

## **Completion Report**

# **Decentralized Energy Services to Fight Poverty: Outcome Driven Engagement of Small and Medium size Enterprises in the Provision of Energy Services in IDA countries**

Energy Sector Management Assistance Program  
June 2009

# Table of Contents

<b>EXECUTIVE SUMMARY .....</b>	<b>5</b>
<b>I. BACKGROUND.....</b>	<b>6</b>
<b>II. OBJECTIVES OF THE PROGRAMMME .....</b>	<b>6</b>
<b>III. OUR APPROACH.....</b>	<b>6</b>
<b>IV. PROGRAM HIGHLIGHTS AND NEXT STEPS.....</b>	<b>7</b>
Renewable energy power generation: grid connected.....	7
Renewable energy power generation: off-grid.....	7
Solar Home Systems.....	8
Lighting and Pico PV.....	8
Cookstoves: Household and Commercial Use.....	8
Next Steps – An overview of Follow up Plans to the Pilot Initiatives.....	10
<b>V. LOGICAL FRAMEWORK:.....</b>	<b>12</b>
<b>Performance: Objective Verifiable Indicators.....</b>	<b>12</b>
Goal.....	12
Objective Verifiable Indicators (OVI).....	12
Project Performance.....	12
<b>VI. PROJECT PERFORMANCE BY COUNTRY: REVIEW OF COUNTRY SPECIFIC GOALS AND RESULTS ACHIEVED .....</b>	<b>16</b>
<b>Cameroon: Capacity Building among Small-Scale Off-Grid Energy Suppliers.....</b>	<b>17</b>
1. Prepare a diagnostic study on the institutional and regulatory framework within which small and medium sized enterprises in the power sector are allowed and/or required to operate through.....	17
2. Framework for accessing finance for energy sector SMEs.....	17
3. M&E Dissemination.....	18
<b>Burkina Faso: Capacity Building among Small-Scale Off-Grid Energy Suppliers.....</b>	<b>19</b>
1. Prepare a diagnostic on the institutional and regulatory framework within which small and medium sized enterprises in the power sector are allowed and/or required to operate through.....	19
2. Framework for accessing finance for energy sector SMEs.....	19
3. M&E Dissemination.....	20
<b>Guinea: Scaling up SME participation in rural electrification in Guinea.....</b>	<b>21</b>
<b>Tanzania: Integrating SMEs in Tanzania’s Rural Energy Initiatives.....</b>	<b>23</b>
1. Assessment of the enabling environment and incentive framework.....	23
2. Mobilization of stakeholders and institutional strengthening.....	23
3. Design, development and implementation of pilot projects.....	24
4. Facilitation of Financing Mechanism.....	25
5. Capacity building.....	25

