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ISSUE BRIEF

KEYS TO ACHIEVING UNIVERSAL ENERGY ACCESS SERIES | BRIEF 1 OF 3

IMPLEMENTATION STRATEGIES FOR RENEWABLE ENERGY SERVICES IN LOW-INCOME, RURAL AREAS

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INTRODUCTION

According to 2012 International Energy Agency (IEA) estimates, more than 1.3 billion people globally lacked access to electricity, and 2.6 billion cooked with inefficient devices fueled with traditional biomass.¹ The majority of people without access to electricity and without clean cooking facilities live in low-income, rural areas in developing countries. Meeting the energy needs of these underserved communities will require effective knowledge management, policies and regulations, standards, capacity building, and access to finance. Innovative strategies are needed to enable socially, environmentally, and economically beneficial energy access solutions for underserved communities. Socially oriented energy enterprises and organizations in developing countries are pioneering such strategies.

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This series of three issues briefs is rooted in a three-day workshop held by the World Resources Institute (WRI) and the DOEN Foundation in March 2012. Through the workshop and subsequent interviews, WRI brought together the experiences of 25 socially oriented energy enterprises, organizations, and financiers who understand the energy needs of low-income consumers in developing countries.

WRI hopes this series will help entities involved in delivering affordable, renewable energy to underserved rural communities benefit from the experiences and expertise of these participants. Their collective knowledge can inform policy recommendations to improve and expand distributed renewable energy services in developing countries.

The first brief describes four common core business strategies employed by the enterprises and gives examples of how these

strategies were implemented. The second issue brief analyzes the challenges these organizations faced in delivering services, discusses how they have overcome these hurdles, and examines the enabling conditions that support their set-up, start-up, and scale-up.

The third brief focuses on specific financing strategies to overcome risks and various financial instruments for expanding delivery of renewable energy products and services. It contains case studies and lessons learned from a variety of business models and examines how funds have been maximized from set-up to scale-up. It outlines the roles of various stakeholders – including governments, the private sector, civil society organizations and local, national and multilateral financial institutions – in delivering scaled up, affordable energy access solutions that are socially and environmentally responsible.

EXECUTIVE SUMMARY

This issue brief is the first in a series of three that focus on expanding the delivery of affordable, renewable energy in developing countries.² It describes the core business strategies employed by a group of socially oriented energy enterprises and organizations working to provide distributed, renewable energy services to low-income, rural communities and provides examples of how these strategies were implemented.

The enterprises and organizations described here promote the social, economic, and environmental benefits of delivering clean energy services to individuals and communities

that are not well served by traditional energy providers. Their business models combine social and environmental objectives with entrepreneurship. Although these enterprises function across different countries and contexts, they are characterized by a common focus on clean, affordable, accessible, and scalable energy solutions. Millions of underserved people in 11 countries around the world have benefited from the work of the enterprises highlighted here.

This series is rooted in a three-day workshop held by the World Resources Institute (WRI) and the DOEN Foundation in March 2012 as well as follow up interviews that

gathered the experiences of 25 socially oriented energy enterprises, organizations, and financiers who understand the energy needs of low-income consumers in developing countries.

Over the course of the workshop and interviews, participants identified four core strategies common to their business models: (1) understanding consumer needs, preferences, and capacity to pay; (2) demonstrating the value of a new technology or energy service delivery model; (3) building and maintaining consumer trust in the product and the supply chain; and (4) designing financing and payment schemes that fit within consumer energy budgets.

This brief examines each of these strategies, first through exploring its rationale and then by considering specific examples of its implementation. Although the energy access solutions discussed still face obstacles for scale up, several socially oriented energy enterprises and organizations have proven that with the right delivery mechanisms, and effective and efficient financing, many consumers can access affordable, cleaner energy services.

In describing their core strategies, workshop participants and interviewees identified several policy, financing, and capacity gaps that national governments and the international donor community should work to address. The second issue brief in this series will analyze the challenges these organizations faced in the delivery of the service, discuss how they have overcome these hurdles, and then examine the enabling conditions that support the set-up, start-up, and scale-up of

socially oriented energy enterprises and organizations. The third brief will focus on specific financing strategies to overcome risks and various financial instruments for expanding delivery of renewable energy products and services.

INTRODUCTION

According to 2012 International Energy Agency (IEA) estimates, more than 1.3 billion people globally lacked access to electricity, and 2.6 billion cooked with inefficient devices fueled with traditional biomass (as described in endnote 1). Approximately 85 percent of people without access to electricity and 82 percent of people without clean cooking facilities live in low-income, rural areas in developing countries.³ Providing access to reliable, affordable, and renewable energy is crucial for both meeting the development needs of these underserved communities and protecting the climate from dangerous levels of greenhouse gas emissions.

A 2011 IEA analysis indicates that an average of \$48 billion per year of global investment in extending access to modern energy⁴ is needed to achieve universal access by 2030.⁵ This amount is more than five times the 2009 level of global investment in extending access to modern energy, but only 3 percent of total annual global investment in energy infrastructure. The IEA estimates that of this \$48 billion, an average of \$20 billion per year globally will be required for mini-grid and off-grid solutions (increasing from approximately \$10 billion per year from 2010–15 to approximately \$40 billion per year from 2026–30), because 70 percent of the rural areas

that currently lack access are too remote for grid extension to be cost effective.⁸

“Mini-grid and off-grid systems, based on small-scale renewable energy applications such as solar energy, hydropower and biogas, as well as improved cookstoves, offer increasingly attractive, reliable and affordable solutions and provide an opportunity for small and micro enterprise business models to be propagated,” reported the International Renewable Energy Agency (IRENA) in 2012. “However, funding for renewable energy technology applications remains inadequate.”⁹

Meeting the energy needs of underserved, low-income, rural communities will require effective knowledge management, policies and regulations, standards, capacity building, and access to finance. Unlocking financing mechanisms for mini-grid and off-grid solutions is essential for scale up, but current business models and financing approaches do not always align with how international and local financial institutions view risk and return. Innovative strategies are needed to enable socially, environmentally, and economically beneficial energy access solutions for underserved communities.

Socially oriented energy enterprises and organizations¹⁰ in developing countries (see Box 1) are pioneering such innovative strategies. These enterprises have strong ethical and social values and design business models to deliver renewable energy products and services that fit the needs, uses, and cash flows of low-income populations. By designing tailored, sustainable solutions¹¹ based on consumer needs and capac-

BOX 1

SOCIALLY ORIENTED ENERGY ENTERPRISES OR ORGANIZATIONS

Socially oriented energy enterprises or organizations promote the social, economic, and environmental benefits of delivering renewable energy services to low-income individuals and communities that are not well served by traditional providers. They focus on clean, affordable, accessible, and scalable energy solutions that match the economic, social, and geographic characteristics of low-income consumers. They include private enterprises (such as SMEs), community cooperatives, and nongovernmental organizations.

ity to pay, socially oriented energy enterprises and organizations can help identify, inform, and overcome policy, capacity, and financing barriers that hinder energy access for low-income communities.

This issue brief is the first in a series of three based on discussions with 25 such enterprises and organizations. It focuses on strategies for delivering distributed, renewable energy¹² to low-income, rural consumers in developing countries. The second issue brief will analyze the challenges these organizations face in the delivery of the service, discuss how they have overcome these hurdles, and examine the enabling conditions that support their set-up, start-up, and scale-up. The third brief will focus on financing strategies to overcome risks and financial instruments for expanding delivery of renewable energy products and services. See “About This Series” box on page 2.

