skills, funders have the time-consuming task of locating promising entrepreneurs and then nurturing them (IIED 2012a). This is also corroborated by funders outside the scope of the present work, such as Acumen fund, an impact investor which channels patient capital to locate and nurture promising SMEs at the BoP. Having considered over 5,000 companies, Acumen fund has invested in only 65 of them due to a shortage of quality investments (Koh *et al.* 2012). Because of this level of involvement, funders have a profound relationship with their investments; one that extends beyond financing and often requires increased trust and higher alignment of interests.

> "There is a need for an intermediary like [name omitted] that identifies the SMEs and helps them nurturing and developing businesses. It is necessary to develop a consensus on energy SMEs in terms of where and how they are, and why they can be an attractive investment." – funder

The funders of energy SMEs face a different set of challenges that come with building up a fledgling sector largely ignored by mainstream financing. In the interviews we asked funders to describe their challenges that had the highest impact on their operations. Based on these results, we discuss these experiences in the following areas of activity:

I. Finding and identifying promising investment opportunities
II. Providing technical assistance, especially with regards to reducing costs and time spent on-site at enterprises
III. Convincing investors to commit capital to this still very nascent asset class

I. Identifying appropriate investments and carrying out due diligence

Finding quality investments is one of the most daunting challenges for the majority of funders interviewed and involves a substantial investment of resources over extended periods of time. The fundamental reason for this is the prevailing lack of the necessary information available to funders. Investment information about the energy SME sector is scarce or at least not publicly available. Promising SMEs may be low profile, remaining invisible to funder scoping efforts. SMEs themselves may be opaque to outside scrutiny. Also, the informal or unprofessional nature of some energy SMEs hinders screening and due diligence if insufficient data is available to satisfy investment criteria. The failure to keep accurate or detailed records, for instance, is grounds for rejection if funders lack access to the appropriate finance and accounting information. Lastly, the stringency of a funder's own assessment criteria can

greatly affect the number of eligible energy SMEs. For instance, most funders expect businesses to follow a double-bottom-line approach, taking into account the social impacts of an energy business. Some funders screen for a triple-bottom-line approach, which ensures that environmental impacts of the SME are also mitigated but simultaneously reduces the number of eligible energy SMEs.

> "The main challenge is to find committed entrepreneurs with a good, solid business plan. Too many entrepreneurs were just opportunists. ... it is crucial to have a well-planned strategy, not just one guy in the office, selling it via the internet and having an ad here and there. ... Through the business plan and the strategy, you could tell the serious entrepreneurs. ... Before due diligence, you can spot the seriousness." – funder

The next challenge is identifying the investment-ready energy SMEs amongst those positively screened. Relative to expected financial returns, costs of due diligence are still incredibly high (IIED 2012a). Funders interviewed herein described several challenges that are causing these costs. First, solid business plans, which were identified as one of the most important criteria for investing in an entrepreneur, are uncommon. According to funder interviews, some entrepreneurs have skewed perceptions about the realities of launching a BoP energy business, underestimating the time horizons for business incubation and overestimating profit margins. Other entrepreneurs are rather opportunistic in their application for funds, revealing an appetite for financing without a serious business case, and are promptly rejected. Most funders actively participate in the further development of promising business plans, but this requires finding plans that have at least a solid foundation to build upon. Second, energy SMEs initially screened as promising investments, may, in the course of due diligence, turn out to require too much preparation to reach investment level. Aspects of the business case may be underdeveloped, such as the market potential or availability of components, for instance. Though funders usually engage in some level of capacity building, there are cases that require an amount of capacity building disproportionate to the investment itself.

As a result of the opacity of the energy SME sector and the lack of investment-ready energy SMEs, funders have great difficulties identifying promising projects, even if they have the necessary capital on hand.

> "The main challenge of [name omitted] working with energy SMEs lay in the fact that the SMEs did not provide [us] with primary data." – funder

While the processes of scoping and screening represent substantial but necessary hurdles for funders, creative efforts have been made to lessen the costs involved. Because scoping and screening activities are carried out independently by each funder, as well as by other financial actors, such as bilateral foundations like Shell Foundation or even the private investment arms of multilateral development banks like the IFC, efforts often overlap, and activities are duplicated. Resources can therefore be saved where scoping and screening activities are combined or consolidated. Such an approach calls for open lines of communication and information exchange between funders and other financial players operating in the same area.

Finally, the funders' high costs of identifying and assessing investments are opening up opportunities for standardizing these tasks and integrating them across different funders. For example, new market players such as investment consultants could specialize in identifying and assessing energy SMEs and bringing them to the point where they become investment

grade so that funders can step in effectively. Because these tasks can be standardized across different business models, specialized actors may successfully take up the responsibility of preparing potential investments for funders. Moreover, such specialized actors are not dependent on the investment decision of a single funder. Instead, they can approach several funders, thereby increasing the rate of successfully screened investments. An example of this type of actor is Open Capital Advisors (see Box 4).

