Mobilising Private Capital for Small and Micro Renewable Energy Investments in Emerging and Developing Countries

Aligning Public and Private Interests for Scaling Up Renewables and Energy Access by the Base of the Pyramid

Discussion paper

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List of Abbreviations

AGF	Secretary -General's High-level Advisory Group on Climate Change Financing
Bn	Billion
CDM	Clean Development Mechanism
CFI	Climate Change, Financial Markets and Innovation
COP	Conference of the Parties
DI	Development Institution
FiT	Feed-in Tariff
GCF	Green Climate Fund
GEF and IDA	Global Environment Facility and International Development Association
GHG	Greenhouse gas
GIZ	Gesellschaft für Internationale Zusammenarbeit
IPP	Independent Power Producers
RE	Renewable energy
kWh	kilowatt-hour
kWp	kilowatt-peak
LCOE	Levelised Cost of Energy
MFI	Microfinance Institution
Mn	Million
mWh	megawatt-hour
NAMA	Nationally Appropriate Mitigation Action
OECD	Organization for Economic Co-Operation and Development
PPP	Public Private Partnership
PV	Photovoltaic
R&D	Research and Development
SHS	Solar Home System
SME	Small and medium-sized enterprise
TLC	Transparency, Longevity and Certainty
tWh	terawatt-hour
VAT	Value added tax

1. Introduction

1.1 Scaling Up Renewable Energies (RE) - Opportunity and Challenge

Scaling up Renewable Energy (RE) presents a tremendous opportunity and challenge for the coming decades and calls for a well calibrated joint public and private sector effort. Recent years have seen an impressive growth of RE, increasing its share in the energy supply and in private energy investments. Total investments in clean energy, combining energy efficiency and renewable energy investments, reached US$ 260 bn in 2011, a five fold increase over 2004 and at the same order of magnitude as fossil fuel investments (Bloomberg New Energy Finance, 2012 and 2013b). With these investments, the share of RE in global power generation has now reached 6.5% and in global installed capacity 10.2%.

Behind these encouraging stories about aggregate growth numbers for RE lies a quite complex reality:

- A low base of an only small share of RE in total primary energy to start from, with hydro accounting for 2.3% and solar and wind energy for only 0.4% in 2008. (IPCC 2011 p. 9), and
- An unven regional distribution of RE investments, with a high concentration in OECD countries and China (World Bank, 2011), and an only limited role so far in the energy mix of low income countries. While at a first glance, the geographical distribution of these investments seems to be reaching parity between developed and developing countries, it is owed in good measure to a decline in RE investments in the OECD following the financial crises, and to China which with investments of USD 66.6 bn accounted for over half of the USD 112 bn invested in developing countries in 2012, followed, with a distance, by India, with USD 6.5 bn. A regional analysis by BNEF which excludes countries with investments below USD 0.1 bn is further evidence that there is a significant number of developing and emerging countries which do receive little RE investments, and which have unrealized or under-realized market potential when it comes to renewable energy: in Latin America 10 countries had investments of below USD 0.1 bn, in Non-OECD Asia 37 countries fell below this limit, and in Africa it was even 50 countries.

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1.2 RE addresses multiple global agendas

Further scaling up the use of RE has gained significance at the national and global level because it can directly contribute to at least five top development priorities: at the national

level to i) improved energy access, ii) energy security, iii) avoidance of negative health and environmental impacts, and iv) economic growth of small and medium enterprises. And at the global level, v) reduction of greenhouse gas emissions (GHG) in the energy sector.

Scaling up renewable energy is made even more attractive because of strong synergies between the different development priorities described above. Renewable off-grid energy solutions can contribute simultaneously to improved energy access, reduction in GHG emissions, and protection of forest eco-systems. Renewable energy power plants feeding into the grid help achieve climate change objectives and strengthen energy security by reducing dependency on oil or coal imports.

In other respects, the synergies may not be as obvious. There is a perceived trade-off between achieving energy access with least cost (fossil) at the fastest speed or at a higher cost and slower speed using low carbon RE solutions. Maximizing energy access may drive (at least in the short-term) least cost fossil fuel based energy solution (including coal, oil, diesel and natural gas), while climate change considerations would push for a maximum deployment of lower carbon RE solutions, even if not the least cost in the short and medium term. The World Bank argues that it will 'not punish the poor' for the actions of others (meaning GHG emissions), but adds that it will continue favoring RE solutions and that achieving universal access to energy will have a minimal environmental impact, increasing GHG by not more than 1% globally (World Bank, Toward a Sustainable Energy Future for All. Directions for the World Bank Group's Energy Sector. 2013 p. vii). (World Bank, 2013 S. vii). Furthermore, considering the high probability that fossil fuel costs will rise as a result of elimination of subsidies, increased scarcity and introduction of carbon taxes while RE costs are declining, reaching long-term energy cost parity between RE and fossil fuel has become a real possibility within a properly designed and balanced policy framework. (World Bank, 2013)

1.3 Unrealized Potential of RE

Despite these broadly acknowledged and documented benefits of RE, the level of RE investments remains far insufficient and unevenly distributed. From a climate change perspective, according to the IEA scenario to stabilize CO2 concentration at a 450 ppm level (global temperature increase to 2 degrees), RE in developing countries should account for 57% of the energy mix in 2035 (an additional 2200 GW of RE capacity), compared to 23% (1000 GW new RE) which are expected under a Business as Usual scenario. (Lutz Weischer, 2011 p. 12). And from an energy access perspective, RE investments in off-grid

areas, where lack of access is felt strongest, are still severely constrained by costs, risks, and unfavorable policy frameworks.

1.4 Role of Private Sector

There is broad consensus, that scaling up RE to a desired level from a climate and energy access perspective, will necessarily require private sector leadership as investors, developers, and operators, encouraged by an enabling public policy environment. (World Bank, 2011 p. 5)

Already today, the overwhelming majority of RE investments are being undertaken by the private sector. However, financing renewable energy, in particular in emerging economies and developing countries faces an array of challenges and risks for private investors and developers. This calls for efficient and effective policies to support initial RE development and level playing field markets for RE to compete with conventional energy (UNEP & SEF Alliance 2009).

Such scaling-up of RE will require a comprehensive shift from fossil fuel-based policy to a RE-based policy, such as is currently attempted by Germany under its 'Energiewende'. For such shift to be successful, it is absolutely essential that the private investor's perspective is well understood and is taken into consideration in the design of the policy framework in order to increase the chance of mobilizing private sector investments and active involvement in the implementation of such transformation.

1.5 Main Purpose and Focus of this Discussion Paper

The main purpose of this report is to contribute to the discussion of what combination of policies and measures by the public and the private sector will achieve an alignment of diverging interests in order to create the enabling environment needed for mobilizing private investment in RE.

The creation of such environment is a challenge of immense proportion given that there is a wide range of private actors, with diverse risk-reward expectations, operating in a wide array of RE applications with different sets of challenges, requiring different policy and support measures. At the same time, public sector actors at local, national, and international level pursue a variety of different policy priorities, some five of them mentioned above, and have different level of capability to design and implement RE policies.

The central theme throughout the report is the call for a constructive dialogue between the public and private sector, informed by a systematic understanding of diverging and converging interests, as foundation for a robust and effective RE policy, institutional, and financial environment, leading to a growth in private RE investment.

In detailed research case studies conducted by the Sustainable Business Institute and its partners, the authors have analyzed the specific situation in three RE applications: on-grid small scale wind power, micro-grid utilities, and off-grid solar home systems.

The focus in each of these areas is on the role of small RE investors and enterprises and what they need to be successful. Particular emphasis is given to the constraints and opportunities they face for financing. In addition, the Sustainable Business Institute conducted a study with its partner Micro Energy International to specifically explore energy SME financing in emerging and developing countries. (Kebir et al. 2013).

These focus areas where chosen for a number of reasons:

- To identify both the constraints and policy approaches which are common across different RE applications, and those which are unique to each of these areas requiring tailored responses. Research in these specific areas has been sparse so far, while they hold great potential (wind) and great relevance for energy access by the Base of the Pyramid.
- A focus on SMEs is important as these enterprises are often first movers or adopters in their regions. The proliferation of SMEs in the off-grid sector is particularly relevant, as they aim to bring RE technologies to regions which are disconnected from, or sporadically connected to, grid infrastructure. To fulfill the goals of Sustainable Energy for All by 2030 will require support for precisely these kinds of companies and it also becomes increasingly vital to connect global financial flows to local RE infrastructure and assets.
- Access to attractive and affordable financing by the private sector is one key challenge for mobilizing private investment and scaling up RE. Some of these challenges are specific to RE, and even to the specific RE application, others are more generic and linked to the limited credit-worthiness of countries and finance access by small enterprises.

After identifying barriers to scaling up private RE investment in general, the report proceeds to highlight specific challenges in each of the three areas. This is followed by a set of options for overcoming these challenges and policy recommendations, including for public funds at

all levels, such as the Green Climate Fund, whose mandate include the expansion of private investment in RE.