Workshop and Interviews

This series of briefs is the product of ongoing WRI initiatives on clean energy policy and financing by international financial institutions.¹³ In particular, it was informed by a three-day workshop that took place in March 2012, “Best Practices in Financing Access to Sustainable Energy,” convened by WRI’s International Financial Flows and the Environment project, WRI’s New Ventures project, and the DOEN Foundation.¹⁴ Between July 26 and October 15, 2012, the authors interviewed six additional socially oriented energy enterprises and organizations, and conducted follow-up interviews with workshop participants. Supplemental desk research helped the authors to further under-

These enterprises and organizations have strong ethical and social values and design business models to deliver renewable energy products and services that fit the needs, uses, and cash flows of low-income populations.

stand and present the work of the workshop and interview participants.

The March 2012 workshop brought together representatives of 19 energy enterprises, project developers, financiers, and nongovernmental organizations that share an understanding of the needs of low-income consumers in developing countries and an ability to devise approaches to meet those needs with distributed, renewable energy.¹⁵ Their work has benefitted tens of millions of underserved people in 11 countries: Bangladesh, Burkina Faso, India, Indonesia, Kenya, Mali, the Netherlands, South Africa, Tanzania, Uganda, and the United States. Some work in multiple countries in a region, such as sub-Saharan Africa.¹⁶

The objectives of the workshop were to convene a forum for these practitioners to learn from one another’s experience, and to develop a set of practices and policy recommendations that can inform international efforts to extend energy access. The workshop enabled peer learning about innovative approaches for delivering sustainable energy access

to low-income populations, particularly those in rural and remote areas.¹⁷

Issues covered during the workshop discussions and interviews included: consumer transitions to renewable energy products and services, finance and payment schemes for low-income consumers, scaling up the delivery of energy, and policies and regulations for renewable energy.

WRI and the DOEN Foundation selected workshop participants based on recommendations from three independent organizations: ArcFinance, a global nonprofit that brings together practitioners, funders, pro-poor enterprises, and end-users to develop solutions for access to finance for clean energy and water; New Ventures, a global network of centers that spur the growth of entrepreneurial approaches to the challenges of sustainable development; and the United Nations Foundation Energy Access Practitioner Network, a network of private sector companies and civil society organizations—formed as part of the UN Secretary-General’s Sustainable Energy for All

Initiative—that catalyze the scale-up of renewable and low-carbon technologies and spur the market toward universal energy access.

Appendix I contains a complete list of workshop and interview participants.¹⁸

Framework for Innovative Strategies

Workshop participants and interviewees identified four core business functions of their enterprises and enumerated the characteristics of innovative implementation strategies. For each core function, they provided examples of innovative strategies, which are described in this issue brief.

This brief is organized according to the four core business functions:

- Understanding consumer needs, preferences, and capacity to pay
- Demonstrating the value of a new technology or energy service delivery model
- Building and maintaining consumer trust in the product and the supply chain
- Designing financing and payment schemes that fit consumer energy budgets.

The following attributes were identified as characteristics of an innovative implementation strategy:

- Considers the interests of consumers, particularly those living in remote communities, from the beginning stages of product and service design through the follow-up stages, such as maintenance and servicing

- Contributes to skills development and livelihood generation in the community
- Tailors specific financing mechanisms and financing instruments to the consumers' circumstances
- Builds a strong network of local organizations and delivery service mechanisms
- Represents different renewable energy sources and varied applications
- Demonstrates long-term growth potential
- Integrates a renewable energy, climate-friendly focus in its business model, such as generating profits “through products, services, or production processes that seek to reduce GHG emissions and the consumption of fossil fuels.”¹⁹

INNOVATIVE IMPLEMENTATION STRATEGIES FOR EXTENDING DISTRIBUTED, RENEWABLE ENERGY SERVICES

Understanding Consumer Needs, Preferences, and Capacity to Pay

Rationale

During the discussions, energy access practitioners emphasized that consumer energy use transitions require tailored solutions that respond to the consumer's needs, preferences, and budgets. Workshop and interview participants identified multiple factors that inform energy access solutions for low-income,

rural areas, whether for use by households, businesses, or community facilities. These factors are largely contextual and include:

- Cultural practices (particularly involving cooking)
- Employment and seasonal income patterns
- Socioeconomic status and budget limitations
- Enabling equal energy access for women
- Costs and characteristics of existing technologies and service providers
- Capacity of enterprises to provide after-sales service
- Strength of the supply chain
- Overcoming skepticism about distributed energy solutions: national policies and investments prioritize grid access, leading many consumers to believe that off-grid solutions are inferior
- Availability of alternative energy resources
- Geography
- Infrastructure such as roads
- Access to financial institutions.

Participants emphasized that when products and services are oriented to consumer energy use and budget demands, consumers are quick to adopt them. Budget limitations are a paramount consideration for low-income consumers; due to competing priorities and variations in income schedules, they may need to pay for energy in small increments. In these situations, installment payment plans are helpful. In addition, participants emphasized that low-income, rural consumers often lack access to institutional loans, such as those provided

by community banks. These consumers can only engage in short-term financial planning.

Inclusive business strategies that prioritize consumer involvement are essential for fostering understanding, identifying solutions, and avoiding problems. Consumer stewardship, from first contact through a sale and extending into product servicing, is also useful for attracting new customers, and can facilitate data collection on consumer preferences.

Examples of Innovative Implementation

SELCO India provides and installs complete, customized, energy systems for the end user, working with local entities to provide consumer financing. SELCO also trains users and offers after-sales service.²⁰ SELCO considers the following factors to better understand its consumers:

Employment characteristics of target population: such as marginal farmers, landless laborers, the self-employed, home-based workers, and the unorganized sector,²¹ who have different energy preferences and needs.

Consumer demographics: such as location characteristics, income, gender, race, and societal segmentation.

Specific contextual components: including specific location; local infrastructure; socio-economic fabric; installation conditions (structure or roof); type of financing; hours of product use; purpose of product

use (reading, cooking, recreational, powering equipment that generates income); and needs for service and spare parts.

SELCO also designs context-appropriate financing mechanisms for energy services, which are described in section D, “Designing Financing and Payment Schemes that Fit Consumer Energy Budgets.”

Consumer energy use transitions require tailored solutions that respond to the consumer’s needs, preferences, and budgets.

Tanzania Traditional Energy Development Organization’s (TaTEDO’s) strategy for understanding customer needs includes participatory monitoring followed by information and knowledge management. A key component of this strategy is a participatory rural appraisal, through which TaTEDO gains insights into community needs. When TaTEDO engages a community, it first develops a set of indicators and conducts a survey to collect baseline information at both the district and village level. Then, through the participatory rural appraisal, community mem-

bers engage in an iterative process to help TaTEDO identify a core set of problems, needs, and opportunities. This process helps TaTEDO evaluate which energy products and services are most appropriate, and lays the groundwork for community participation in project planning.

TaTEDO has found that specific cultural practices help determine a community’s energy needs.

For instance, many of TaTEDO’s solutions respond to the use of inefficient traditional stoves, which are common in rural Tanzania. TaTEDO works with community members to design clean and efficient cookstove models; conducts culturally-specific demonstrations; and trains community members to be technicians for their products, which include solar systems as well as cookstoves. TaTEDO has supported a number of local informal groups to produce, distribute, and install several thousand solar energy systems in

rural areas of Tanzania, and over 1,000,000 efficient stoves in rural and urban areas.²²

Frontier Markets in India prioritizes the collection of consumer data to understand product demands. This data helps Frontier Markets determine which products to introduce to a market and informs the development of energy products that are appropriate for and desired by low-income households. Frontier Markets convenes focus groups in rural areas to demonstrate new products and to gather feedback on the products’ benefits and limitations.