Box 4: Open Capital Advisors

Open Capital Advisors is a funder operating in East Africa that acts as a financing bridge by identifying and capacitating high-potential SMEs and connecting them with investors. They offer investors due-diligence consulting services to pinpoint investment opportunities while determining the particular financing needs of the SMEs. By leveraging their experience, local network and on-the-ground presence in the region, Open Capital creates value for investors by allowing them to outsource the high-cost screening, due diligence and market research activities. The funder also undercuts due diligence costs by coordinating co-investment schemes with financial institutions and / or investors in which the partners' expertise is pooled and the burden of due diligence is distributed. On the energy SME side, Open Capital provides technical assistance, building up elements of the business according to the precise requirements of the funders. In this way, the company makes a business case out of streamlining the due diligence process and facilitating the flow of funding for promising investments.

II. Technical assistance and enterprise development services before the investment and along the value chain

There are various forms of technical assistance that funders provide as a complement to funding energy SMEs. Capacity-building activities, such as business plan development, management training, legal and accounting services, technology-oriented training, institutional development, and creating links to supply chains and markets are essential to transforming a solid business plan into a profitable enterprise. Since there are few actors willing or able to provide this indispensable service, some funders have integrated it into their approaches.

> "Technical assistance was the problem - there was too much face time, i.e. time spent face-to-face with our customers and their customers." – funder

Technical training requires a substantial dedication of resources from the funders. The energy SME sector consists of a combination of product and service delivery for which SMEs require both technological and business know-how. Extensive training and support is often necessary to fill in this capacity gap. Furthermore, the various elements of technical assistance involve different levels of commitment on the side of the funder. For example, legal assistance and technical training are easier to provide because they are unambiguous and tangible in nature. On the other hand, management training, which entails changes in behavior and social interaction, is more difficult and requires a larger resource investment. Developing the capacity of energy SMEs, especially the skills of the entrepreneurs and other management staff, might require a steady investment over several years.

In order to build a solid business case, funders need to perform a detailed assessment before creating the business plan, which requires exhaustive collection of micro-data from the entrepreneur, customers, and other elements of the local market context. According to funders, many technical assistance providers have faltered because they have not gathered the appropriate micro-data, opting instead for pre-gathered data collected by a government agency or other third party. Intimate, face-to-face consultation, however, comes at a price, demanding a substantial time investment and logistical costs that funders have to find a way to absorb (IIED 2012a). Besides the mountain of resources that go into these specific aspects of technical assistance, funders often tailor their methodology for providing technical assistance to individual energy SMEs, which requires greater effort and increases transaction costs.

> "The assessment of micro-data (market assessment) is the most fundamental part of the technical assistance. Lots of international technical assistance providers fail because they don't have the local market data. It is necessary to have a sense of the client market situation, and therefore have funding for the micro-data assessment before developing a business model." – funder

> "To bridge the financing gap you could bring in more strategic partners with seed capital, for example in the form of technology partners that could bring in know-how like different solutions with micro-grids. It is crucial to get away from the traditional system sales into service businesses." – funder

Promising energy SMEs that get through the gauntlet of due diligence may still not be investment-ready. There may be any number of elements that are weak or missing, such as organizational or managerial strength or a greater volume of customer information. Funders have the challenge of building this capacity before funds start flowing. While this early and intensive technical assistance has been widely identified as one of the heaviest burdens funders have to bear, novel approaches are fueling innovation in this area and offer insight into overcoming this hurdle.

> "Yet another issue is that in trying to solve problems in the energy SME sector, people get stuck on value chain and channels of distribution. Instead, you should start with the customer and delivery enterprise and work backwards, which makes it a much easier task. You start with the final transaction with the customer and eventually get to capital city. Someone will go into the business if the downstream demand is there." – funder