2. Barriers To Scaling Up Private RE Investment

2.1 Generic Barriers faced by RE Investors

Despite the encouraging global trends, private RE investment falls far short of its potential to satisfy the un- and under-served energy needs of a growing population and business sector in ELDC.

This chapter looks at key barriers private sector investors and operators face when entering the RE market in ELDCs and prevent a faster growth of RE.

At the risk of simplification, these potential barriers can be grouped around the following three issues:

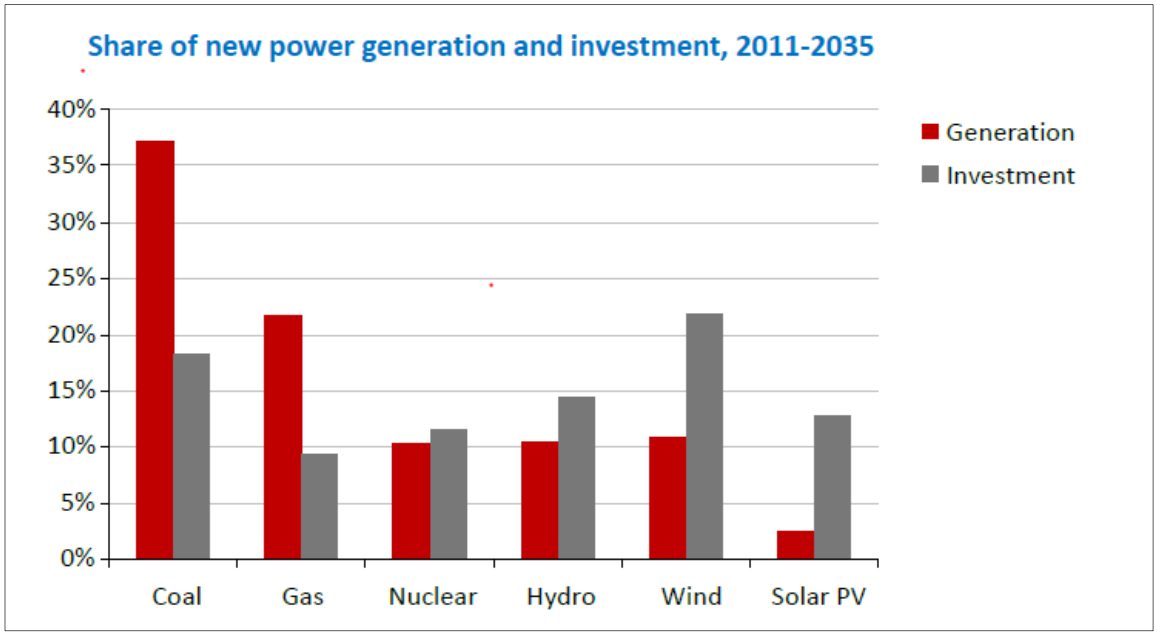
- Specific cost structure of RE
- Unfavorable policy and regulatory environment, and
- Capacity constraints of key stakeholder

In addition to these RE specific barriers, the private sector faces general country specific barriers, such as inadequate physical and institutional infrastructure, insecurity, and corruption. (Deutsche Bank Climate Change Advisor, 2011 p. 12ff)

These barriers affect the investment decision of potential private sector investors and operators. In a direct or indirect way, these barriers translate in elevated costs of, or diminished revenues from generating RE based energy, and in particular electricity generation.

Cost Structure of RE

In general, the generation of RE based electricity faces two cost challenges compared to conventional (fossil fuel based) energy: i) upfront investment requirements can be significantly higher; and ii) long term generation costs (i.e. levelized cost of energy, LCOE) can be higher, although this is changing fast as wind, mini hydro, and solar PV are approaching cost parity (although not necessarily risk parity) with fossil energy.



Source: (IEA, 2011a) Press Launch London, 2011

The above figure reconfirms the capital intensive nature of RE. Looking at estimated power sector investments between 2010 and 2035, IEA estimates that RE will account for 60% of capital investment for only 30% of additional future power generation capacity. (IEA, Nov 2011b) What the graph does not show are the minimal fuel costs, if any, and hence lower operating costs over the life time of the RE investment, which are illustrated in a stylized form below in a break down of a typical RE cost structure.

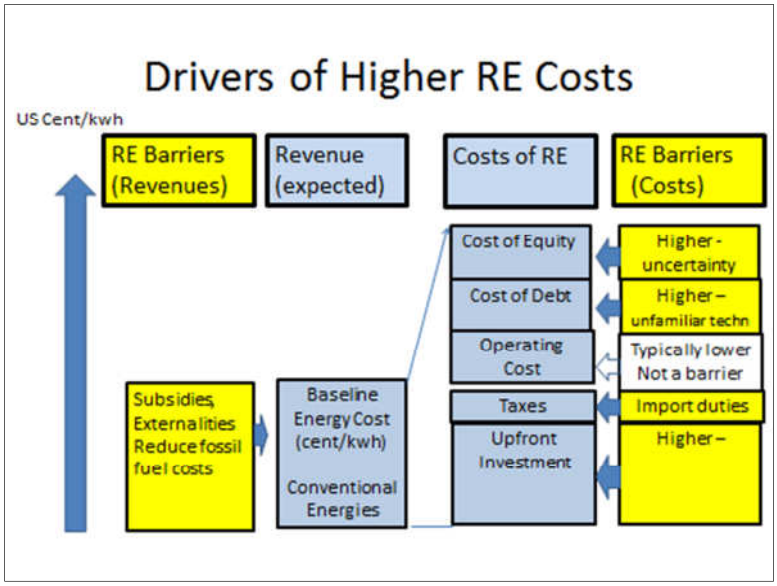


Figure 1: Drivers of Higher RE Costs

Comparison of renewable and fossil fuel based electricity generation costs is a complex exercise, as multiple factors such as taxation, regulations, and local variations in costs need to be considered. Levelized Cost of Electricity (LCOE) provides an approximation of the cost of generating 1 kwh of electricity, taking into consideration upfront investments and operating costs over the lifetime of the power generation facility.

The typical key barriers and drivers for pushing up RE costs, as identified in above Figure, include:

- (Levelized/Annualized) higher upfront investments for RE typically (compared to conventional electricity generation).
- Higher amount of import duties – driving up Taxes and Duties because in most countries a larger share of RE technology needs to be imported.
- Operating Costs are typically lower than for conventional energy because there is no, or a much reduced, consumption of fuel. Hence this is not a barrier but a strength of RE.
- Debt financing could be more costly a) because of the greater upfront investment, and b) because of a possible risk premium the lender may charge for not being familiar with RE technology and new business models (eg. for off-grid electrification).
- Equity financing could be more costly because investors may also demand a premium to compensate for perceived higher risks associated with RE, related to new technologies in new locations and payback periods of 5 to 15 years. Other risks related to institutional factors are further discussed in the next section.

All of the above drivers tend to push up the costs of RE. There are a number of barriers which push down expected revenues from the sale of RE based electricity. This can include:

- Fossil fuel subsidies, which lower the benchmark cost against which RE needs to compete, i.e. an un-level playing field;
- Electricity consumer subsidies granted to the users of existing public utilities to make electricity affordable, and which may not automatically be granted to private RE power producers.
- External costs of fossil fuel generated electricity, that are not reflected in the benchmark price, such as GHG emissions and local health damages from pollution. By ignoring those external costs of fossil fuels, RE are competing in an un-level playing field, in which the benefits from lower GHG emissions and reduced health damages are not taken into consideration when comparing market prices for RE and conventional energy.

Moving beyond this stylized scenario, there are at least 2 important developments which affect the capital cost of RE and the benchmark costs of conventional energy, and which as a

result will make RE increasingly attractive to the point, where RE will be able to compete without subsidies.

- The upfront capital cost of solar PV is falling dramatically as economies of scale, market competition from Asia, and in particular China, and better product performance are pushing down the cost per KWp. In other technologies, such as wind, grid parity has already been reached in select locations and further reduction in capital costs will be less dramatic than for solar.
- The benchmark cost of power generation in off-grid locations is significantly higher than the LCOE for grid generated power, making RE a competitive alternative in many locations. Evidence from field visits in Asia indicates LCOE for diesel generated electricity of 30 to 80 US cent/kwh, depending on transport costs, cost of diesel, and scale of operation. At the same time, demand for electricity in such location is rising fast because of basic needs to charge cell phones, operate lights and TVs, process food, and generally higher consumer expectations, which in turn are encouraged by global and national energy access for all policies.

Unfavorable Policy and Regulatory Environment

Private Sector RE investors and operators face a number of policy and regulatory hurdles, broadly revolving around issues of inadequate or volatile RE policy frameworks, a dearth of transparent permission and licensing processes and restricted or absent grid access. RE policy frameworks can lack strategic planning, cast doubts over government commitment and change with political pressure. The fear of uncertain targets, sudden policy changes during project implementation and regional fluctuation of energy prices keeps many investors away. A dearth of transparent permission processes might also lead to unfavourable investment climates and high levels of corruption with no adequate recourse measures (Friebe & von Flotow 2011; Waissbein et al. 2013). Restricted or lack of guaranteed grid access might result from antiquated grid infrastructures (WBGU 2012) or an absence of clear network access rules or of standardised power purchase agreements (PPAs).