Over a two- to three-day period, focus groups of five to ten volunteers (either a variety of community members or a specific constituency, such as farmers) provide feedback on new products and suggest products and services they would like to receive in the future.²⁴

Demonstrating the Value of a New Technology or Energy Service Delivery Model

Rationale

Several workshop participants noted that they must provide energy products and services specifically tailored to consumers' needs and within a household's existing energy budget. Although economic considerations are paramount, quality of life advancements such as saving time, and cleaner, safer, smoke-free houses, are valued by consumers as well. In cases where switching to a clean energy product or service does not provide a clear upfront economic advantage—such as improved cookstoves in regions where fuel is gathered instead of purchased²⁵—quality considerations are especially important. Enterprises seeking to facilitate consumer energy transitions must demonstrate that the overall financial and nonfinancial benefits are significant enough for the consumer to warrant a capital expenditure.

Examples of Innovative Implementation

Husk Power Systems (HPS) in Bihar, India installs biomass gasification mini power plants (25kW – 100kW) that convert agricultural residue (primarily rice husks) to electricity, and builds micro grids for villages of up to 4,000 inhabitants, to provide electricity on a pay-for-use basis.

HPS also supplies energy-efficient light bulbs and mobile phone charging technology to its customers, and delivers “consumer savings of at least 30 percent over competing kerosene and diesel energy sources.” HPS decided to supply energy-efficient light bulbs after noticing that consumers were using poor-quality bulbs that waste energy. Husk purchases a large volume of high-quality bulbs from a bulb manufacturer at a discount rate and sells them to consumers.²⁷

HPS customizes energy packages and the corresponding cost structures for households, even though this often involves site visits, which are time consuming and labor intensive. They highlight to their customers that the use of biomass-generated electricity reduces indoor air pollution and improves health, and promotes economic development by enabling

businesses to stay open after dark. Since 2008, HPS has provided electricity to over 200,000 people and employed 350 people across 300 villages in the state of Bihar.²⁸

Mera Gao Power (MGP) in Uttar Pradesh, India builds low-cost solar-powered micro grids to supply LED lighting and mobile phone charging services to rural villages.²⁹ Each solar-powered micro-grid system provides power to 100 households, enough power for each to use two lights and a mobile charging unit for seven hours a night. For this service, MGP charges a monthly subscription fee of US\$2 (100 INR)—a cost comparable to what villagers pay for kerosene and mobile charging services.³⁰ MGP explains that the lights are brighter, cleaner, and longer running than kerosene wick lanterns, and the mobile charging units save villagers time by eliminating the

Frontier Markets uses solar-powered mobile phone charging kiosks, which attract attention, raise public awareness of the enterprise and the product, and demonstrate a viable alternative to conventional grid electricity.

Husk Power Systems customizes energy packages and the corresponding cost structures for households.

need to travel to charging services in towns.³¹ MGP anticipates that as communities experience the value of the lighting and charging enabled by the solar-powered micro grids, the use of micro grids may expand to other needs, such as irrigation, agriculture, healthcare, education, and entertainment.³² Since their founding in 2010, MGP has “constructed lighting utilities in 103 villages... serving 2,240 households and approximately 12,000 people with improved lighting and mobile phone charging.”³³

Sustaintech in Tamil Nadu, India, sells its custom-designed smokeless, fuel-efficient cookstoves to small businesses such as roadside eateries, tea shops, and sweet shops. These stoves are tailored to directly respond to a variety of cooking needs, which boosts their appeal, especially to women. Sustaintech works with a partner to develop a basket of stove designs in-house, and is able to “translate consumer needs into a set of technical specifications for stove design.”³⁴

Sustaintech has the most success with small businesses that pay for wood fuel and have tried, but abandoned, fuel types that are more expensive or less efficient. According to Sustaintech, their stoves reduce

fuel consumption by 30 percent, which translates to a fuel cost savings. In addition, Sustaintech highlights that its clean cookstoves provide health and environmental benefits, including clean air, insulation from heat, and a reduction of deforestation and carbon dioxide emissions.³⁵ From its founding in 2009 through November 2012, Sustaintech has sold more than 1,300 custom-designed fuel-efficient cookstoves in Tamil Nadu.³⁶

Building and Maintaining Consumer Trust in the Product and the Supply Chain

Rationale

Many communities and financial institutions are skeptical about renewable energy products and services and consider them risky investments. Communities and financial institutions may be unfamiliar with renewable energy products, making it difficult for them to discern quality. Alternatively, they may have had negative experiences with unreliable or under-serviced renewable energy solutions. Low-income households are risk-averse because they have little margin for financial error. Accordingly, to introduce (or re-introduce) renewable energy

products and services to low-income communities, socially oriented energy enterprises and organizations must prioritize building and maintaining trust with the people they seek to serve.

Examples of Innovative Implementation

The Rural Energy Foundation’s (REF) SolarNow program, which was created in 2007 and became a stand-alone company based in Uganda in 2011, “identifies retailers and distributors, trains them in solar energy technology, marketing, sales and business administration, and helps them start up and expand businesses selling solar energy products.”³⁷ Entrepreneurs can use SolarNow branding if they complete the SolarNow training, agree to develop a rural solar business, and continually meet the SolarNow quality standards. The SolarNow brand is supported by marketing campaigns undertaken by REF.³⁸ SolarNow dealers “provide warranty on their products and offer after-sales service agreements to their customers.”³⁹ The quality standards, marketing information, warranty, and service agreements all help to increase consumer trust in the solar energy products and systems.

Frontier Markets in India partners with well-known energy companies and sells renewable energy products through local retailers. Using local distribution networks helps build trust — consumers tend to be more comfortable buying from a known source. Frontier Markets also uses solar-powered mobile phone charging kiosks, which attract attention, raise public awareness of the enterprise and the product, and demon-

strate a viable alternative to conventional grid electricity. These kiosks enable customers to understand and become more comfortable with new products.

To provide continued technical support, Frontier Markets builds service centers and staffs them with local residents. The service centers educate customers and address their concerns, repair and replace products, and solicit feedback on how and why consumers are using their products. This after-sales support helps build consumer confidence in the products' reliability, and incorporating community members throughout the supply chain helps maintain consumer trust.

Husk Power Systems employs and trains local technicians to operate its biomass gasification plants in a franchisee model. The plants run on rice husks, a locally available agricultural residue. Husk Power Systems builds trust by conducting monitoring visits, checking plants remotely to ensure smooth operations, and using smart meters to reduce the possibility of error in measuring consumption.⁴⁰ Husk Power Systems also creates income generation opportunities for local farmers who can sell their rice husks to the biomass plants, and employs women from local villages to make incense sticks and char briquettes from the bio-char waste of the gasification process. Husk Power Systems' focus on community empowerment also helps to build trust.⁴¹

SNV, based in the Netherlands, provides advisory services to local organizations in Asia, Africa, and Latin America and has established knowledge networks on renewable

energy in more than 50 countries. One track of SNV's work is providing support for national programs on domestic biogas.⁴² SNV works with local stakeholders to develop and test solutions adapted to local contexts.⁴³ SNV approaches consumer transitions in the biogas sector through capacity building and training masons and entrepreneurs to be qualified delivery channels for biogas digesters.⁴⁴

Designing Financing and Payment Schemes that Fit Consumer Energy Budgets

Rationale

Even seemingly modestly priced renewable energy services can be prohibitively expensive for low-income consumers who are accustomed to purchasing energy in small increments. Accordingly, providers have had to design innovative financing and payment schemes to help consumers purchase their products.

At the WRI–DOEN workshop, participants presented their experiences with different business models for providing finance to energy consumers. Six distinct models emerged from the discussions and are listed below. Workshop participant ArcFinance, in partnership with Ashden Awards and GVEP International, identified the first five models. The descriptions of these five models are excerpted from their 2009 publication, *End-user Finance: A Guide for Sustainable Energy Enterprises and NGOs*.⁴⁵ The sixth model was identified during the course of the workshop and is used by Simpa Networks, Husk Power Systems, and organizations that were later interviewed, such as Mera Gao Power.