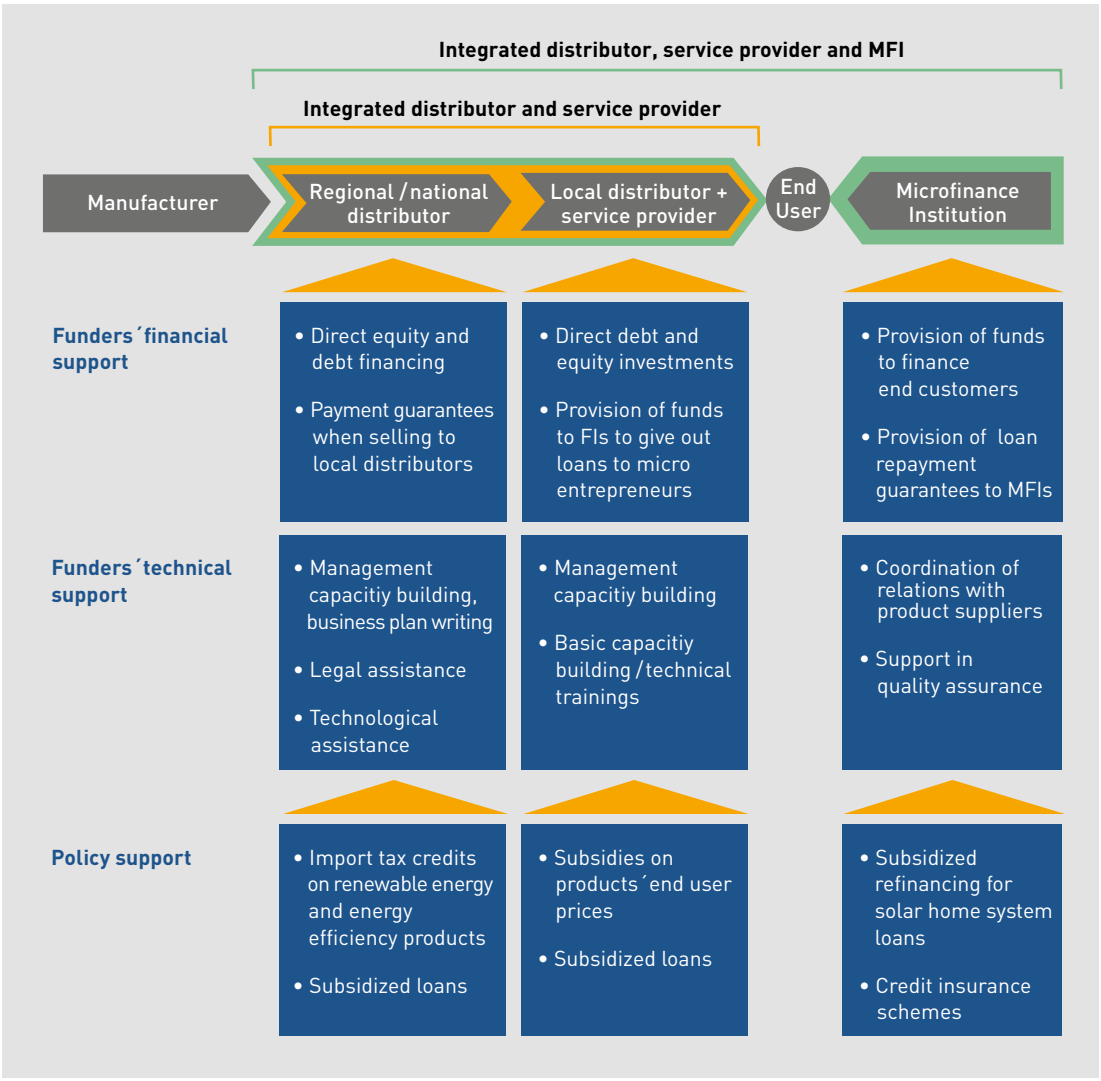
The resources that funders dedicate to initial technical assistance activities are substantial. Different funders have experimented with streamlining the process in a variety of ways. For one funder, the provision of technical assistance threatened their ability to scale up operations. The constant face-to-face interactions with clients on the ground took a toll on the funder's resources and created a bottleneck that blocked further growth. To cut down the amount of 'face time', the funder has begun considering integrating communication technology to simulate face-to-face interactions via cyberspace. Telecommunications services are exploding all over the developing world, enabling such solutions in an ever-growing number of sparsely populated areas. It is clear that a video conference, for example, is not sufficient replacement for physical presence on the ground, since a level of trust and proximity to the project needs to be established and maintained, but remote communications solutions may be a means to reduce the necessity for constant, expensive physical proximity.

After the initial technical assistance activities are completed, further technical assistance is required along the energy SME value chain. A bird's eye view of the entire value chain reveals how funder intervention at specific points addresses the needs of energy SMEs through direct support activities, as well as indirect assistance targeting other players.

Regional / national distributors need all the business know-how required of any formalized enterprise. Therefore, many elements of the technical assistance are services such as developing the business plan, providing legal advice, and building management capacity. In addition, these energy SMEs require technological know-how so that they can procure quality components and properly configure systems that address the particular needs of the target end users. While local distributors also need support in developing general aspects, such as management capacities, at the same time, they require specialized training, especially technological, for their small teams of local employees, which carry out energy system installation and maintenance, as well as payment collection and marketing activities. One funder in the report, GVEP, applies a comprehensive strategy to technological training that mirrors its financing approach, in which it simultaneously builds the capacity of entrepreneurs and financial institutions to address product and service quality assessment issues.