Capacity Constraints (institutional, technical, financial)

In addition to unfavorable cost structures and policies, the scaling up of RE is seriously hampered by limited institutional, technical and financial capacity among various stakeholders in both the public and private sector.

In fact, these unfavourable regulations and policies often arise from capacity constraints which exist with policy and decision making stakeholder along the RE value chain. Poorly-informed decision makers might make sub-optimal decisions, while limited technical and

managerial capacities of project developers might result in suboptimal plant design or construction material quality issues.

Grid operators often lack capacity to integrate intermittent RE sources leading to sub-optimal yields of RE investments. RE projects may enjoy little social acceptance with end-users who lack relevant information about life cycle savings or may have a negative experience with poorly performing RE installations for lack of comparable and reliable product information. These capacity barriers together thus affect not only the financing and investment, but also the regulation and development of RE technologies and investments.

One capacity constraint about which investors regularly complain is the under-developed debt and equity market for RE investments which make access to timely and affordable capital difficult. Local banks find it difficult to assess and properly price the risks associated with RE investment for lack of experience and reliable benchmarks, and lack of familiarity with the RE specific business models and structuring of risks. Risk aversion leads to a mismatch of financing terms & conditions and financing needs – e.g. the maturity is shorter than needed to match the cash flow profile of the RE project.

New SME companies with interest in RE face additional hurdles and they are often forced to rely heavily on own, friends, and family funds to finance their first deals. International equity markets for RE are evolving for larger scale investments, but typically find smaller and medium scale investments, in particular in off-grid locations, unattractive.

2.2 Sector and Technology Specific Barriers: Findings from Three Case Studies

The three case studies which underpin this report provide insights into the specific barriers small size investors and companies can face, when engaging in RE development. These studies demonstrate the value of detailed analysis of specific framework conditions and barriers for market development before designing or adapting existing national and international policies with the well-intended aim of leveraging private investment.

These studies are based on interviews and workshops to understand the perspectives of private sector companies that are currently actively developing RE in emerging and developing countries. For the wind farm study, the team chose project developers from Germany, who were active in emerging and developing countries, as well as experts from smaller emerging markets, especially in Eastern Europe and South America. For the micro-grids study, research focused on eight existing and successful companies active in countries such as India, Laos, Philippines and Senegal, including some with operating pilot plants in those countries. Those findings were complemented with additional interviews with other

stakeholder groups like policymakers, development consultants and private social investors. For the SHSs study, research focused on two types of stakeholders within the value chain: local company representatives in India and Tanzania (which are at different stages of market development) and German off-grid wholesalers that supply local companies with technology and know-how.

Onshore Wind Farms

Onshore wind energy is now a mature technology and, depending on national circumstances (including availability of wind, an encouraging policy framework etc.), wind energy can contribute a significant share to the national energy mix. Globally, wind accounts to about 30% of total RE investments in 2012 (about US$ 80 bn out of US$ 270 bn, only second to solar energy which accounts for almost 2/3 (IEA, 2013 S. 22). The major wind energy markets today are China, EU and USA, and current developments in many emerging and developing countries are encouraging (GWEC 2012).

Lack of availability and access to investment capital may appear at the surface as the major impediment to scaling up wind energy, but most of the time that lack results from several interlinked barriers, most of which stem from the absence of a robust regulatory framework and the related risks for the revenue stream of the project.

This risk is particularly high, where no agreed framework for the off-take of wind energy exists, and all conditions need to be negotiated bilaterally between the wind energy operator and the electricity distribution company, often a publicly owned monopoly. But even where e.g. a Feed-in Tariff (FIT) regime exists, the financial stability of the off-taker may be poor or the grid operator lacks ability, and/or the regulatory mandate, to absorb all of the intermittent wind energy, thereby making the revenue stream of the wind energy operator more volatile. Even with existing legal frameworks, the permitting or licensing processes can be vague and bidding processes intransparent, opening the door to corruption.

Also the high local content requirements can translate into a barrier to diffusion, which may create a significant delay in market development due to local industries being unable to develop their capabilities in time.

It seems that the risk that results from such regulatory weaknesses are often considered too high for investors and banks. A project developer who recently shut down all activities outside Europe noted, “regarding risk and return, emerging countries are competing with low-risk, low-return, quick-approval-process projects in Germany and the EU”. Therefore, public international investors and donors are important for kick-off projects and beyond – especially

after the global financial crisis. However, the supply of finance may not always be the binding constraint as two interviewees highlighted: “donor funding is available – in fact, donors compete for good projects, but the number of good projects is limited” (public finance expert), and “often, development banks are not willing to take more risk than commercial banks” (project developer). In this case, local private or public banks might be more capable in dealing with political risks. Another project developer reiterated that “during the first five years, you always have to secure funding locally”. It seems as if low risk and low return are currently preferred by most investors over high risk and high return, with the exception perhaps of some local private equity investors.

Regarding capacity barriers, local investors and credit agencies often lack the skills and experience to conduct due diligence for wind farm investments. Grid operators often still lack the knowhow and necessary infrastructure to manage the intermittent supply from wind power without infringing on the grid’s reliability, thereby reducing the yield and revenue from the windfarm investment.

Micro-Grids.

Electrification of small, low-income villages situated far from existing electricity grid often represents an unattractive investment for larger entities but some private sector and PPP models have been identified as feasible solutions to address these needs. The entities which provide electricity to these off-grid villages are called micro-utilities, defined as organisations owning and operating at least one power system connected to a small and local electricity distribution network supplying and selling electricity to typically fewer than 5,000 customers, sometimes distributed among several individual micro-grids, and with an annual revenue of below USD 1 mn. (Peterschmidt et al. 2013)1

A key challenge, which touches upon the three types of barriers identified in this report (costs, regulation, capacity), which micro-utility entrepreneurs face is the need for developing a model which **balances risk, returns and responsibilities between the local community, the private operator and investors**. What might appear as a social issue at first sight, actually directly affects the financial viability of the micro-utility.

Cost Barriers. Funding piloting and demonstration of micro utility models is a challenge and deters many small enterprises. The network of stakeholders involved at this stage is small and beyond grants, no external financing and financial risk mitigation is available. Third party financing is rare at this early stage. Thus, micro-utilities have to put in considerable amounts of high-risk equity or apply for business plan competitions with award money to be able to

[1] This section on micro utilities is based on the Study Peterschmidt et. al, 2013

generate their core capital. Small companies or companies without an international network of supporters usually do not reach the stage of gathering enough finance to finalize their demonstration project successfully.

There is also a lack of funding to scale-up successful pilot projects. To prove a micro-utility model works requires funding for 3 to 4 years of the pilot- and due diligence-phases (EUR 200,000 and EUR 1 mn respectively). Subsequent scaling up of such a proven model requires additional funding from public and private investors. Due to lack of established regulatory frameworks in the off-grid arena, transaction costs escalate during the scale-up of micro-utilities. What might have been informally tolerated during the pilot phase without a licence needs now to be regularized with a costly approval process, inter alia to satisfy potential investors' requirements.

As the effort for due diligence procedures is almost independent from the loan amount, transaction costs for investors are comparably high. Beyond potential investors such as large utilities, pension funds, and private banks, even development banks face issues of comparably small investment amounts, perceived high risks and challenging evaluation of village-level projects. For international long-term finance of micro-utilities (typically 10 to 15 years), considerable risks of inflation and foreign exchange rate fluctuations exist. Small entrepreneurs have not the means to mitigate these risks as do large corporation (e.g. by using portfolio balancing methods).

Regulatory Barriers. The acquisition of permissions and licenses for micro-utilities causes considerable transaction costs for the private sector. These transaction costs are in general not reflected in the tariff calculations of the regulatory authority and must be covered by the entrepreneur accordingly.

A lack of coordination in public support instruments also results in increased transaction costs. More specifically, it may be assumed that the complexity of a project as well as its transaction costs increase exponentially with the number of instruments or funding sources used in parallel. This is partly because each instrument requires reporting data, but a larger issue concerns the interaction of different instruments, resulting in multiple interconnections and interdependencies among them. The smaller the micro-utility is, the higher is the percentage of transaction costs in total generation costs (in some cases up to 50%). The challenge for public policy and public investors here is to set up a framework of instruments, adjustable to national characteristics, that reduce transaction costs without limiting the options of micro-utilities to develop and implement their own innovative and creative business models.