1. One-Stop-Shop Model: In this model, sustainable energy products and finance are provided by the same organization. This happens when a finance provider decides to offer energy products, or when an energy enterprise decides to offer finance.

- *Key advantage:* The finance provider or energy enterprise maintains complete control over both aspects of their business.
- *Key disadvantage:* The organization has to develop new areas of skills and expertise to be able to implement this model effectively.

2. Financial Institution Partnered with Energy Enterprise: In this case, an energy enterprise enters into a partnership with a local financial institution to sell sustainable energy products. This model typically involves a financial institution providing credit to an end-user and managing the monitoring and repayment processes, while the energy company provides the energy product, installation (if necessary), service and maintenance.

- *Key advantage:* Both organizations stick to the business area that they know best.
- *Key disadvantage:* It relies on a good partnership to make sure that both organizations deliver their side of the partnership effectively.

3. Umbrella Partnership Model: The energy enterprise enters into a partnership arrangement with an "apex institution" that manages a network of local financial institutions (e.g. a union or organization of credit cooperatives, credit unions, or other village-

based financial institutions). The apex institution lends money to the local finance providers, who then lend to an end-user and manage the monitoring and repayment processes. The energy enterprise provides the energy product, installation (if necessary), service and maintenance.

- *Key advantage:* Both organizations stick to the business area that they know best, and the energy enterprise is able to reach many more clients than with a local partnership.
- *Key disadvantage:* Compared to a local partnership, it is more difficult to manage partnership and make sure that all activities are being implemented effectively across the network.

4. Franchise/Dealership Model:

The energy enterprise provides credit to dealers and/or franchises to allow them to sell to clients on an installment basis. This particular model is common for relatively inexpensive products – usually those that cost under US\$50 (e.g., solar lanterns, treadle pumps, or efficient cook stoves).

- *Key advantage:* A simple way

of increasing the reach of an energy enterprise and expanding the market.

- *Key disadvantage:* It requires upfront cash investment from the energy enterprise, and relies on effective dealers who can provide quality services to customers and collect repayments.

5. Brokering Model: A third-party organization or individual is paid by the finance provider and the energy enterprise to market energy products and assess customers' suitability for financing. They will then bring viable customers forward to buy energy products. The broker may also be involved with loan payment collection, after-sales service, and technical upkeep.

- *Key advantage:* A simple way of increasing reach and expanding the market, and brokers are usually paid a finder's fee after the product is sold, so it doesn't require upfront cash investment.
- *Key disadvantage:* It relies on brokers who can effectively market products and screen customers.

6. Pay-As-You-Go Model: Consumers purchase energy services on a pay-as-you-consume schedule. This is similar to the business model common for grid-connected electricity consumers, but can be adapted to fit the technology and financing circumstances of low-income rural consumers of distributed generation. Frequently, the payment is scheduled as an advance on service, rather than retroactive billing. Mini-grid operators⁴⁶ may set flat rates for periodic services that reflect expected energy demand, or rates that release a metered quantity of electricity. The success of mobile phone penetration through pre-paid scratch cards combined with SMS communications to remotely unlock service provides an additional template for energy service providers that offer decentralized generation options such as solar home systems.

- *Key advantage:* This model can minimize transaction costs and accommodate increments preferred by consumers, while also paying down capital and maintenance costs of renewable energy technologies.
- *Key disadvantage:* The enterprise must provide 100 percent of finance and therefore requires access to substantial equity and working capital.

SELCO India provides and installs complete, customized, energy systems for the end user, working with local entities to provide consumer financing.

Examples of Innovative Implementation

This section describes how the enterprises and organizations that participated in the workshop or interviews have used the six models described above.

One-Stop-Shop Model: Bright Green Energy Foundation (BGEF) in Bangladesh manufactures and sells solar home systems and provides mid-term financing for its customers. BGEF provides credit for three years at 6 percent interest with 15 percent down payment, free after sales service for two or three years, and long-term warranty for the products (20 years for panel, five years for battery, three years for charge controllers, and one year for light).⁴⁷

BGEF has established six Green Technology Centers (GTCs) across Bangladesh to enable rural assembly, repair, and maintenance of solar accessories. At these centers, young entrepreneurs are trained in maintenance and after-sales service. BGEF prioritizes training rural women — on average, 60 to 100 rural women a month are trained to be solar technicians. Eighty percent of the assembly of solar equipment takes place at the GTCs, and all solar system components except the solar panels are produced locally.⁴⁸ BGEF is working to facilitate the set-up of solar panel factories in Bangladesh.⁴⁹

BGEF also provides training for entrepreneurs, particularly women, to become owners of their own renewable energy businesses. BGEF will help these entrepreneurs obtain financing at low interest rates and equipment at cost-effective prices. In addition, BGEF lobbies for policies favorable to renewable energy in Bangladesh and other developing countries.⁵⁰

Financial Institution Partnered with Energy Enterprise Model: Through a record of offering affordable, renewable energy products, SELCO India has brokered multiple agreements with financial institu-

tions, including Self Employed Women's Association (SEWA), a cooperative bank in India,⁵¹ to facilitate consumers' financing needs. The enterprise has successfully implemented a variety of financing mechanisms in different contexts, including user contributions, loans, subsidies, mobile payments, rental models, and community financing, all involving interaction with a financial entity.

SELCO India provided financing to a rural agricultural community in Sirsi, Karnataka, where most residents are areca nut farmers and receive income seasonally. SELCO worked with a community farming cooperative society to help farmers purchase solar lights. The cooperative society provided loans to farmers for the purchase of solar power systems, and the society then deducted loan repayments from the proceeds of nut crops. There was no cash transaction.

Umbrella Partnership Model: Workshop participant ArcFinance pointed to the Kenya Union of Savings and Credit Cooperatives (KUSCCO) as an example of an Umbrella Partnership, and referred to Kabutha et al. 2007⁵² for an overview of how KUSCCO operates in the energy sector in Kenya. The following description of KUSCCO's work was developed based on this publication.

Founded in 1973, KUSCCO is a national umbrella organization for nearly 2,000 savings and credit cooperatives (SACCOs) throughout Kenya. Since 1999, KUSCCO's work has included a focus on delivering modern energy products to low-income communities by conducting market research and acting as an intermediary to enable product delivery from energy companies to SACCOs at below-market costs. KUS-

CCO currently supports the delivery of solar, liquid petroleum gas (LPG), and biogas in 43 out of 72 districts in Kenya.

KUSCCO assesses whether energy loans should be administered in a market to support decision making by the SACCOs, but the SACCOs themselves provide and manage the loans to consumers. KUSCCO confers with SACCOs regarding the types and quantities of energy products needed, and KUSCCO then makes bulk purchases from energy companies. KUSCCO's technical staff is trained in product usage by the energy companies. KUSCCO distributes the energy products to SACCOs at small cost mark-ups, but still below market prices, and also trains technical staff at the SACCOs. The SACCOs then deliver the energy products to consumers and educate them about their use. The energy company provides after-sales service.

This arrangement enables the energy company to reach more customers, while lowering their marketing, transaction and training costs, as KUSCCO and the SACCOs carry out much of this work. KUSCCO and the SACCOs benefit from the trade and financing margins, and the customer is able to purchase quality energy products at affordable prices.