> "Management capacity-building is difficult because individuals are more resistant to change their way of work. You need external experts who are very understanding and patient and not put off by internal resistance. This requires very experienced personnel." – funder

Figure 3: Value chain in the solar BoP market and supporting roles of funders and government



III. Securing capital

Funders, like their clients, face their own challenges with fundraising vis-à-vis their investors, which complicates their ability to develop the energy SME market. Some funders have lamented the difficulty of obtaining capital for their own funds. According to funder interviews, one reason for this is the comparatively low awareness for the BoP energy sector on the side of traditional investors. The "ignorance" of mainstream investors regarding the BoP SME market has been corroborated by other studies (Barreiro *et al.* 2009: 11). Moreover, some funders employ distinct financing mechanisms, such as guarantees to product suppliers and financial institutions, performance bonds for SMEs bidding on large tenders, refinancing funds for MFIs financing end-user products and crowdfunding. These particular funders experience difficulties in raising awareness of the benefits of such methods.

Another difficulty with attracting capital for funders is that real success cases of BoP energy SMEs are still very rare. Our case studies show some positive examples of companies that have managed to address BoP markets with solar home systems. However, in the case of Tecnosol in Nicaragua, the business success hinged greatly on the availability of subsidies provided through ODA funds and the availability of microfinancing options for end users. Zara Solar in Tanzania operates profitably and managed to pay back the loans that it received from E+Co. Although the focus of the business has been on peri-urban areas, the company is currently lining up its operations to target even more remote areas. Even the often cited success case in terms of customer outreach, Grameen Shakti, only became profitable in the fourth year of its operations, requiring several million dollars in grants to fund its seed, pilot, and initial scale-up phases (Chowdhury 1997, 2002). Grameen Shakti received access to this substantial support with a multi-million dollar credit guarantor, the Grameen Bank, at its back. Funder interviews suggest that the global solar BoP sector is still in a relatively early stage of development where businesses tend to operate on a trial-and-error approach. Funders and investors need to be aware of this, and funding schemes need to be adapted likewise.

A different approach to ensuring liquidity throughout the value chain is used by GVEP, which provides loan guarantees to national distributors so that they can offer 15-30 day payment terms to local distributors. In this way, GVEP tackles the issue of product availability at the level of the local distributor. Besides that, GVEP also provides loan guarantees to MFIs that finance the working capital of local distributors and provide end-user loans. The latter topic will be discussed in depth in the following section.

5.3 Incorporating end-user financing into the business model

Funders stated that the solution to a financing problem is not solely achieved through providing SMEs with loans and equity. The examples of Grameen Shakti, Tecnosol and SolarNow Uganda highlight the relevance of end-user financing for solar BoP businesses. In the case of Grameen Shakti, end-user financing unlocked substantial demand from customers by giving them the ability to afford systems without actually having the liquidity required to pay for the system. The enterprise's initial use of grant funds and, later, the financing of end-user loans through subsidized debt allowed it to reach an exceptional growth rate. In the case of Tecnosol, the importance of end-user financing has been demonstrated through the company's cooperation with MFIs and the impact of ending those partnerships in 2011. Although no detailed numbers are available, the founder stated that while collaborating with MFIs, about 40% of unit sales were financed through end-user loans, whereas after the partnerships ended, only 10% of unit sales were financed through loans. For the past year, Tecnosol has been trying to set up its own end-user financing operations with its current five to ten dedicated employees. At the time of writing, Tecnosol is approaching funders to finance its end-user loan operations independent of the rest of the business.

Incorporating both the distribution of systems and end-user financing under the same roof of one enterprise can lead to a much greater alignment of interests in the value chain[9]. In this way, the enterprise not only has the interest to increase sales, but, at the same time, also to provide high quality products and services that will make the systems last longer and thereby ensure a higher rate of repayment of loans. On the other hand, an enterprise that wishes to offer end-user financing faces a set of challenges, including the establishment of infrastructure for bill collection, pre-financing the product and assuring payment of installation (Adib *et al.* 2001). Furthermore, the combination of two naturally distinct business models like distributing / servicing hardware and providing financing require very different types of organizational models. By necessity, MFIs develop highly effective accounting capacities and other specialized financial capabilities. Thus, if a product distributor wishes to start providing customer financing, it might necessitate a business transformation, including building stronger departments as well as new business processes, as is the aim of Tecnosol. However, to achieve this, businesses need to make substantial investments, and unlike Tecnosol, are often still too small to absorb the enormous funding required for end-user financing. According to an interview with a funder of energy SMEs, there are limits to the amount of investment small enterprises can take in (IIED 2012a). Even if they are able to absorb the funding, a powerful guarantor is often required as backing.

> **"The main difficulty with the one-hand model [integration of product distribution with financing] is that processes of MFIs and product suppliers are very different and it is very challenging to make both work in the same organization." - entrepreneur**

Moreover, other challenges arise depending on the level of an energy SME's integration of the distributional links in the supply chain. An energy SME that relies on partnerships with independent local technicians to handle installation and after-sales services may have control or incentive issues when it comes to implementing end-user financing schemes, particularly where bill collection or sales are concerned. In Uganda, for example, specific monetary incentives had to be applied for loan officers to engage in the extra time and effort of marketing energy loans in the context of MFI / energy SME partnerships (Rohatgi & Enright 2010). Companies with full integration of distribution activities, like Grameen Shakti and Tecnosol may have an easier task of organizing maintenance and loan repayment activities as well as enforcing quality issues because all elements are 'under one roof'.