The mis-alignment of administrative procedures of diverse public stakeholders such as national authorities and international donors makes it sometimes difficult for the private sector to avail of public support instruments. As regulations and support instruments are often not adjusted to each other, conflicts can arise. A concrete example is the challenge to align timing for the national licensing process and the availability of international donor money. Donor money is only available for a certain time period and under certain conditions, which includes, for example, the legal approval of micro-utilities by national authorities. If the framework conditions are not yet defined or implemented, the approval process is, in most cases, only initiated once funding is available and can take longer than the time period for which the donor money is available. A similar challenge exists with equity investors, who request a high and quick return once the transaction to the micro-utility is completed, while the approval process may only start then and often takes an unpredictable amount of time.

Capacity barriers. Past experiences show that communities receiving adequate training are capable of running a micro-utility but face difficulties once the system needs to be extended. The micro- utility may be owned and operated by the community, the private sector (utility or SME) or a combination of both. Pure private sector models can handle operations as well as necessary system extensions. However, due to a monopoly-structure, conflicts of interests are likely to arise regarding electricity price and allocation of loads.

The financing gap for scaling up proven models beyond the one or two donor funded pilots, is also the result of inexperienced potential investors, such as large utilities, pension funds, and private banks, or development banks, that shy away from the costly due diligence for (for them) relatively small investments and unfamiliar risks and uncertainties related to the interaction with small communities who for the first time gain access to electricity.

Off-Grid Solar Home Systems

Off-grid RE solutions, like SHSs, face a set of barriers which require attention from policy makers, investors and entrepreneurs alike.

Cost barriers include the need to offer adequate after-sale maintenance services when selling SHSs to poor customers. This interaction with customers and building their capacities (before sale) and offering maintenance services (after sale) are costly for the seller. Some businesses avoid these costly (but necessary) services. This contributes to the low reliability of SHSs and poor reputation regarding product quality.

Another cost factor is the need to provide in many cases seller credits and similar financing to the cash-poor customers with limited purchasing power. Clients have often no access of their own to credit, because risk-averse microfinance institutions (MFIs) hesitate to fund

them. The seller or small distribution company in turn has too limited working capital to provide sellers credit by themselves and find it difficult to mobilize working capital financing, let along longer-term capital, for themselves.

Regulatory barriers include the absence, or non-enforcement, of product standards allowing for unfair competition from companies that offer low-quality products at lower cost and thereby win market share and public tenders. This can have very negative consequences for the reputation of RE products in general, not just the specific product.

SHS are often promoted with public subsidies. Unless there is a long-term commitment by the Government, backed up with funding, there is a great risk for a boom-and-bust cycle, as donor programs expire and new ones emerge, leaving stranded small companies who have entered the RE field with the expectations of continued government support.

3. Overcoming Barriers to Scaling Up RE: Competitive costs, enabling policy framework, stakeholders' capacity

Scaling up RE to the levels demanded by climate change and energy access requires an enormous joint public and private effort to make RE cost competitive with conventional energy sources, reduce risks for private operators and investors through a transparent and predictable policy and regulatory framework, and create practical experience along the entire RE value chain.

Seen from the lens of a private RE investor or operator, the public sector can support private sector engagement in four ways:

- Increase the revenue stream for RE based energy (arrow up in below figure),
- Reduce the cost of RE energy generation (arrow down in below figure),
- Reduce the risks associated with RE investments (both on the cost and revenue side), and
- Strengthen capacity of relevant public and private stakeholders.

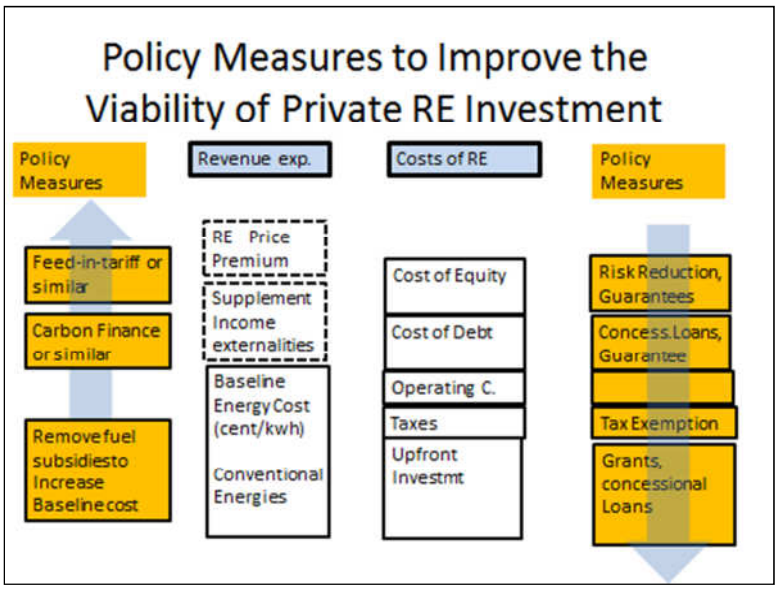


Figure 2: Policy measures to improve the viability of private RE investments

In this stylized scenario, (levelized) revenues exceed (levelized) costs as a result of various policy measures to enhance revenues and reduce costs to private RE investments. This, in

combination with appropriate capacity building efforts, would make private investments in RE viable.

3.1 Measures to Enhance Revenues for RE Generated Energy

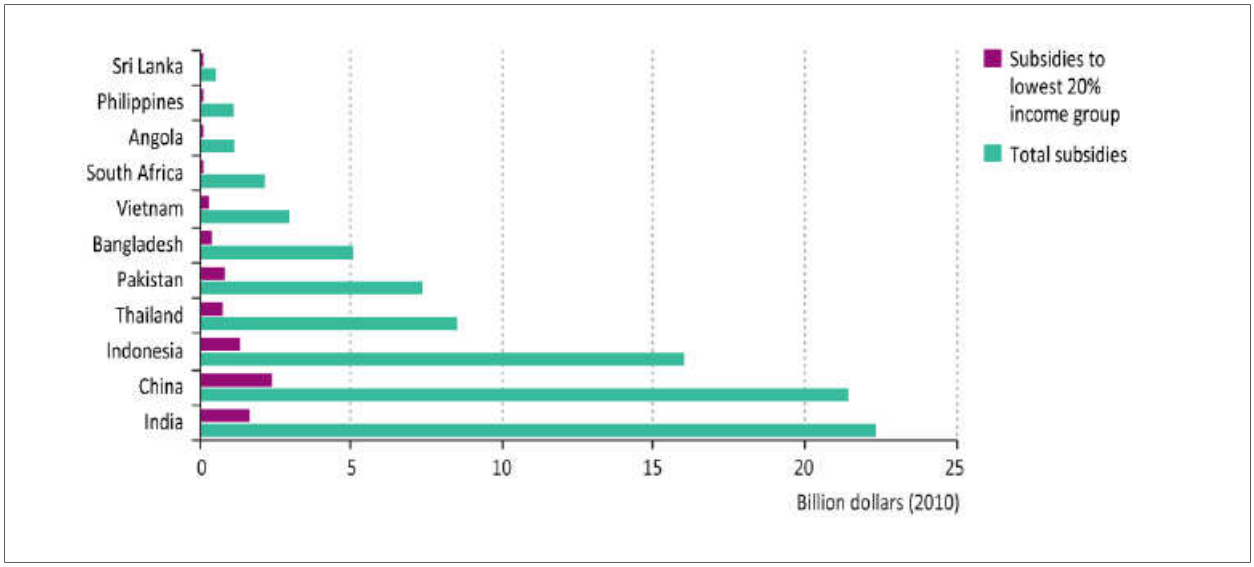
Close the Cost Gap: Feed-in-Tariff, Quota, and Carbon Finance

The public sector can use several instruments to close the gap between conventional and RE electricity prices: i) pricing tools, such as general Feed-in tariffs, ii) quantitative tools such as Renewable Energy Standards with tradable RE certificates, and auctions (both discussed further down in the wind energy section), iii) eliminating counter-productive subsidies to fossil fuels, which ignore the their external costs, and iv) additional income streams, such as revenues from carbon credits which reflect external benefits of RE. The first two are being discussed in the specific wind energy section.

Reduce Subsidies of, or Charge a Carbon Tax on, Fossil Fuel Based Electricity

Elimination of overt and hidden fossil fuel subsidies, which ignore the external costs such as global and local environmental damages embodied in fossil fuels, makes RE more competitive by reducing the gap between higher RE and lower fossil fuel costs, while at the same time freeing up fiscal resources which can be deployed in support of RE and other sustainable development priorities. Subsidies of fossil fuel based energy amounted to over US$ 409 billion dollar in 2010 compared to an estimated 66 billion in support of RE development (IEA, Nov 2011b).

Despite international support (e.g. by the World Bank) and national policy promises, the results of subsidy elimination are still mixed as the graph below shows. It also is evident that these subsidies do not primarily serve the poor, as occasionally is argued in defense of the subsidy.



Source: World Energy Outlook – Energy Access (IEA, 2011c p. 40)

Creating a level playing field for RE through reduction of fossil fuel subsidies remains perhaps the most effective, and cost-effective, approach to scale up RE, while at the same time reducing the fiscal burden of energy subsidies and improve energy access, if savings are invested in extending energy services to the poor.