Franchise Model: The Energy and Resources Institute (TERI), in India, uses a variation of the Franchise Model as part of its *Lighting a Billion Lives* campaign. TERI trains local entrepreneurs in unelectrified or poorly electrified villages to run "micro solar enterprises" that rent branded, charged solar lanterns to households on a daily basis. *Lighting a Billion Lives* also plans to help

entrepreneurs scale up and take ownership of their local enterprise by facilitating loans with financial institutions, and providing subsidies from TERI or government agencies.⁵³ Entrepreneurs are vetted based on entrepreneurial capacity, literacy, and community support. Lighting a Billion Lives provides the entrepreneurs with a turnkey operation, with the entrepreneur only covering operation and maintenance costs through income from rental fees. For households, the cost of renting the solar lanterns (100 INR, or ~US\$2 per month) is cheaper than the cost of fuel for lanterns with regular refills (150 INR, or ~US\$3 per month).⁵⁴

According to Lighting a Billion Lives staff, the campaign has addressed the key challenges of scale up and diversification in financing, which demonstrates the credibility of its financial and business models. It receives financial support from the central and state governments, corporations and individuals, and generates funds “through a range of financial instruments which largely include grants but also equity investments, loans, syndication, payment for services, [and] research grants.”⁵⁵

Broker Model: Frontier Markets functions as a broker for renewable energy products in India. The enterprise approaches a manufacturer of renewable energy technology and, for a small fee, offers to sell the product in a community in difficult to access markets.⁵⁶
⁵⁷ Frontier Markets will conduct market assessments for renewable energy companies, to determine whether market entry is viable. If so, Frontier Markets will “conduct marketing sessions to build demand for products” based on a peer-to-

The innovative use of the “pay-as-you-go” model for energy by enterprises such as Simpa Networks makes energy more affordable and accessible through pricing that matches both the variable cash flows of customers and their energy consumption patterns.

peer marketing strategy, and will sell products through a “wholesale and retail model where...locally hired staff work with local shopkeepers to reach out from a central retail-service shop to develop awareness and match products to customer needs through existing community points like markets and social meetings.”⁵⁸ Frontier Markets provides linkages to financing support for consumers through partnership with micro-finance institutions, self-help groups, and organizations that specialize in lending to farmers (see Figure 1).⁵⁹

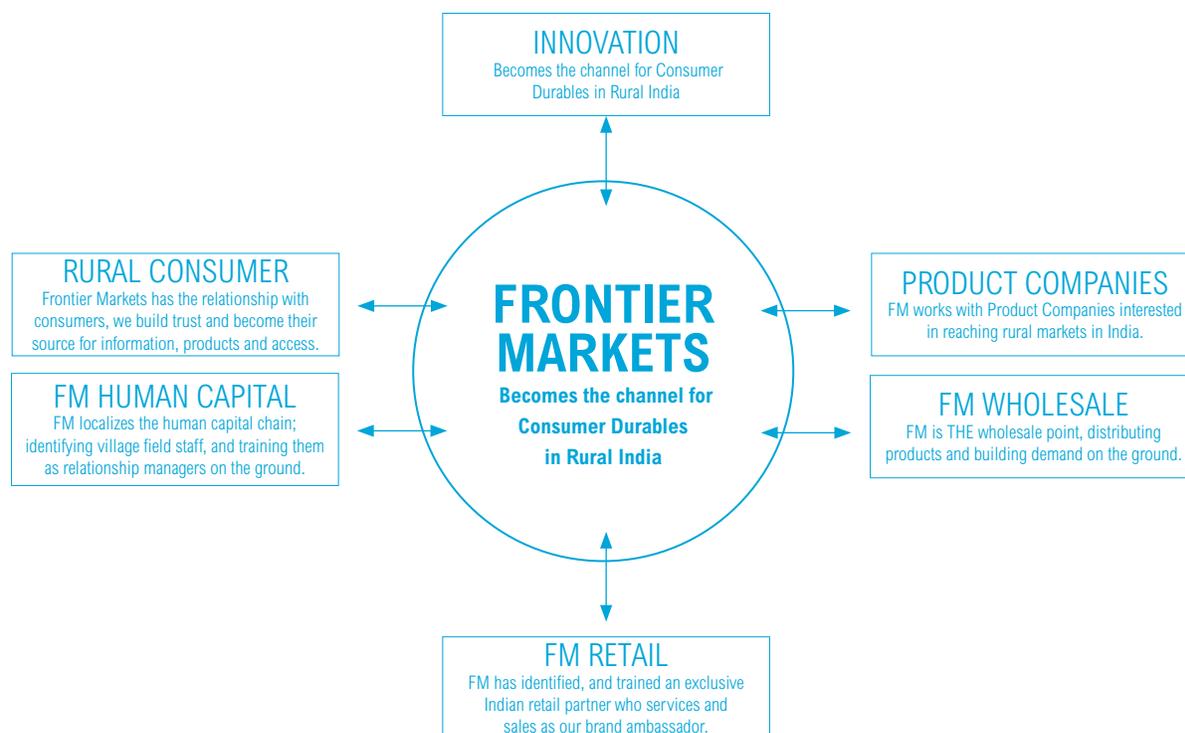
Pay-As-You-Go Model: This model, used by M-KOPA Solar in Kenya and Simpa Networks in India, was inspired by the mobile phone industry’s success with prepayment for small increments of service. With the “pay-as-you-go” model for solar energy, consumers make a small upfront payment for the solar system hardware, and then buy credits for increments of service, which go

toward paying off the full cost of the system. M-KOPA Solar and Simpa Networks both enable payment and system control via mobile phone. Ultimately, the consumer becomes the owner of the solar system, and the energy generated is then free.

M-KOPA Solar provides a portable solar home system with three lights and mobile charging outlet, and their customers usually pay off this system within a year.⁶⁰ Simpa Networks partners with an authorized dealer for the installation of solar home systems for consumers, typically 25-50 Watts peak (Wp). The systems range from two lights plus mobile phone charging outlet systems to four lights plus a fan and mobile charging outlet systems, and all systems come with a minimum 5-year warranty on major components.⁶¹ Customers usually pay off the solar system in approximately three years.⁶² Simpa provides a longer pay-back period on their system to more closely match the

FIGURE 1

FRONTIER MARKETS SHOWS HOW AN ENTERPRISE CAN SERVE AS A BROKER TO DELIVER ENERGY PRODUCTS IN INDIA



Source: Frontier Markets website.

customer’s previous expenditure on kerosene and to reduce the customer’s monthly payments. Simpa Networks has calculated that the cost of a 25 Wp solar home system over 10 years is approximately half the cost of traditional energy solutions over the same time frame, and will deliver ten times the quantity of light plus extra electricity capacity for charging mobile phones, and using devices such as fans, TV, and a radio. (See Figure 2)

The innovative use of the “pay-as-you-go” model for energy by enterprises such as M-KOPA Solar and

Simpa Networks makes energy more affordable and accessible through pricing that matches both the variable cash flows of customers and their energy consumption patterns.

CONCLUSION AND NEXT STEPS

Conclusion

This issue brief shows that several socially oriented energy enterprises and organizations are extending distributed, renewable energy access to low-income, rural communities through innovative implementation

of four core business functions:

- Understanding the consumer’s needs, preferences, and capacity to pay
- Demonstrating the value of a new technology or energy service delivery model
- Building trust in the product and the supply chain
- Designing financing and payment schemes that fit within consumer energy budgets.

These innovative implementation strategies have enabled progress on

socially, environmentally, and economically beneficial energy access solutions for low-income, rural communities in developing countries. As the experiences described in this brief demonstrate, it is crucial that people from the affected, underserved communities are involved in all stages and levels of the process. Although the energy access solutions discussed still face obstacles for scale up, several socially oriented energy enterprises and organizations have proven that with the right delivery mechanisms, and effective and efficient financing, many consumers can have access to affordable, cleaner energy services. The World Resources Institute (WRI) hopes the information presented in this issue brief will be helpful to other enterprises, organizations, and policy makers involved in extending access to energy.