6. Learning from results .....	25
<b>Zambia: Strengthening Small-Scale Off-Grid Energy Suppliers .....</b>	<b>27</b>
1. Market assessment of Solar PV .....	27
• <i>Assess national market potential, including consumer willingness to pay</i> .....	27
2. Technical Assistance to Rural Electrification Agency (REA) for Solar PV and isolated grids .....	27
3. Capacity Building for off-grid (mini-hydro and biomass power plants) MSMEs .....	28
4. Facilitating access to financing through capacity building to financial institutions .....	28
5. Support to developing and implementing pilot projects .....	28
<b>Cambodia: SMEs in Decentralized Energy Services .....</b>	<b>29</b>
1. Diagnostic study and initial assessment .....	29
2. General sector support for decentralized energy access to Ministry of Industry, Mines and Energy (MIME) 29	
3. Training for Rural Energy Enterprises .....	30
4. Design and implementation of technical assistance for pilot projects that complement ongoing Bank programs on grid-based access .....	30
5. Facilitating access to financing by assessing financing needs and required terms and conditions of the SME energy sector and helping mobilize domestic financing .....	32
6. Training to Ministry of Mining and Energy (MIME) senior staff on budget planning and economic analysis of SMEs .....	33
<b>Lao PDR: SMEs in Decentralized Energy Services .....</b>	<b>34</b>
1. Diagnostic study and initial assessment .....	34
2. Options for service delivery .....	34
3. Addressing regulatory and financing issues .....	34
4. Design and implementation of pilot projects .....	35
<b>Mongolia: Capacity Building among Small-Scale Off-Grid Energy Suppliers .....</b>	<b>36</b>
1. Capacity building of SMEs selling solar home and wind turbine systems .....	36
2. Capacity building of small community-run utilities in the soums .....	36
<b>Haiti: Dissemination of Improved Cook-stoves .....</b>	<b>38</b>
1. Capacity building and business support services .....	38
2. Improved branding .....	39
3. Customer awareness and publicity campaigns .....	39
<b>Peru: Small and Medium size Enterprises for Energy Services Delivery .....</b>	<b>40</b>
1. Assess and identify the potential for energy SMEs in the sector .....	40
2. Capacity building through pilot projects .....	41
<b>Bolivia: Strengthening Small-Scale Off-Grid Energy Suppliers .....</b>	<b>43</b>
1. Strengthen the solar home system (SHS) supply chain .....	43
2. Develop Pico PV market .....	43
3. Capacity building to small scale village suppliers .....	44
4. Revision of the current regulatory framework in order to include MSME-specific solutions .....	44
<b>Nicaragua: Technical Assistance for Improved Small-Scale Energy Supply .....</b>	<b>46</b>
1. Strengthening biomass market .....	46
2. Capacity building to SMEs (hydro power and village grids, PV-based power supply) .....	47
3. Develop Pico-PV market .....	47
<b>Lighting Africa: Small and Medium Enterprise and Financing Activity .....</b>	<b>48</b>
1. Market assessment .....	48
2. Identify and outreach to key SMEs and financial intermediaries .....	49

3.	Training and Capacity building .....	50
4.	Establish and deploy expert group .....	51
5.	Integration with broader part / activities.....	52
<b>VII.</b>	<b>LESSONS LEARNED AND RECOMMENDATIONS .....</b>	<b>53</b>
	<b>Technology specific lessons .....</b>	<b>53</b>
	Hydro power .....	54
	Pico-hydro.....	54
	Micro-hydro .....	54
	Biomass Gasification .....	55
	Efficient Cookstoves .....	55
	Home Solar Systems .....	56
<b>VIII.</b>	<b>SUMMARY OF COUNTRY SPECIFIC DISBURSEMENTS.....</b>	<b>57</b>
<b>IX.</b>	<b>CASE STUDIES:.....</b>	<b>58</b>
	Integrating Energy SMEs in Tanzania’s Rural Energy Initiatives .....	59
	Building the Runway for the Take-Off of Electricity SMEs in Cameroon.....	65
	Lighting Africa.....	70
	Combining Forces to Strengthen Small-Scale Service Provision: Electricity in Bolivia .....	76
	Opening Mainstream Pathways for Electrification via Rural Off-grid Energy Services SMEs in Peru .....	82
	Facilitating the Improved Cook Stoves Product Chain in Haiti.....	89
	Advancing Decentralized Energy Services SMEs in Cambodia .....	95
	SME (Small and Medium Size Enterprises) Engagement in the Provision of Decentralized Energy Services .....	102

## Executive Summary

The DFID-Funded Energy SME Program was created to support SMEs by helping countries unblock the factors that prevent their potential in the delivery of energy services. With thirteen energy projects in twelve countries and one regional program in Africa, the implementation of the program started considerably slower than expected but has demonstrated potential to make an impact in a relatively neglected area of delivering energy services to the poor. Despite the slow initial start-up and disbursement of funds, the activities in the set of countries where projects were initiated earlier achieved the following results:

- Based on the Energy SME pilot project in Cambodia, a US\$3.6 million National Efficient Cookstove Program was proposed to target the production and distribution of 1 million stoves over a four-year period.
- Capacity building provided to over 500 SMEs to provide energy related services to the poor in rural communities.
- Completed a Global Mapping and Survey of Small-Scale Private Providers, in collaboration with PPIAF, in Bangladesh, Kenya, Philippines, and Cambodia to quantify the scale and scope of SME involvement in the delivery of decentralized water and energy services.
- Developed business model and established partnerships with over 100 artisans in Haiti that now proposes to produce over 50,000 improved cookstoves annually.
- Leveraged donor funding to enhance SME capacity in a \$23M Renewable Energy and Rural Electricity Access Project in Mongolia.
- Published a global guidance document “Electrification and Regulation: Principles and a Model Law” which is now in use in Cambodia and Cameroon and have been initiated in Bolivia and Mongolia for active policy dialogue and regulation reform to unblock the role of SMEs in the provision of energy services.
- The Energy SME Program is also working with other global programs supported by DFID to ensure coordination and leverage. The Laos Energy SME project has, for example, leveraged US\$150,000 from ASTATE and US\$100,000 from PPIAF. The PPIAF funds covered the cost for preparing legal and operational procedures for the Rural Electrification Fund (REF) to support private sector participation in decentralized energy services. The ASTAE funding supported resource mapping whilst an IDA allocation (Borrower executed under REF 1) supported procurement of biomass equipment for piloting SME projects.
- The Energy SME project in Bolivia obtained GPOBA funding to strengthen the capacity of small-scale off-grid energy suppliers.
- US\$400,000 mobilized in support of the preparation of the framework for the Energy SME program in Cameroon.
- Legal and regulatory regimes, policy constraints and incentives and financing opportunities examined and addressed in at least 10 countries.
- Light-handed regulation for off-grid and small-scale energy services solutions developed in Zambia, Tanzania, Burkina Faso, Bolivia, Cameroon, Lao and Nicaragua leading to the inclusion of an SME component in government and donor-funded rural electrification and off-grid energy initiatives.

## I. Background

Lack of access to sufficient and sustainable supplies of energy affects as much as 90% of the population of many developing countries. Some 2 billion people are without electricity; a similar number remain dependent on fuels such as animal dung, crop residues, wood, and charcoal to cook their daily meals. Widespread inefficient production and use of traditional energy sources, such as fuel-wood and agricultural residues, pose economic, environmental, and health threats. Uneven distribution and use of modern energy sources, such as electricity, petroleum products, and liquefied or compressed natural gas, pose important issues of economics, equity, and quality of life. The ESMAP Energy SME program focused on off-grid electrification and biomass use as many communities and households that have yet to be electrified are relatively isolated, and off-grid electrification may be the only economically rational choice.

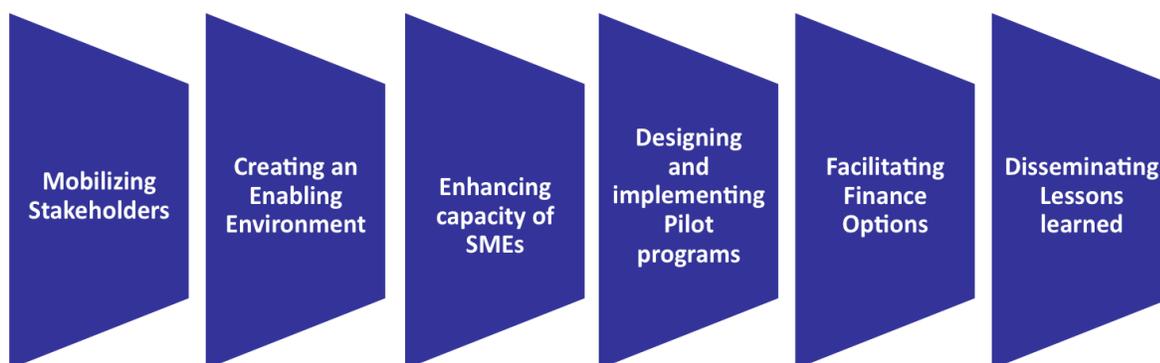
## II. Objectives of the Programme

To address some of these problems, the ESMAP global energy SME program, a joint effort in collaboration with DFID was designed to support the development of small medium size enterprises that supply electricity to households, public facilities, or businesses with limited or no access to electricity. We identified several barriers blocking the development of SMEs in energy delivery services. These included outmoded or nonexistent legal and regulatory frameworks, market rules that exclude small players, high transaction costs, lack of access to financing, and perceptions that decentralized off-grid solutions are inferior to national energy networks.