A carbon tax is another policy instrument to level the playing field between RE and fossil energy sources by monetizing the external costs associated with GHG emissions. It results in increased costs for fossil fuel based energy, given that on average coal fired power generation emits 1 kg CO2e per kwh, natural gas based electricity about 0.6 kg/kwh, compared to less than 0.05 kg CO2e/kwh for RE. However, so far only few OECD countries, including most recently Australia, have introduced a carbon tax. The introduction of carbon taxes is resisted by some groups who argue that the increase in energy prices caused by the tax will render industry uncompetitive and will unfairly burden the poor. Those concerns can be addressed e.g. by making the tax budget neutral and with revenues earmarked for desired purposes, e.g. to subsidize low income household energy consumption (lifeline tariffs) or reduce payroll taxes, both possible instruments to offset higher energy costs in low income households.

Carbon Finance will likely play a limited role in RE funding, because the scope of the Clean Development Mechanism (CDM) has been severely restricted after the first Kyoto Protocol commitment period expired in 2012 to only low income countries , the demand for new projects is weak because modest ambition of buyer countries and a large pipeline of CDM projects waiting for funding.

3.2 Measures to Reduce RE Costs

Concessional loans to reduce cost of debt financing

Concessional loans offer reduced interest rates, often in combination with extended maturities, that help reduce financing costs and debt service. This is perhaps the most traditional instrument of public support for the RE sector. Relevant sources come foremost from national source, but also from bilateral or specialized multilateral climate funds, most notably the Clean Technology Fund CTF that is implemented by the World Bank and Regional Development Banks.

REFF, the Mexican Renewable Energy Financing Facility, is a 210 Million concessional loan fund, financed to equal parts by three partners: IDB, CTF, and NAFIN, a national development bank. It aims at facilitating the development of approx. 1000 MW of new RE installed capacity. Another example for concessional loan financing for a private RE project in Mexico is EURUS, Latin America's largest wind farm with a capacity of 250.5 MW. IDB provided $30 million concessional funding from the CTF. (Interamerican Development Bank IADB, 2011 p. 5)

Mezzanine Finance - Improved access to debt through local banks

Providing loans directly to private business, in particular small entreprises which are the focus of this report, is generally not cost-effective for national development banks or DIs. An IFC review of DI support for private solar investments concluded that international support in form of equity financing directly to private companies had not lead to the expected market transformation and recommended to focus future DI support on creating enabling environments instead of company winner picking. (IFC, 2010 p. 7) In that context, DIs have opted to strengthen domestic financial institutions to improve access to credit by RE investors by offering credit lines through second tier financial institutions, such as national development banks (Netto, 2011)), or directly to first tier banks, allowing refinancing of loans at favorable conditions, typically combined with TA measures to strengthen capacity of the banks as well as of private sector borrowers.

Improving Access to and Reducing the Cost of Equity

Venture Capital and Co-Investment.

While access to debt financing is already a challenge for small RE investors, smaller and new investors and developers are virtually left on their own friends and family networks when they need to mobilize risk equity capital. With falling costs and increased competitiveness with conventional energy source, certain type of RE investments should become more

attractive to the private sector. This is particularly true for business-to business RE investments such as RE based back-up of for industries replacing more expensive diesel generation, because these investments have lower approval costs (e.g. no public sector subsidies involved) and lower payment risks (reliable client with predictable demand) and shorter pay back periods of less than 5 years. Co-investment from an international partner supported fund, does not only contribute equity, but can also reduce risk for the investor (e.g. through sub-ordination, first loss, and to a lesser extent, through structuring the DI equity share as mezzanine financing). Furthermore, DI participation may facilitate access to additional equity and debt, as other investors and lenders take comfort in the due diligence of the international co-investor and the link to the host government. As a result, the RE investor may obtain debt financing at lower cost and achieve a higher debt/equity ratio with improved return on equity. (Deutsche Bank Climate Change Advisor, 2011 p. 32). However, for RE investments with payback periods well over 5 years and IRRs of up to 15%, such as for micro-grids and utilities, with elevated risk because of a financially weak clientele, there remains a serious core equity gap.

The table below gives a brief overview of different financing sources and typical financing conditions.

	Amounts available	Percentage of total investment	Expected interest rates
Expected input from core equity investor	Usually USD 50 k - USD 0.5 mn	Usually: >50% Minimum: >25%	15 to 20%
Impact investor / social investor	Usually between USD 0.5 mn-USD 4 mn	25 ... 30% of shares	15 to 20%
Mezzanine Finance from international development banks	Minimum: USD 5 mn – USD 10 mn	Usually: >30% of total investment Sometimes: up to 50%	3 to 18% (depending on per-formance of company)
Loans from international development banks	Minimum: USD 5 mn – USD 10 mn	Usually: >30% of total investment Sometimes: up to 50%	6 to 12% (interest fixed throughout payback period)

Source: Peterschmidt 2013, p. 29, Investors and Their Typical Investment Targets (e.g. for Micro Utility Projects)

Enabling Access to Bond Markets

The magnitude of financing needed for scaling up RE to desired levels exceeds by far the capacity of public sector funding. Once RE is being made financially viable in a supportive policy environment, it need to be made attractive for institutional investors.

There are serious discussions among pension funds and other institutional investors to go beyond initial 'feel good green bond' experiments; however progress is slow as those investors need a risk-reward ratio which many RE investments in ELDC cannot offer because of inherent country and project risks. A more recent development is the interest of large pension funds of ELDCs to engage in green investments. A report by Mercer for a Norwegian Government Pension fund recommends investment in RE as a second priority (Mercer, 2012 p. 54ff). Some of them have received a mandate by their government, such as in South Africa:

> The National Treasury welcomes this much needed initiative and its inclusiveness, and greatly appreciates the involvement of all the stakeholders in this project. This welcome industry-led initiative follows the promulgation of the new Regulation 28 last year and seeks to give practical effect to one of the key principles in the Regulation, namely the need for pension funds trustees to take into consideration the role of the Environment, Society and Governance when they consider their investments." (FOCUS - Sustainable Stock Exchanges , 2012)

This prepares the ground for such pension funds to invest a certain share of their assets in green projects, including RE, while safeguarding their overall risk exposure. Here is a role for international DI to help de-risk such green bonds to such extent, that they become viable for domestic pension fund investors. The expected leverage of such public funds could be enormous, but limited number of bankable RE projects might become the main constraint.

Tax reductions/exemptions

Tax holidays or import duty exemptions are another form of reducing upfront costs of RE investments, as well as operating costs. For example, the Philippines Renewable Energy Act of 2008 offers a wide range of tax incentives including a) income tax holiday for 7 years, b) corporate tax rate after the holiday limited to 10%.c) duty free importation of RE equipment, d) net operating loss carry-over for the first three years, e) a zero percent value added tax on domestic purchases of RE equipment, and f) a zero percent value added tax on energy sold. (Philippines, 2008)

Concerning the last item, RE developers have pointed out that the VAT exemption for RE energy sold may not be only a blessing and actually have an adverse effect, in that the developer cannot pass on or offset the 12% VAT to be paid on imported goods. As at this stage, there is no RE equipment production in the Philippines, the investor has no alternative to importing equipment, which means a defacto net financial burden for the RE company which diminishes the overall impact of the tax incentives. This presumably unintended negative consequence of a regulation to help RE reminds us of the complexity of developing

effective regulation and the need to consult with the intended private sector beneficiaries in the process of developing regulations.

3.3 Build Capacity of Stakeholders

Overcoming capacity constraints is a broad field of critical importance to scaling up private sector investment in RE. It applies to both the supply side, i.e. the capacity of investors to assess risks and structure viable deals, operators to manage intermittent loads, and regulators to effectively design incentive mechanisms, and the demand side, i.e. the users of RE, in particular where they gain for the first time access to modern energy, such as in the case of micro-grids and off-grid SHS.

Financing capacity building is inherently difficult as there is no direct income stream resulting from it, although adequate capacity is a pre-requisit for generating any income from a RE investment. Often, the actual cost of capacity is borne by pioneer small investors who are ill prepared to carry this burden. E.g. most successful off-grid RE project models are developing hybrid approaches that aim to balance the power between electricity consumers and providers while also encouraging investments in system extensions. Enhancing capabilities and familiarity of communities with energy production facilities represents a large share of the costly upfront pilot phase borne by the micro-grid investor, which typically is not recognized and reflected in the electricity tariffs which are set to compensate operators for typical investment and operating costs, but not for extraordinary development costs. E.g. developing a business model and the regulatory framework for micro-utilities in Senegal, the private investor Inensus spent 4 years with regulators to develop rules, often through trial and error, while larger institutional investors are sitting on the sidelines awaiting till a predictable regulatory framework becomes available. This is a costly process which few small investors can afford to finance out of their own equity. It is generally also an unnecessarily slow process.