SolarNow is an innovative example of a national distributor that creates a hybrid model using an approach that extends consumer financing through a network of franchisees that act as local distributors (see Box 5). On the other hand, SolarNow is facing the challenge of ensuring that their local franchisees adhere to the quality standards. They reported that some of their dealers installed cheaper low-quality parts from other suppliers instead of the parts shipped from SolarNow. In such cases the dealers were expelled from the franchise network, which apparently has kept larger numbers of dealers from following their path.

[9] This approach is often referred to as the "one-hand model", as the distribution, servicing and financing are all provided by one organization.

Box 5: Solar Now

SolarNow is a national distributor of solar home systems in Uganda and employs a franchise model to distribute products at the local level. The company came into being as a network of branded retailers affiliated with the Rural Energy Foundation (REF), a Dutch not-for-profit organization that aimed to build up the solar energy market in Sub-Saharan Africa by training distributors and technicians to catalyze the sale of SHS and implementing customer financing schemes. SolarNow Uganda, which spun off as a subsidiary of REF, has developed an integrated approach by combining national and local distribution activities with end-user financing based on the model established by REF. Their network of 33 franchisees distributes SHSs for a commission and is responsible for installation and after-sales services, including maintenance. By merging national and local distribution activities in this way, SolarNow cuts costs for customers while ensuring margins for its franchisees by negotiating bulk prices for the components of its systems.

The real innovation, however, is the way in which SolarNow incorporates end-user financing and ensures product and service quality. Their approach resolves the 'classic' problem in which MFIs and financial institutions are discouraged from providing loans for energy products because of the credit risk posed by low product and service quality. Local distributors, on the other hand, have every incentive to compromise on quality because lower product prices mean greater sales volume where customers pay in cash. From the company's perspective, quality and customer financing are mutually dependent. SolarNow works closely with its franchisees to ensure adherence to quality standards so that only authorized components can be utilized in SolarNow products. Service quality is monitored to ensure proper product functioning and customer satisfaction. Franchisees must give each customer initial training on use and care of the system and make the necessary repairs or replacements in the case of product failure. Only the franchisees that uphold the stringent quality standards may represent the SolarNow brand. In exchange, SolarNow conducts the end-user credit assessment and provides the credit facility. Though the brand's SHS are relatively expensive due to high quality components (a 40Wp system starts at USD 500), the credit scheme spreads the cost over 12 months, allowing the franchisee access to a greater number of customers. To date, the company has disbursed over 1,000 "Pay Plans". As a summary, SolarNow aligns its interests with those of the franchisees and their customers through its institutionalization of quality standards and end-user financing.

5.4 Enacting supportive policies and ODA programs

Government policies can represent either a challenge or an opportunity for energy SMEs. Ideally, government's role in the development and growth of energy SMEs is to design a policy framework that creates a favorable investment environment, which incentivizes private sector forces to develop the market. However, the situation on the ground is far from ideal; policies and regulations that affect energy SMEs may be non-existent, ineffective, counterproductive or even damaging. Although this is beginning to change, the policy landscape in many countries is relatively barren because the utilization of renewable energy technologies for the purpose of delivering energy access to rural areas is not high on the policy agenda (Rehman *et al.* 2012). Despite the fact that many developing countries are integrating renewables into their medium- and long-term energy

plans, these efforts focus mainly on grid-based technologies, reflecting conventional views on increasing energy access through grid extension (Rehman *et al.* 2012) that are based on the specific economic, political and social context of each country (World Bank 2010).

Though not the norm, cases of government policies that are supportive to the solar BoP sector do exist. Of the potential policy mechanisms that governments can apply, we discuss four, namely, direct product subsidies, subsidized loans for end-user financing, credit guarantees for financial institutions and establishment of quality standards.

First, direct product subsidies are one of the most influential policy instruments that affect energy SMEs (Rehman *et al.* 2012; Rogers *et al.* 2006; World Bank 2010). End-user subsidies for kerosene, diesel, and other fossil fuels have been widely documented as distorting the market for sustainable energy technologies (Balachandra 2011; Philips & Browne 2001). Such policies are clearly harmful to energy SMEs whose products, such as solar PV, aim to compete with these fossil fuels. On the other hand, subsidy regimes may damage markets through over-subsidization (Balachandra 2011). The FOMILENIO program in El Salvador, for instance, has negatively impacted the off-grid solar market because it distributed thousands of systems at well under the market price. Such subsidies distort end-user price and value perceptions of sustainable energy technologies (IEA 2002). Other subsidy regimes have more subtle impacts. In Nicaragua, a well-designed support program initially benefited energy SMEs by subsidizing the price of their products to the end-user. Profits slumped, however, when sales dropped dramatically after the end of the program (See Box 6).