Next Steps

The United Nations General Assembly (UNGA) declared 2012 as the International Year of Sustainable Energy for All.⁶³ The objectives identified in this UNGA resolution include “investing in access to cleaner energy technology options and a climate-resilient future for all and the need to improve access to reliable, affordable, economically viable, socially acceptable and environmentally sound energy services and resources for sustainable development....” This resolution offers a fitting call and essential guidelines for collective work to support expansion of scalable solutions for distributed, renewable energy services for underserved populations. A core challenge remains: how to get to scale and at the right speed? We encourage those leading and developing energy access programs,

FIGURE 2

SIMPA NETWORKS PROVIDES MORE THAN 10 TIMES THE ELECTRICITY CAPACITY FOR HALF THE COST OF TRADITIONAL ENERGY SOURCES

BUSINESS AS USUAL

Existing Solutions

- Two kerosene lamps (\$5/mo)
- Dry-cell batteries for radio (\$2/mo)
- Mobile phone charging (\$2/mo)

Benefits

- Two dim kerosene lamps (35 lumens)
- No extra electricity capacity

10-year expenditure **\$1,080**

WITH SIMPA

Simpa Solar System

- 25Wp panel + 30Ah battery
- Four 5W CFL lamps + charger + jacks
- Ave \$11.60/mo x 36 months

Benefits

- Four bright lamps delivering 10 times the light (350 lumens each)
- 67 Wh/day of usable electricity for TV, fan, mobile phone charging, radio

10-year expenditure **\$560**

SAVINGS **\$520**

Source: Simpa Networks

whether local, subnational, national, or global, to learn from socially oriented enterprises and organizations and integrate their expertise and inputs into the design of the programs and projects. Areas to focus on include:

- **Fostering Innovation.** Innovative strategies are needed to enable socially, environmentally, and economically beneficial energy access solutions for underserved communities. This innovation should take place not only in technology and finance,

but also in the implementation of core business functions. Enterprises and organizations featured in this paper have demonstrated bottom-up experiences of such innovative implementation. Energy access initiatives supported by local government, philanthropies, bilateral development cooperation, and private sector investment should consider the multiple factors outlined in this paper that inform energy access solutions for low-income, rural areas: cultural practices (particularly involving cooking), employment

and seasonal income patterns, socioeconomic status and budget limitations, enabling equal energy access for women, costs and characteristics of existing technologies and service providers, capacity of enterprises to provide after-sales service, strength of the supply chain, overcoming skepticism about distributed energy solutions, availability of alternative energy resources, geography, infrastructure such as roads, and access to financial institutions.

■ **Harnessing the voices of socially oriented enterprises and organizations.**

A new generation of enterprises and nongovernment organizations has emerged over the last few years. Some of them are featured in this paper as they strive to implement business strategies anchored on investing in the poor while promoting community development. The most relevant and beneficial innovation for achieving universal energy access comes from this sector. Governments as well as regional and international development and finance organizations should ensure the participation of these enterprises and organizations in decision making.

■ **Enabling sustained peer-to-peer learning.**

Socially oriented enterprises and organizations focused on the delivery of energy services need to consistently learn from each other. Initiatives such as the March 2012 workshop organized by WRI and the DOEN Foundation, and the UN Foundation Energy Access Practitioner Network, enable enterprises and organizations to exchange views, share expertise, and expand their

professional networks. Regular peer-to-peer learning opportunities including workshops, conference calls, and online knowledge sharing platforms should be prioritized and supported by all stakeholders.

■ **Establishing updated and inclusive sets of metrics for determining success.**

The authors of this paper alluded to the issue of metrics when presenting information about the extent of impact of the enterprises' and organizations' strategies, such as the number of individuals or households served. Metrics was a prominent topic of discussion at the WRI–DOEN workshop. According to many of the participants, the metrics currently used for tracking progress are inadequate. Practitioners emphasized the need for more appropriate ways to measure progress and success than the number of households reached. Measures of

Socially oriented energy enterprises and organizations have proven that with the right delivery mechanisms, and effective and efficient financing, many consumers can have access to affordable, cleaner energy services.

installed capacity or households connected, for instance, do not necessarily reflect the quality-of-life improvements that renewable energy services provide. Further research is needed on how to measure performance that is inclusive and cognizant of the other cobenefits to the consumer, the household, and the local community.

■ **Analyzing challenges faced by socially oriented enterprises and organizations.**

Overcoming barriers to delivering energy access to low-income, rural consumers, and directing consumer spending to high-quality, safe, and economical solutions will require developing an ecosystem of enabling conditions that can facilitate innovative delivery channels, and enhance affordability of the products and services. This issue brief surfaced some of the difficulties faced by enterprises and organizations in the con-

duct of their business and implementation of programs. Our next brief in this series will analyze the technical, policy, regulatory, and financing challenges these enterprises and organizations have faced in the delivery of the service, discuss how they have overcome some of these hurdles, and then examine the enabling conditions that support the set-up, start-up, and scale-up of socially oriented energy enterprises and organizations.

- **Examining and documenting successful financing strategies and effective, sustainable business models.** As demonstrated by examples in this paper, significant business opportunities exist to provide distributed renewable energy services to underserved communities. However, this seemingly attractive market faces barriers from high transaction costs, market failures and distortions, and financing constraints. Hence, WRI's third and final brief in this series will focus on specific financing strategies to overcome risks and various financial instruments for expanding delivery of renewable energy services. It will contain case studies and lessons learned from a variety of business models and will examine how funds have been maximized from set-up to scale-up. It will also outline the roles of various stakeholders – including governments, the private sector, civil society organizations and local, national, and multilateral financial institutions – in delivering scaled up, affordable energy access solutions that are socially and environmentally responsible.

APPENDIX I

Enterprises and Organizations Participating in the Workshop, “Best Practices in Financing Access to Sustainable Energy,” March 5-7, 2012, Organized by the World Resources Institute’s International Financial Flows and Environment and New Ventures projects, and the DOEN Foundation

Arc Finance is a global nonprofit organization that brings together practitioners, funders, pro-poor enterprises, and end users to develop solutions for access to finance for clean energy and water. It provides the tools, technical services, catalytic investment, and linkages that allow these diverse groups to find common opportunity and achieve mutual benefits.

Bright Green Energy Foundation (BGEF), Bangladesh, promotes the use of renewable energy technologies in Bangladesh through sales, financing and servicing of solar home systems, clean cook stoves, and biogas plants. It also trains entrepreneurs, particularly rural women, to set up their own renewable energy businesses, and advocates for policy changes favorable to renewable energy in Bangladesh and other developing countries.

Danamon Bank is one of the largest financial institutions in Indonesia and describes itself on its web site as “a customer centric organization that covers all customer segments, each with unique value proposition, centered on sales and service excellence supported by world class technology.”

Foundation for Rural Energy Services (FRES) is a foundation based in the Netherlands that fosters rural electrification in developing countries by setting up small-scale commercial solar electricity companies in areas without a connection to the national electricity grid. FRES currently has companies in four countries in Africa: Burkina Faso, Mali, Uganda, and South Africa.

Frontier Markets is a for-profit enterprise that provides an end-to-end supply chain for “last mile”⁶⁴ distribution from an initial hub in Jaipur, India. It seeks to market reliable and appropriate products and services and operate wholesale, retail, and

servicing distribution outlets to energy consumers with very limited financial means.

Husk Power Systems is an Indian for-profit enterprise that seeks to provide reliable, renewable, and affordable electricity to rural underserved villages in India. Husk builds, owns, and operates gas-based mini power plants that cost-effectively convert rice husks into electricity.

IBEKA is a nonprofit NGO founded in 1989 and based in Jakarta to improve the economic conditions of rural communities through village infrastructure development. Such development includes access to electricity and clean water facilities, and using appropriate technology. IBEKA mainly uses micro and mini hydro as an entry point for rural community development activities to facilitate the community’s capacity and equity building based on their local resources.