A more efficient process could be a targeted demonstration and piloting program with grant or concessional funding from public sources, reflecting the unusually high development risks which typically deter private sector. However, grant funding from government and donors is limited and often introduces biases and transaction costs for accessing them, plus lack of coordination between different actors limits its effectiveness.

Nonetheless, the importance of capacity building and technical assistance is generally recognized by international donors and public – private funds investing in RE. An analysis of 116 international environmental PPP funds undertaken by SBI revealed that the most

frequently offered support mechanisms are technical assistance and grants for the pilot and demonstration phases. Fewer offer debt and equity for the operational or implementation phases. Very few offer de-risking instruments, such as guarantees, and if at all, they are focused on debt repayment (Figure 1). It is to be noted that international PPP funds often apply a combination of instruments and measures to address needs of RE investments.

Seen as an evolutionary process, the scaling up of RE private investment requires differentiated support in each relevant phase: demonstrating, piloting, operationalizing, and scaling up implementation. The class of de-risking instruments, which has relevance both for an early piloting as well as for a later scaling up stage is perhaps the one area needing most refinement and development.

The data also revealed that the majority of PPP in the sample addressed more than one geographical region and more than one technology. Diversified investment portfolios allow PPP funds to reduce risks. By contrast, it could be argued, focus on specific regions and technologies might empower such PPPs to discuss and influence the development of technology-specific framework conditions with national and subnational policymakers.

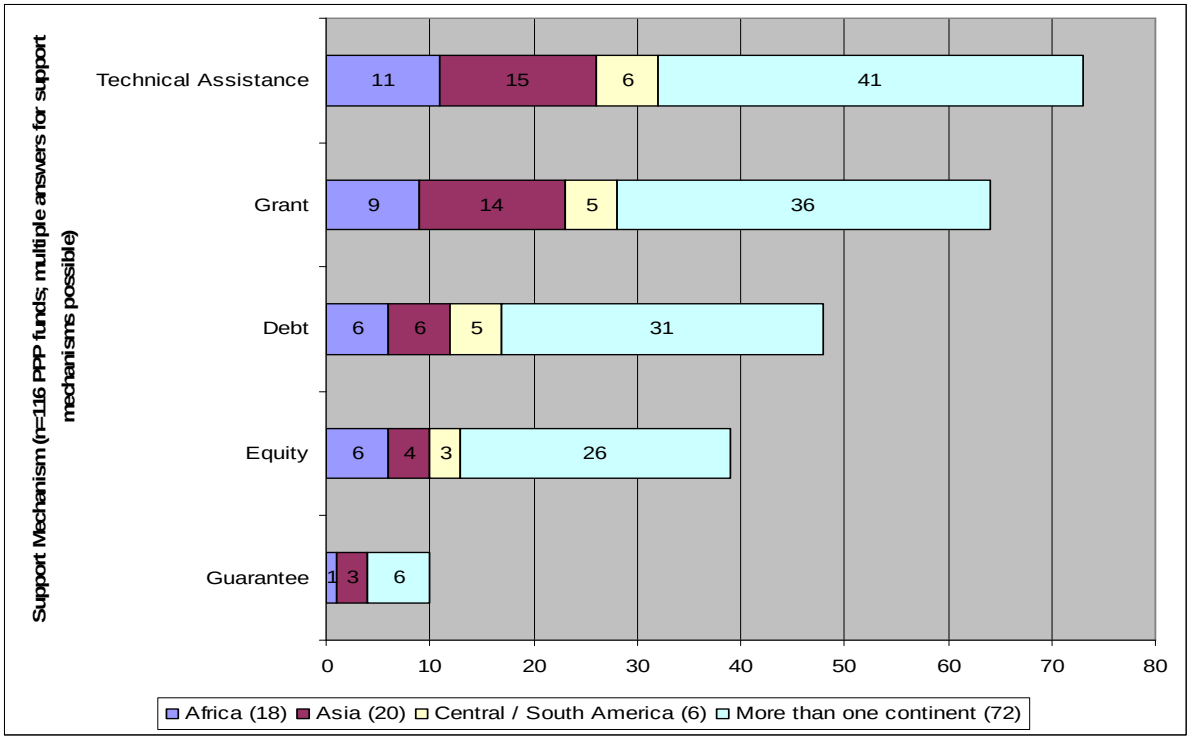


Figure 1: Number support mechanisms by type of mechanism and geographic focus based on analysis of 116 PPP funds (authors)

3.4 Support for Specific RE Applications

Measures to address specific barriers for Wind Power

On-grid on-shore wind RE investments flourish where revenue streams are made predictable, e.g. through a feed-in-tariff regime. More recently, the international discussion about climate finance and negotiation about the design of the Green Climate Fund, has increased the interest in FiT as a tool for scaling up low carbon measures, including RE wind energy. E.g. the AGF refers to South Africa's REFIT program as a promising instrument for scaling up wind energy and to the need for mobilizing international finance to scale it up, inter alia, to buy down the incremental cost to energy intensive industries, such as aluminum smelters, who would finance the FiT through a surcharge on their electricity bill and have shown resistance to the new instrument. (UN AGF, 2010 p. 57)

There is a lively debate about the advantages and disadvantages of quantitative policy instruments such as India's Renewable Purchase Obligations (RPO) over price instruments, such as FiT. Under the RPO scheme, utilities are obliged to purchase a minimum percentage of electricity from renewable sources (which could vary from state to state and range from 1 to 15%). RE generators enjoy an additional income stream from Renewable Energy Certificates (REC) which they can sell to utilities for their compliance with the RPO. Through the REC, the external benefits of RE (in terms of lower carbon and lower pollution) are monetized and make RE more competitive with conventional energy sources, but the RE investor is left with the uncertainty what actual value the REC will have, and hence the REC may be less helpful to secure debt financing from a lender.

In general, FiT are considered more effective in reducing RE investor risk, while quantitative instruments are seen as more cost-effective for government. (Gabriela Elizondo Azuela, 2011 p. 12)

Measures to address specific barriers for micro-utilities

Micro-utilities present at least three specific challenges for private investment: i) create access to finance to overcome a financing gap for scaling up and ii) create a local regulatory arrangement balancing private investors and public community interests to avoid a likely conflict between both parties, and iii) create capacity for complex load management in a relatively small and non-connected grid, and thereby also stabilize revenues of the micro utility.

Regarding the **financing gap** which exists for scale-up in the micro-utility space has been identified as being between at least USD 200,000 up to USD 1 million (Peterschmidt et al. 2013). These amounts are too large for the typical microfinance institution, which would

typically attend to the clientele of micro-utilities, but in most cases cap their exposure to individual borrowers at US$ 5 to 10,000, while commercial banks are looking for more collaterals than those projects can offer. In the short term, public funding sources, such as national development banks or international PPP Funds could facilitate financing for replicating successful micro-utilities through guarantee funds that reduce or transfer at least parts of the risks involved in the investments (technology, payment risks by poor community) and through working with relevant ministries for clear rules and regulations which shorten the time and the risk of corruption in the approval process.

The challenge for policy and public investors here is to set up a framework of instruments, adjustable to national characteristics, without limiting the options of micro-utilities to develop and implement their own innovative and creative business models. An exemplar in this regard is the Tanzanian government, who is partnering with the World Bank to coordinate regulatory frameworks with support instruments and structures for a micro-utility market, with the aim of attracting private investors and system operators. Major achievements include cost-reflective tariffs, provision of capital from local banks, the (almost complete) structure of the regulatory framework, availability of grants adjusted to the national framework (USD 500 per new connection) and initiation of a CDM program. The company Windpower Serengeti (2013) works within this framework, and is a micro-utility with a wind-solar hybrid power plant servicing approximately 4000 inhabitants in the Serengeti area.

Regulatory Environment cannot always be provided by national governments, but sometimes need to be created locally between the private micro-utility investor and the community. E.g. nationally prescribed tariffs combined with long-term power purchase agreements may not be appropriate for micro-utilities because they can easily lead to monopolistic and hostile relationships between private utility operators and the village. By contrast, **asset splitting** is an approach to create a nurturing social environment for micro-utilites. Assets are split into movable (e.g. power generation components) which are owned by the micro-utility and non-movable fixed assets (e.g.the grid, buildings and foundations) which are owned by the village. This allows to agree on relatively shorter power purchase agreements (as short as 6 months), after which time the micro-utility could be dismissed and take with it its assets (and move them to another village). This reduces the potential of the micro-utility to misuse economic power eg. in terms of higher prices or poor performance as it is possible in a long-term monopolistic dependency. In turn, a healthy and balanced relationship with clients increases the likelihood of timely payments and a stable relationship to gradually expand the micro-grid capacity, thereby directly affecting long-term stability and growth of revenues. Another model is being used by ‘Energy for Africa’ which founds micro-

utilities together with with the village. Through the distribution of shares in the company which convey certain veto-rights, negotiations with the village are more likely to be on an eye-to-eye level (Peterschmidt 2013, p. 18). In case of very poor villages without the necessary resources to finance their share of assets, government (or international organizations) can support them through targeted budgetary support, while leaving the community and the micro-utility some flexibility to negotiate locally appropriate terms and conditions.