> "You don't have any specific policies that are geared at the rural energy sector in [place omitted]. Grants distort the market and have the potential to destroy the market for energy entrepreneurs." - funder

> "In [place omitted], the [name omitted] program gave away thousands of systems. This has been damaging to people accepting/buying the systems. It has had some harmful effects on the normal development of the system market." – funder

Box 6: PERZA off-grid electrification project

The PERZA program was a joint effort between the Nicaraguan government and the World Bank designed to support the government's ability to increase sustainable energy access in rural areas. Part of the program funds were earmarked specifically for the support of local MFIs and SMEs to bridge the affordability gap for customers. End-users received a subsidized consumer loan from MFIs and a subsidized price for the products of energy SMEs. The price of Tecnosol's primary PV system, for example, was effectively cut from USD 500 to USD 300. Another subsidy financed SMEs' marketing campaigns. Product sales skyrocketed. When the subsidy program ended in 2011, however, the same energy SMEs that enjoyed the benefits scrambled to keep their footing after the subsidies stopped flowing. Sales plummeted. Tecnosol saw its sales figures drop by 30%. Furthermore, the links created between the MFIs and the energy SMEs also hinged on government support to an extent because they improved the prospects of creating a business case for such collaboration. Tecnosol reports that the termination of the PERZA program was one of the reasons its experiments with MFI partnerships were abandoned. This example illustrates the volatility of a well-intentioned subsidy program, which involves transient international financing arrangements.

Rather than a policy framework, many countries have a patchwork of regulations, requirements and red tape that can add to the complexity and cost of doing business. In this context, some funders reported that any interaction with government is perceived as a risk factor. Even policies designed to empower energy SMEs depend on reliable implementation. An import tax rebate on technology, for example, is not effective if the government is very slow or inconsistent in refunding the tax payment. One funder reported that some entrepreneurs were only able to claim their tax refund through their personal contacts at ministries. Subsidies can have great effects in building up entire sectors, but need to be dealt with carefully in order to avoid destructive distortion of markets.

> "The energy sector is a difficult policy sector to deal with. Policies are usually more complicated than in other sectors. Governmental decisions can evolve very rapidly. ... it is really difficult for energy SMEs having no contacts or even no knowledge of the policy framework. It takes time and money and thereby has a great impact on the business profitability." – funder

Second, subsidizing loans for products, rather than directly reducing the prices of products, improves the conditions for providing end-user product financing. Thus this mechanism can help to specifically target the development of end-user financing for solar, thereby particularly favoring the sales to customers that are not able to pay up front. In Bangladesh, the Infrastructure Development Company Limited (IDCOL), a state-owned institution established to promote green technologies at the BoP, provides subsidized working capital loans for solar product businesses and direct subsidies for solar energy products. IDCOL provides BoP energy businesses with loans at a 6-7% subsidized interest rate (compared to a normal competitive rate of ca. 17%) amounting to up to 70-80% of the price of the financed product. This enables the enterprises to offer debt financing options to their customers without falling into a liquidity trap themselves. To do so, IDCOL requires the business to provide a 40% guarantee for its loans, 20% in the form of a cash deposit and 20% in the form of assets. Besides that, IDCOL provides a 2,000 BDT (ca. USD 25) grant to the business for every installed system, which makes up roughly 8% of the total system and installation cost. Another important lesson learned in the Bangladesh as well as in the Nepal case, is that SMEs have to prove that they are developing local infrastructure if they want to receive the subsidies. The KfW learned from the case of Nepal that subsidies must increase when energy SMEs reach out to more remote areas. Otherwise SMEs only concentrate on low hanging fruits with regard to outreach.

Third, credit guarantee schemes can enable financial institutions to direct a much larger share of their capital into the solar BoP sector. One funder described the success of credit guarantee schemes in the agricultural sector and suggested that they may well be adapted to the BoP energy market. In Kenya, the Ministry of Agriculture extended several credit guarantees to Equity Bank and other financial institutions, enabling them to give out loans to farmers of a total size of about 9-10 times the amount that was given as a guarantee (Republic of Kenya 2012). Additionally, when Grameen Shakti secured its first rounds of financing, the Grameen Bank provided substantial credit guarantees to third party lenders. In another case, a funder described how local companies were not able to bid on larger jobs because they did not have the financial capacity to guarantee compensation in case the project failed. The funder thus issued a performance bond to the contractor, thereby enabling the enterprise to bid on the job. In the end the job was completed satisfactorily and no financial transaction between the funder and the contractor needed to be made. In fact the funder stated that "this is a huge area of funding that has not gotten that much attention". As can be seen from the examples,

credit guarantees have been crucial for the development and success of some solar BoP enterprises. Governments, ODAs and funders might do well to look into these previously rather unnoticed mechanisms for enabling capital flow.