Kenya Women Finance Trust (KWFT) was established in 1981 to provide access to financial services to women entrepreneurs to enable them to improve their economic status and livelihoods. KWFT has the largest network of any microfinance institution in Kenya including deep penetration into rural and urban areas, and has more than 600,000 members. KWFT is the only financial institution in Kenya that focuses solely on women clients. KWFT recognized that women are a key niche market that has significantly lower levels of access to financial services than the rest of the general population.

Mali Folkecenter is a Malian NGO that represents the Nordic Folkecenter for Renewable Energy in Denmark. This NGO works with rural populations and entrepreneurs to provide renewable energy services, perform technology transfers, train local technicians, and deliver enterprise development services.

New Ventures is the World Resources Institute’s center for environmental entrepreneurship. It provides business development services to environmentally focused small and medium enterprises (SMEs) in six emerging economies: Brazil, China, Colombia, India, Indonesia, and Mexico. New Ventures builds in-country support networks for environmental enterprises and increases their access to finance. The country directors from New Ventures India and Indonesia were present at the March 2012 workshop.

SELCO India is a social enterprise established in 1995 in Bangalore that provides renewable energy solutions and services to underserved communities and businesses in India.

Simpa Networks is a venture-backed technology company that provides affordable, technologically appropriate, and accessible energy services to a wide range of consumers. It sells distributed energy solutions through an innovative business model to underserved energy consumers in emerging markets.

Sustaintech is a social enterprise operating in Tamil Nadu, India, conducting direct sales of fuel-efficient, smokeless cook stoves. Sustaintech aims to expand its business throughout India through partnerships by combining its technical and business expertise with the regional expertise of partner organizations that are already well established and successful in their areas of operation.

SNV is an international not-for-profit development organization based in the Netherlands and working in 36 developing countries. SNV’s local and international advisors work with local partners to equip communities, businesses, and organizations with the tools, knowledge, and connections they need to increase their incomes and gain access to basic services. SNV shares specialist expertise in renewable energy, agriculture, water, sanitation, and hygiene.

Tanzania Traditional Energy Development Organization (TaTEDO) is a renewable energy development NGO based in Dar es Salaam with energy activities in 10 regions, 27 districts, and over 100 villages in Tanzania. TaTEDO acts as a promoter of modern energy for all uses, program implementer, consultant, focal point for facilitating partnerships, knowledge manager, lobbyist, energy enterprise supporter, and researcher.

United Nations Non-Governmental Liaison Service (UN-NGLS) is an inter-agency program of the United Nations mandated to promote and develop constructive relations between the United Nations and civil society organizations.

Ms. Christine Eibs Singer, Co-founder and former CEO of E+Co and Member of the UN Secretary-General’s High-level Group on Sustainable Energy for All attended the workshop. The Secretary-General established the High-level Group on Sustainable Energy for All to mobilize commitments from all sectors of society toward achieving three interlinked objectives by 2030: ensuring universal access to modern energy services, doubling the global rate of improvement in energy efficiency, and doubling the share of renewable energy in the global energy mix.

ENTERPRISES INTERVIEWED BY TELEPHONE FOR THIS PUBLICATION

IDCOL (Infrastructure Development Company Limited) is a public institution of the government of Bangladesh that, among other things, implements a solar energy program that qualifies and refinances partnering organizations to sell, finance, install and maintain solar home systems.

Kenya Union of Savings and Credit Cooperatives (KUSCCO) is the umbrella body for Savings and Credit Cooperatives (SACCOs) in Kenya. Its key roles are local and international advocacy and representation for the SACCOs. KUSCCO also seeks to empower SACCOs and other cooperatives through financial and technical assistance, tailored to largely benefit the middle- and low-income earners in Kenya's rural and urban areas.

Lighting a Billion Lives is a campaign started by The Energy and Resources Institute (TERI) in India. It uses philanthropic donations to subsidize the capital costs of setting up village-level franchises that use solar photovoltaics to charge lanterns.

Mera Gao Power is a for-profit enterprise in Uttar Pradesh, India, that builds and operates micro-lighting utilities that provide off-grid customers with high-quality and dependable lighting and mobile phone charging services.

M-KOPA Solar in Kenya provides affordable solar-powered systems for lighting and mobile phone charging to rural customers on a pay-as-you-go basis, with payment via Kenya's mobile phone money service. M-Kopa partners with Kenya's mobile operator, Safaricom; its solar lighting company, d.light; and machine-to-machine communication experts, Eseye.

Project Dharma is a for-profit enterprise that aims to serve the needs of low-income, rural households by creating a rural distribution network that provides customized products and services at an affordable price. Project Dharma also provides microfinance credit solutions for rural entrepreneurs and consumers. The company has about 400 village-level entrepreneurs in Maharashtra, Bihar, and Uttar Pradesh.

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ENDNOTES

- 1 IEA 2012.
- 2 Renewable energy is defined here as electricity produced from solar and wind power, tidal and wave power, small hydropower, geothermal power, and small biomass. Large-scale hydro and large-scale biomass are excluded from this definition. See WRI 2011, *Grounding Green Power*.
- 3 IEA 2010, 17, 20.
- 4 The IEA defines modern energy as, “a household having reliable and affordable access to clean cooking facilities, a first connection to electricity and then an increasing level of electricity consumption over time to reach the regional average.” IEA 2011.
- 5 IEA 2011.
- 6 IEA 2011.
- 7 Mini grids provide electricity to a small area, such as a single community, and tend to be low voltage. Off-grid electricity supplies are not connected to a large or public grid, and can consist of mini-grid or stand-alone energy sources. Mini- and off-grid sources tend to work well in rural or isolated areas.
- 8 IEA 2011.
- 9 IRENA 2012.
- 10 The definition of “socially oriented enterprises and organizations” in Box 1 has been crafted by WRI, based on New Ventures literature such as Christianson et al., 2012, *Voices of the Entrepreneurs* and Bairiganjan et al., 2010, *Power to the People: Investing in Clean Energy for the Base of the Pyramid in India* as well as literature from E+Co and ArcFinance. We consider these to be social enterprises that deliver environmentally responsible services.
- 11 Including technology, financing, infrastructure, delivery, servicing, and other processes that go into providing renewable energy access.
- 12 Renewable energy is defined here as electricity produced from solar and wind power, tidal and wave power, small hydropower, geothermal power, and small biomass. Large-scale hydro and large-scale biomass are excluded from this definition. See WRI 2011, *Grounding Green Power*.
- 13 WRI has been conducting interviews with workshop participants for more in-depth information about their experiences. Additionally, it is conducting desk research on enterprises providing access to energy, as well as on new and existing international initiatives that support energy access. WRI is also monitoring recent developments of the UN Sustainable Energy for All Initiative and Norway’s Energy+ Partnership, as well as World Bank lending to energy projects.
- 14 The Netherlands-based DOEN Foundation strives to “help build a sustainable world in which everyone can participate.” DOEN supports work targeting climate change, culture and cohesion, and promoting a new economy. For more information see: www.doen.nl.
- 15 For the purposes of this paper, we define renewable energy as electricity produced from solar and wind power, tidal and wave power, small hydropower, geothermal power, and small biomass. We do not include large-scale hydro or large-scale biomass in this definition. See World Resources Institute 2011, *Grounding Green Power*.
- 16 Some participating enterprises and organizations report the number of individual customers served and others indicate the number of households served. Those reporting individual customers served include: Foundation Rural Energy Services - 20,000; Frontier Markets - 250,000; Husk Power Systems - 200,000; Kenya Women Finance Trust - 450,000; Mali Folkecenter - 50,000; Simpa Networks - more than 500; SNV - 521,000. Those reporting number of households served include: Bright Green Energy Foundation - more than 10 million solar home systems and more than 1,500 efficient cook stoves; SELCO - more than 115,000 solar home systems; Sustaintech - 1,300 efficient cook stoves; TaTEDO - more than 2 million efficient cookstoves. All data from enterprises’ websites except Sustaintech, which is from an email interview with Svati Bhogle, managing director for Sustaintech. Countries impacted by these enterprises include Bangladesh, Benin, Burkina Faso, Guinea Bissau, India, Indonesia, Kenya, Mali, and Tanzania.
- 17 As a result of the workshop, DOEN has supported several renewable energy access initiatives for a total amount of close to US\$1.6 million, with the potential to reach thousands of underserved households, mostly in India. (These initiatives were approved in principle by the DOEN Foundation as of June 2012: Frontier Markets, US\$250,000 grant; SELCO-India, US\$250,000 grant; Simpa Networks: US\$755,262 grant plus US\$328.375 convertible loan.) DOEN also expects further collaboration with New Ventures. In addition, a second workshop will be planned in 2013.
- 18 The participation by an enterprise in the workshop and/or interviews does not signify endorsement of the enterprise by WRI or the DOEN Foundation. WRI and the DOEN Foundation seek to highlight these enterprises’ innovation in implementing business strategies to deliver distributed, renewable energy access to low-income, rural communities.
- 19 Environmental Intent Categories New Ventures website, <http://www.new-ventures.org/content/environmental-intent-categories-0>
- 20 See Selco’s website at <http://www.selco-india.com/services.html>
- 21 These are some of the target groups that SELCO prioritizes. From SELCO PowerPoint presentation, “A Practitioner’s Perspective: Energy services and end user finance,” March 6, 2012, at the WRI-DOEN “Best Practices in Financing Access to Sustainable Energy” workshop, Tarrytown, New York.
- 22 Email interview with Gisela Ngoo, TaTEDO, May 24, 2012.
- 23 Frontier Markets describes how it brings products to market at <http://www.frontiermarkets.com/site/services/outcomes/>
- 24 From conversation with Ajaita Shah, founder and CEO of Frontier Markets, June 2012.
- 25 Rehman et al., 2009.
- 26 “Business Model,” Husk Power Systems. http://www.huskpowersystems.com/innerpagedata.php?pageT=BusinessModel&page_id=77&pagesub_id=114
- 27 Bornstein, David, “A Light in India,” *Opinionator*, The New York Times. <http://opinionator.blogs.nytimes.com/2011/01/10/a-light-in-india/>