Setting Electricity Tariffs in Off-Grid Locations. One issue which emerges is whether to set uniform tariffs at national level for both on-grid and off-grid locations or to differentiate them reflecting different cost structures. Setting tariffs for off-grid areas poses a difficult political task: should micro-grid consumers pay the same price or a higher kwh price than national grid customers? On one hand, it is obviously desirable to have everybody in the country pay the same tariff for electricity in order to give, at first sight, equal chances to all citizens. E.g. the Philippines achieves this by public subsidies making electricity cost in rural areas comparable to on-grid areas, while compensating the private utility for the elevated costs in off-grid areas. This may result in micro-utilities receiving more than 50% of their income from public subsidies. On the other hand, opening up and differentiating the tariff structure can accelerate rural electrification processes considerably (e.g. Tanzania) if new private investment can be attracted with differentiated tariffs reflecting elevated costs and risk of micro-utilities. There is a twofold advantage for those who choose immediate electrification with higher tariffs rather than waiting to be connected to the main grid in the future: Firstly, new rural business centers can be established where micro-grids exist, and secondly, micro-grids replace even more expensive lighting provided by kerosene lamps or candles.

Operation of a micro-grid, and in particular expansion of its capacity requires qualified staff. Micro-utilities have found different options to keep staff cost down. The first obvious one is training staff in the village. Another one has been to cluster several micro-grids under one local management team, capable to attract a higher trained team capable of handling even more complex issues while keeping travel costs down. A third option is a franchise model, whereby the local management team is kept lean and the franchisor backs it up with technical know how on more complex questions. An example model (but not in the RE field) is the Indian company Husk Power Systems (2013), the first to use a franchising system for micro-utilities to install 84 gasification power plants in four years. It enables the franchisor to sell systems, offer maintenance services, train operators and guide the partner in civil work or to acquire financing while enabling the franchisor to provide a sales channel for the char by-product.

The viability of a private micro-grid investment greatly depends on the ability of its (generally poor) clients to pay for electricity and its ability to increase capacity in response to growing demand without having to drastically increase tariffs. Micro-utility investors may therefore seek ways to not only sell electricity but also promote electricity using productive activities which grow local income. In collaboration with micro-finance institutions, local wood, steel, and agricultural product processing workshops can be fostered as leaders in local energy consumption and income generation. Another approach is to seek an anchor user, such as a telecom tower with a stable demand and payment record to reach a minimum scale to make the micro grid financially viable. E.g. the mobile telecom industry association GSMA and the Rockefeller Foundation use telecom base stations as anchor loads for micro-grids. (Peterschmidt 2013 p.22).

Measures to address specific barriers for off-grid Solar Home Systems

Private investors appreciate public sector grants to reduce the upfront investment costs for RE. Grants have the advantage of being easier to administer than loans, and are preferred by private sector, as they reduce the need for equity or debt financing. On the other hand, grants are not sustainable, as they rely on a constant inflow of new public resources. Hence they are best applied where public good functions or externalities need to be funded, such as capacity building, which do not lend themselves to loan or private sector financing. This is also true for the first pilot projects that need to prove the concept and demonstrate the technical and financial viability of RE investments, and thereby reduce the risk of subsequent investors. It is good practice to build in trigger points for reducing subsidies when certain milestones have been achieved (such as number of systems sold, cost reduced to certain level as a result of economies of scale, independently tested business models have proven financially viable).

For example, Bangladesh offers an upfront grant to buyers of solar home system to make them affordable. The subsidy dropped from US$90 per unit when the program started in 2002 to about US$25 dollar in 2011 as a result of falling SHS costs. These grants in turn were funded by GEF and IDA under the World Bank Rural Electrification and Renewable Energy Development Project (REREDP). (Nazum Haque, IDOCOL, 2012)

4. Conclusions

The main theme of this report has been the need for aligning and balancing public and private interests to create an environment that makes RE investments attractive to the private sector with an acceptable level of risk and reward for both the public and the private sector.

4.1 Private Sector taking the lead

For private RE investments, some encouraging trends have emerged over the last few years which can increase RE deployment in emerging and developing countries. While 2011 saw increased investment in both developed and developing economies, 2012 witnessed the highest ever investor activity in developing economies. Investment in developing economies in 2012 was up 19% from 2011, while developed economies, it was down by 29% (BNEF 2013). Another encouraging trend is that the last few years have witnessed increasing attractiveness of small-scale capacity (less than 1 MW) projects, with USD 80 bn being invested in 2012, despite rapidly falling prices for PV panels. In contrast, asset finance of large projects decreased 18% from 2011 to 2012 (BNEF 2013).

Both these trends, of investment moving towards developing economies and small scale capacity projects are indicative of new investment opportunities for different private investors. Grid-connected onshore wind farms are already well developed in OECD countries, with large institutional investors such as pension funds investing regularly. They represent a significant opportunity for institutional investors or project financiers to align themselves with investment in emerging and developing countries, thereby indirectly catalysing the development of the onshore wind market in these countries. For micro-grids, the demonstration, pilot and scale-up phases would benefit from PPP-based funding owing to the number of public and private stakeholders involved in micro-grid operation. However, they also represent an investment opportunity for (social) impact investors, commercial investors, large utilities, pension funds, and private banks. There is increased hope for business development of SMEs looking to scale-up their commercial operations in the SHS space representing an investment opportunity for (social) impact investors as well as a long-term opportunity for commercial investors and venture capitalists, even in an environment of declining subsidies.

The private sector has a legitimate right to ask for government regulations and support that is transparent, designed with a long-term horizon in mind, and offering a degree of certainty by making rules and support predictable. But there is much scope for the private sector itself to create conditions which help reduce risks and increase rewards to make RE investments more attractive and profitable. Examples are innovative business models like the above mentioned asset splitting that distribute risks and rewards in a balanced way leading to better results for both private investors and communities. Or creative forms of reducing operating costs by clustering several village grids to be served by one local technical management team. And very importantly, to work on the demand side with energy users, to provide incentives, through smart tariffs, for consumption patterns that are efficient and compatible with intermittent RE supply, and which encourage productive use of newly available energy in income generating business, thereby gradually expanding demand and the ability to pay for additional energy supply. Sellers' credit is another business model to foment demand for RE by enabling poor clients to purchase energy and cost saving RE products, such as solar lights.

4.2 Three Trends re-shaping RE public policy

Three trends are reshaping public RE policy, all geared towards a public sector role of creating an enabling environment and increasing the leverage of scarce public resources in mobilizing private investment following the TLC (transparency, longevity, and certainty) principles of good governance:

- **From support for individual RE companies to support for a comprehensive RE policy environment.** Having achieved only modest development impacts with supporting individual companies (winner picking), emphasis is shifting towards designing comprehensive packages of multiple polices and institutions that need to be in place for a successful scale up of private RE investments. Elements of this package include setting clear and reasonably ambitious short and long term goals (increase in access or share in the energy mix or emission reductions, etc.) in line with the principle drivers (and their relative political priority) behind the RE policy (access, climate, energy security, etc..). The goals need to be commensurate with implementation capacity of the country in order to build trust in the commitment and delivery capacity of the government. Incentives, such as a FIT, should be open to all qualified actors (as opposed to bilateral business – government arrangements). Transparent and predictable permitting processes are another key element. This could involve the principle of 'consider it approved, unless authorities find and point out a violation of laws or regulations'. And a comprehensive

policy package will not only include support measures but also eliminate barriers, such as fossil fuel incentives which render RE uncompetitive or inefficient public energy sector monopolies preventing private initiative. These can be politically difficult and time consuming policy processes where sequencing matters: the best RE policy cannot attract private investors without having first clear rules for conducting private business, using land, and hiring labor.

- **From investment oriented incentives (e.g. grants) to generation based incentives (e.g. FIT).** To minimize unintended consequences, incentives need to be as much as possible aligned with desired outcomes. For RE policy, this means encouraging and rewarding actual generation and delivery of electricity and not upfront investments in RE capacity. India and China made the unfortunate experience of having promoted with public incentives the construction of facilities which in the end did not deliver actual kilowatt hours because, in this case, the grid had not the capacity to absorb the RE. More generally, the trend is towards results based incentives which shift the risk of actually achieving planned outcomes from the government to the private investor. Again, risk and rewards have to be balanced: hence results based approaches are appropriate for well proven business models which give the private sector, with reasonable certainty, an idea of expected costs and benefits. Results based approaches are less appropriate during and early trial and error piloting phase with new technologies and new business models, because it would impose an unreasonable burden on the private investor.
- **From financing instruments to de-risking instruments.** In the majority of countries, there is no shortage of private capital but a shortage of RE investment opportunities offering acceptable risk-reward ratios. Public investment in de-risking of private RE investments stands to have a greater leverage than 1:1 direct funding in form of grants and concessional loans.