However, the success of such guarantee funds hugely depends on appropriate capacity building for fund users (energy SMEs) and fund dispersers (local banks). As such funds guarantee only up to 70-80% of the total loan, a residual financial risk is left with local banks. Therefore, SMEs need to learn to communicate their business models effectively to financial institutions and, likewise, banks should learn to assess risks effectively. Otherwise, guarantee funds will remain untouched by local banks as it has happened in manycases in the past.

> "Although credit guarantee funds have been largely promoted by development institutions, they often do not work in practice. Banks have been found to be highly reluctant to conduct due diligences even with guarantees in their back." – expert during workshop

> "There should be more involvement at the policy level to improve quality standards and keep low-quality products out of the sector." - funder

Finally, by establishing quality standards for products and particularly for services in the solar BoP sector, governments can reduce the negative effect of information asymmetries between financial institutions and enterprises and at the same time combat adverse selection of low-quality products and insufficient services on the side of end users. Although there is academic debate over whether quality standards actually lead to better product performance (Kurtz *et al.* 2011; Nieuwenhout *et al.* 2000), the role of product quality standards in decreasing information asymmetries and enabling successful partnerships between local financial institutions and energy SMEs at the regional level suggests that product quality standards can also play a enabling role when implemented at the national level. The interviews with funders and enterprises did not reveal any case where such quality standards on products or services have been put into practice or even drafted by governments. Still, as the impact of quality problems on the solar BoP markets has been more than substantial, governments might do well to look into ways of resolving this particular issue to shift competition on prices towards competition on quality and service as well as reducing information asymmetries between lenders and enterprises.

> "It is very important to have competition between several players in the market so that the businesses have an incentive to improve maintenance and product quality." – funder

6. CONCLUSIONS

Statistics indicate that there is both a need and a market potential in the field of energy poverty in developing countries. Furthermore, literature illustrates that SMEs play an important role when it comes to job creation, poverty reduction, and economic development in general. Consequently, we take up the case for energy SMEs, as they have a vital function in tackling energy poverty through a market-driven approach. We investigate one important reason for their limited growth, namely the pressing financing gap for SMEs (see also Figure 1). Thereby, we examine causes and impacts on the businesses. In contrast to previous studies, we isolate energy SMEs as a distinctive group of enterprises and test potential factors contributing to the financing gap derived from literature against evidence from company cases and expert interviews with entrepreneurs and financiers of energy SMEs. Based on the three research questions set out in the introduction, our key findings are as follows:

First, both interviews and case studies point to the distinctiveness of energy SMEs. Specifically, they face particular challenges related to the nature of their businesses, including the following:

- High upfront costs to build up distribution and service infrastructure
- The need for providing consumer finance
- Internationally-sourced components, and
- Lack of funder understanding of energy SMEs and their products

Second, the financing gap is confirmed in both the interviews and the SME case studies. Funders unanimously stated that energy SMEs face a financing gap characterized by a lack of domestic and international financing sources for energy SMEs. Although in retrospect, the case studies are success cases for applying for funding, the entrepreneurs experienced great difficulties in applying for domestic funding and little availability of international funding in their early business development phases. Exceptional are the cases where entrepreneurs are closely linked with international funders or multilateral institutions, who are then taking the role of guarantors. Therefore, we conclude that energy SMEs face a financing gap between Microfinance (up to USD 5,000) and Private Equity or conventional banks (starting with USD 2 mn) that is so far not addressed by public and private stakeholders (Figure 1).

Third, particular financing challenges causing the financing gap for energy SMEs are identified:

- Existence of information asymmetries between energy SMEs and financial institutions

  Evidence on information asymmetries between businesses and their financiers is shown in the expert interviews. Funders reported that major challenges in conducting financial assessments of energy SMEs lay in the distinctiveness of market demand characteristics, technology-specific knowledge, and the lack of a track record of individual businesses and the sector as a whole.

- High working capital needs due to international sourcing of product parts, which increases the cost of the energy product

  High working capital costs caused by international sourcing of product parts can be observed in the case studies, where entrepreneurs pointed out that their strong financial position enabled them to achieve substantially lower purchase costs than competitors. Furthermore, funders shared examples of businesses they financed that achieved significant cost reductions through working capital financing.

- High upfront costs in establishing service and distribution infrastructure

  The existence of high upfront costs in establishing the infrastructure for after-sales servicing and maintenance was equally confirmed in the expert interviews. The energy SME case studies, on the other hand, provided only limited support mainly due to a lack of financial information on the businesses and differing approaches in developing service networks. For example, whereas Grameen Shakti created a wholly-owned subsidiary network of servicing technicians, Zara Solar and Tecnosol relied more on external technicians.