- 28 "Community Impact," Husk Power Systems. http://www.huskpowersystems.com/innerPage.php?pageT=Community Impact&page_id=81
- 29 As of September 27, 2012, Mera Gao Power has reached over 70 villages and over 2,000 consumers. (Interview with Brian Shaad, Mera Gao Power, September 27, 2012)
- 30 "Services," Mera Gao Power website. <http://meragaopower.com/products/> and "Solar Powered Systems for Rural Off-Grid Villages," Watt Now (blog) Mera Gao Power website. <http://wattnow.org/2285/mera-gao-micro-grid-power-solar-powered-network-systems-for-rural-off-grid-villages>
- 31 "Market," Mera Gao Power website. <http://meragaopower.com/market/>
- 32 Interview with MGP founders Nikhil Jaisinghani and Brian Shaad in The Guardian, January 16, 2012: <http://www.guardian.co.uk/global-development/poverty-matters/2012/jan/16/india-solar-power-system>
- 33 Mera Gao Power website. <http://meragaopower.com/>
- 34 Sustaintech PowerPoint presentation, March 6, 2012, "Best Practices in Financing Access to Sustainable Energy" workshop, WRI and DOEN Foundation, Tarrytown, New York.
- 35 Sustaintech website. <http://www.sustaintech.in/customers.html>
- 36 Email correspondence with Svati Bhogle, Founder, Promoter and Managing Director, Sustaintech on December 3, 2012.
- 37 2010 Ashden Awards Rural Energy Foundation Case Study, available at <http://www.ashden.org/winners/REF10>.
- 38 Ibid
- 39 "Service," Solar Now website. http://www.solarnow.eu/index.php?option=com_content&view=article&id=17&Itemid=16
- 40 For more information, visit Husk Power Systems website : <http://www.huskpowersystems.com/>
- 41 Husk Power Systems website. http://www.huskpowersystems.com/innerpagedata.php?pageT=Business%20Model&page_id=77&pagesub_id=114
- 42 "Service," SNV website. <http://www.snvworld.org/en/sectors/renewable-energy/our-work/our-work>
- 43 SNV. 2012. "SNV Renewable Energy." Sector positioning paper. <http://www.snvworld.org/node/4677>
- 44 Between 1989 and the end of 2011, SNV "realised the installation of 431,588 biogas plants... in 17 countries, benefiting an estimated 2.5 million people." SNV 2012.
- 45 Arc Finance Ltd. et al., 2009.
- 46 In the experience of workshop participants who work with mini-grid operators, individual customers typically purchase energy credits directly from an agent, employee, or owner of the grid. Mini-grid operators may feel it is important to have customers who use energy for commercial purposes, since this directly improves business earnings. Two models seem to be emerging: (1) small DC micro-grids, which only provide basic lighting services and are appropriate for clusters of 20-50 households, and (2) large AC micro-grids better suited for larger cluster sizes. (Information from an email with Karthik Meda, Vice President of Finance, Simpa Networks, November 29, 2012.)
- 47 Presentation by Dipal Barua, chairman and CEO of Bright Green Energy Foundation in Cancun, Mexico, December 2010, 9, 15-16.
- 48 Presentation by Dipal Barua, chairman and CEO of Bright Green Energy Foundation at WRI – DOEN Foundation Workshop, New York, March 2012, 9, 16, 18.
- 49 See "Powering Our Future," Bright Green Energy website, <http://www.greenenergybd.com/About.html>
- 50 Ibid.
- 51 In May 1974, the SEWA Bank was registered as a cooperative bank under the dual control of The Reserve Bank of India and the state government. Since then it has been providing banking services to poor, illiterate, self-employed women and has become a viable financial venture. For more information, visit: <http://www.sewabank.com/aboutus-origin.htm>
- 52 Kabutha et al., 2007.
- 53 TERI (The Energy and Resources Institute), "What is Lighting a Billion Lives?" TERI website. http://labl.teriin.org/index.php?option=com_content&view=article&id=6&Itemid=137
- 54 TERI "Goela: Where Light Was Just Out of Sight." Impact Stories. TERI website. http://labl.teriin.org/index.php?option=com_content&view=article&id=12&story=3&Itemid=133
- 55 <http://labl.teriin.org/pdf/Flyerfinacne.pdf>
- 56 See also Vachani and Smith 2007.
- 57 For more information on the value of this service, see Prahalad 2005.
- 58 See "Marketing," Frontier Markets website, <http://www.frontiermkts.com/site/services/marketing/>
- 59 See "Distribution," Frontier Markets website, <http://www.frontiermkts.com/site/services/microfinance-institutions/>
- 60 See "Products," M-KOPA website. <http://www.m-kopa.com/products/>
- 61 Information from an email with Karthik Meda, vice president of finance, Simpa Networks, November 29, 2012.
- 62 Interview with Simpa Networks' cofounder Jacob Winiecki: Katie Fehrenbacher "A Startup's Plan to Sell Solar Like Cell Phones" Gigaom website, December 27, 2011.
- 63 UN General Assembly 2011.
- 64 Defined by practitioners as the final leg or segment of the population where delivery of energy services is most challenging either because of a lack of physical infrastructure or complex local political realities as a result of very distant location from the main grid.

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