4.3 International Development Institutions (DI) Promoting Innovation in RE

Scaling Up RE offers a tremendous 'development dividend' in economic, environmental, and social terms. In order to fully reap this dividend, DI should support committed countries in pushing innovations in at least three areas: i) technology, ii) policy frameworks; and iii) business models.

Technology Innovation. RE technology innovation and related reduction in cost and increase in productivity remain a core mission, which underpins the scaling up of RE. The dramatic drop of solar PV costs has opened up vast new opportunities for non-subsidized deployment of RE. Technology innovation is a complex field but quite familiar terrain for DIs.

Support can take in principle three forms: i) funding for R&D, ii) proactive sharing and transfer of existing technologies, iii) piloting, local adaptation and adoption of technologies. Data on R&D spending for clean energy (including energy efficiency and RE) unfortunately point in the wrong direction: Corporate research and development in clean energy slipped to $13.2bn last year, from $15.3bn, and government research and development fell to $12.7bn from $16.2bn – due in large part to the fading effect of the "green stimulus" programmes announced by major economies after the 2008 financial crisis. (Bloomberg New Energy Finance, 2012 p. 2) A reversal of this downward trend in both the private and public sector is needed and justified in view of the magnitude of expected RE investments.

DIs can also a play a role in supporting piloting and development of less popular but nonetheless promising RE technologies, such as Ocean energy in the form of ocean thermal energy conversion (OETC), wave or tidal currents, which have received less attention in the past, because of high upfront costs exploration and development costs. SIDS and countries with long and exposed coastlines are interested in understanding better the commercial viability of these energy forms. E.g. the Philippines has on a very preliminary basis identified a theoretical capacity of 120,000 MW for OETC alone, and project ideas for about 70 MW, but encountered only limited interest from 2 companies so far. (Department of Energy, Philippines) International support in form of cost sharing for early pilot efforts would help reduce risks for private investors and, with appropriate knowledge sharing, generate valuable lessons for other countries.

Policy Frameworks. The number of countries with explicit RE policies, such as RE targets, has grown to 118, of which half are developing countries (REN21). However the reality on the ground is often characterized by a lack of clear implementation regulations and lack of implementation capacity, which creates uncertainty for potential private sector investors, and can lead to a wait and see attitude. The role of international DIs is limited, as the policy process is largely nationally driven, but nonetheless, DIs can play a critical role in facilitating knowledge sharing among policy practitioners, supporting basic capacity building for implementers, both at national and local level, monitoring the effectiveness of policies under different country circumstances, and finally Multilateral Development Banks can help roll out RE policies in the context of sector loans with a performance based approach.

Business Models. The energy sector faces nothing short of a paradigm shift towards decentralized clean energy solutions enabled by cost-effective renewable energy technologies. This is in addition to the growing share of renewables in large-scale power generation. Changes in the market structure call for new business models which offer the private sector acceptable risk-reward options for scaling-up its engagement. A particular

challenge exists at the micro to medium size level serving off-grid and mini-grid clients, which are still predominantly public sector subsidy dependent. This has led to creative solutions for allocating risks and distributing costs among the private company and the community as in the case of the INENSUS approach to mini-grids in rural Senegal (INENSUS).

4.4 Suggestions for the Design of the Green Climate Fund (GCF) and other long-term Climate Finance Mechanism For RE Support

RE is an indispensable and integral component of any low carbon development. Supporting the scaling up of RE will therefore also be a key mandate of the GCF and other long-term climate finance mechanisms. The national and international experience with RE policies and private sector participation allows at least two suggestions for the design of the GCF with regard to effective approaches to RE development:

- Leveraging the balance sheet of the GCF for de-risking RE investments and unleashing private investment
- A results based support of evolving national RE policies.

Leveraging the balance sheet of the GCF for de-risking RE investments

The GCF paper approved by COP17 in Durban included a reference to a Private Sector Facility. There a numerous proposals for how to design and operationalize such facility. (Sierra, 2011) One common theme is the use of GCF resources to reduce risks associated with low carbon, including RE investments. This is consistent with the findings of this report, that de-risking instruments are needed but are least developed among the typical RE support mechanisms. For that purpose, the GCF could employ mechanisms which are widely used in the private financial sector, such as first loss risk sharing with local financial institutions, sub-ordinated debt and mezzanine funding, as well as guarantees and insurance products.

A particular focus, with high leverage, should be the development of true Green Bonds which actively invest in riskier RE operations. Eligible activities would be situation and country specific and appropriate for each evolutionary phase of a country's RE sector: e.g. support for 'early movers' during the readiness phase, for new business models with potential for replication during the 'operationalization phase'; and large scale market transforming investments during the 'scaling up' phase. The GCF would act as the 'buffer' that transforms the risk profile of these portfolios in such a way, that RE Green Bonds can offer risk-adjusted returns acceptable to institutional investors. For the governance of such Private Sector De-risking Facility under the GCF it will be essential to have seasoned private and public sector

leadership with a strong risk appetite and willingness to incur calculated risks and occasional failures, while maintaining the overall facility viable.

It can be expected that there will be skepticism, if not political opposition, during the design of the GCF, to an enhanced role of private sector funding and increased use of de-risking instruments. The perception might be that these are 'cheap ways out' of Annex 1 countries to not come up with promised public funding and to hold back funding in form of guarantee funds, instead of releasing them to Non-Annex 1. It will therefore require solid pilot programs which are carefully monitored through independent and credible organizations, to demonstrate the actual economic, social, and environmental benefits from a massive mobilization of private sector investments in RE with the help, inter alia, of using public resources as de-risking instrument. Nothing short of practical experience and tangible results will be able to overcome political, if not ideological, resistance to a massive public private partnership for scaling up RE

Evolutionary approach to International RE Support

Throughout this report, it was emphasized that RE support needs to be sensitive to the specific barriers of different RE technologies and applications. In a similar way, RE support needs to be sensitive to the level of country commitment and capacity. That capacity evolves gradually and RE policy instruments, including those of international support mechanisms like the GCF, need to evolve accordingly. An evolutionary approach could involve the following phases:

- RE Country readiness, supported through technical assistance to build the basic legal framework and institutions and through some concessional financial assistance for pilot programs and 'early movers'.
- Operationalizing RE Country Systems, supported through technical assistance for the design of complex general RE policies, such as a feed-in tariff. Financial assistance could cover part of the design costs and also provide subsidies, to dampen the initial impact on electricity rate payers cross – subsidizing the FIT.
- Coming to Scale, accompanied with technical assistance to the financial sector to become familiar with RE investments and to ease access to credit based on well founded risk assessments. Financial assistance could provide seed funding for guarantee funds and for equity funds to address the financing gaps identified e.g. for micro-utilities.

This evolutionary approach could apply a performance based incentive mechanism to move through the stages fast, by using trigger points. Each trigger would be linked to certain level of country readiness and certain increase in the RE share in the country's energy mix, as well as other pre-agreed indicators, such as energy access by certain disenfranchised

groups. Each time a trigger is reached, a new tranche of funding is automatically released, thereby also making international support for RE more predictable for the country.

Such approach requires an effective Monitoring, Reporting, and Verification (MRV) system. With such system in place, the country would be in a strong position to present its RE scaling up program also as a Nationally Appropriate Mitigation Action (NAMA) to potential NAMA funders.

4.5 Agenda for Further Research

This paper was born out of a research effort on climate change and financial institutions with a special focus on understanding the different public and private sector perspectives on scaling up private RE investments. The paper shed light on the barriers perceived by the private sector and the tool box of the public sector to overcome them. Case studies went into a detailed analysis of specific RE applications which so far had received less attention in the academic literature.

The paper also revealed both the complexity of RE development once the specific technology and country context is taken into consideration and the richness of solutions being developed by pioneer small RE enterprises, often with very little professional and analytical support.

Given the significant 'development dividend' which scaling up RE offers, it is important to accompany the implementation of RE policies and private investments with systematic research on the question of aligning and balancing public and private interest. Such research would need to be very practical application oriented in form of a series of in-depth case studies and with a strong quantitative focus to complement the predominantly qualitative research in this field. Building on the findings of this report, research would be needed in at least the following three areas:

- **RE Business Models**: which models offer attractive risk-reward profiles for a specific technology and country context? How can the creativity of small scale RE enterprises be harnessed and their barriers to scale up and replicate be addressed? How can risks and investments be allocated between vulnerable groups, like rural off-grid villages, and private investors to achieve sustainable relationships?

- **De-risking Instruments**: which experience has been made with de-risking instruments in actually increasing the flow of private investments in RE? How would de-risking instruments need to be designed to be most cost-effective from a public investment point

of view and still being perceived as effective tools by the private sector to off-load risks it cannot manage?

- **Performance based blending of diverse international and national RE support mechanisms at different stages of RE readiness**: what are meaningful and measurable targets of country RE readiness to be used as trigger points for performance based international and national support? What is an appropriate balance between performance based incentives to the private sector (e.g. rewarding energy generation) and upfront support in development policies, business models and technologies?

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