- Reduced liquidity for energy SMEs that offer end user financing options, which, paradoxically, is a prerequisite for achieving scale

  The literature review and interviews indicate that the financing gap limits energy SMEs' growth and scaling up opportunities and, as such, delays or prevents the break-even. Furthermore, we find evidence that the financing gap is amplified by liquidity traps whenever the energy SME chooses to provide end-user financing options. While confirmed in funder interviews, this factor is further supported by the cases of SolarNow, which experienced growth restrictions due to a lack of financing, and Tecnosol, where sales fell drastically after the end-user financing option was removed from their market offering.

There is evidence that on a global level there are not enough international funds available to develop access to clean energy (Bhattacharyaa 2013). However, this absolute deficit does not sufficiently explain the specific challenges faced by energy SMEs. We have shown that their financing gap is characterized by structural problems in the interaction between financial institutions and energy SMEs. Even in cases where financial resources are available, structural barriers prevent financial institutions and SMEs from finding common terms.

Hence, based on the results section on the expert interviews, we have identified the following measures that are needed to mitigate the financing gap:

- Building sector knowledge in financial institutions
- Financing through funders with sector expertise

- Streamlining the screening and due diligence process through modern information and communication technologies
- Incorporating end-user financing into the business model
- Enacting supportive policies and ODA programs

With regard to the examined case studies, we could also identify the powerful role of different guarantor mechanisms, either related to the personal networks of the entrepreneur, or by implementing the SME under the roof of a larger organization with a proven track record.

A range of drawbacks to this report needs careful consideration. First, we lack quantitative evidence on the impact of the financing on the energy SME sector. Second, in our sample, there exist only energy SMEs that are considered success cases. It is very likely that in a broader and more diversified sample, more in-depth challenges can be detected. Third, as seen in the characterization of energy SMEs, these businesses can be founded either by entrepreneurs from the same communities they aim to serve or by socially-minded entrepreneurs from industrialized countries. These two groups should be assessed separately. Fourth, the factor that energy SMEs are exposed to higher policy risks than their counterparts in other sectors could not be confirmed due to lack of evidence. Although there have been cases where policies, particularly subsidies, severely affected the sector (e.g. El Salvador, Bangladesh, Uganda), interview results indicated that policy risks were highly specific to the individual country contexts. Beyond, this study does not explicitly differentiate between the need of entrepreneurs for equity and debt. Further exploring this difference seems to be a worthwhile effort for future research.

Considering the sparse literature on energy SMEs, further research is required. In particular, we suggest further research regarding the following aspects, given that the present study explores the existence of a financing gap for energy SMEs, gathering first evidence on its causes and impacts:

- First, future research should refine the conclusions drawn here in greater depth by differentiating amongst payment schemes (e.g. cash sales vs. end-user credit financing) or amongst distribution and after-sales servicing models (e.g. wholly owned network of service technicians vs. contracting of external parties) and also investigate effects created by national financial markets and their degree of maturity and market transparency.
- Second, it is important to differentiate between equity and debt. Raising equity for the rural energy sector seems to be a huge challenge as indicated by some of the company case studies discussed in this report.
- Third, further research should explore the effects of policy frameworks on the financing gap for energy SMEs. Policy schemes containing subsidy measures, public quality control mechanisms, and public finance instruments for energy SMEs and their financing institutions can be found in various countries (e.g. Bangladesh, Nepal, Uganda & India).
- Fourth, quantitative evidence is needed to further highlight the existence and impact of the financing gap in the energy SME sector. This will hopefully be possible in the near future once more companies enter the sector.

"Climate Change, Financial Markets and Innovation" (CFI) PROJECT OVERVIEW

As part of the research project "CFI – Climate Change, Financial Markets and Innovation", funded by the Federal Ministry for Education and Research (BMBF), Germany, the SBI carried out a series of studies about renewable energies in emerging and developing countries including

- **Friebe, C. & von Flotow, P.** (2011) *Framework Conditions for Investments in Wind Parks in Emerging and Developing Markets: The Investors' Perspective*. Oestrich-Winkel, Germany: Sustainable Business Institute (SBI)

- **Friebe, C., von Flotow, P. & Täube, F. A.** (2013) Exploring the link between products and services in low-income markets - Evidence from solar home systems. *Energy Policy*, 52: 760-769

- **Peterschmidt, N., Neumann, C., von Flotow, P., Friebe, C., Springmann, J.-P. & Schmidt-Reindahl, J.** (2013) *Scaling up successful Micro-utilities for rural electrification - Private sector perspectives on Operational Approaches, Financing Instruments and Stakeholder Interaction*. Goslar and Oestrich-Winkel, Germany: Energy Research Center Niedersachsen (efzn), INENSUS GmbH and Sustainable Business Institute (SBI)

For further information about the project and other publications see also www.cfi21.org.

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