Pilot initiatives were launched in 12 countries to address specific economic, institutional, and technical characteristics of small medium size enterprises. Baseline assessments revealed that many of these enterprises will not be economically viable, unless they receive an initial direct or indirect capital cost support in the form of subsidies or grants. Even with such subsidies, the underlying economics of the enterprises remain fragile. Finally, the technologies for producing and distributing electricity varied widely. Given these considerations, the project focused on five main areas of energy: Technical assistance to Rural Electricity Enterprises (REEs), biomass gasification, solar home systems, efficient cook-stoves and hydropower.

## III. Our Approach

Our approach to unblocking barriers facing energy SMEs comprises the following six steps:



## IV. Program Highlights and Next Steps

The pilot programs focused on the following activities:

- (i) assessing the legal, institutional, and financial framework under which SMEs can function in the energy sector
- (ii) supporting training, pilots, and tests of technology or financial schemes
- (iii) assisting SMEs develop their investment plans, and
- (iv) studies and analyses needed to promote SMEs in general as well as in the context of ongoing World Bank Group investment programs. One of the biggest challenges for SMEs is the need for further support to acquire investment loans from commercial financiers.

### Renewable energy power generation: grid connected

In **Tanzania**, the project addressed the legal, institutional, and technical aspects of the framework under which SMEs could generate power and sell to the main grid operator.

Eleven projects, with a capacity of 42 MW (about 4% of total installed grid capacity), that could take advantage of this framework have been identified and partially prepared. These SMEs may find it difficult to get loans from commercial institutions to finance their investments; resolution of this issue is part of the ongoing efforts of the World Bank in Tanzania.

Similarly, in **Peru**, the project played a key role in achieving policy and reform changes necessary to facilitate energy sector SMEs.

### Renewable energy power generation: off-grid

**Tanzania** has developed the framework for mini-grids and grid-connected power generation. A pipeline of 11 projects, with a total capacity of 39 MW, has been developed. These projects are also likely to face some difficulties in getting loans from commercial institutions.

In **Cameroon**, the main focus was to establish a Rural Energy Fund (REF) that would be a co-financing and technical assistance window for SMEs. The draft law decree for the creation of the REF, and an REF Operating Manual have been developed.

In **Cambodia**, the project has promoted gasifiers in rice mills, which allow the mills to produce electricity for their own use. Thirty mills have placed orders for these gasifiers. The project has prepared an Action Plan for gasifiers in medium size enterprises, and IFC has indicated an interest in funding the project.

In **Lao PDR**, the focus is biomass gasifiers to power independent mini-grids. A pre-feasibility study is being undertaken for a site identified by the project. Based on the results of the study, the Dept. of Energy will decide whether to pursue grant funds to construct the demonstration project.

In **Peru**, the project has helped develop the policy, institutional and subsidy framework. The project has helped a proposed SME-operated micro-hydro scheme develop its business and technical plan. The project also assisted a micro-hydro project that is operating without all the formal approvals.

In **Bolivia**, the project has provided technical assistance to existing village suppliers and utilities, with the aim of improved performance in grid operations and adding new users. With GPOBA funding, significant grid densification subsidies have been bid out in late 2008 and are awaiting signature.

## Solar Home Systems

In **Guinea**, four pilot projects for solar PV micro-concessions have been designed, and their operators have been assisted by this project on the supply, installation, operation and maintenance of PV systems. The PV systems are financed under a World Bank loan; 2,000 systems are currently being procured in bulk to reduce the costs for the SME providers. However, the fragile political situation may hamper implementation and replication.

In **Peru**, a methodology for calculating full cost tariffs for individual PV systems installed by distribution concession companies has been developed. The project assisted two distribution concession companies to develop PV fee-for-service connections for 2,000 dispersed households and other users in off-grid communities in four areas that would be served by the SMEs contracted by the companies. These PV pilot projects are expected to co-finance their investments from an ongoing World Bank-GEF project. A detailed schedule for next steps for the PV pilots has been developed.

In **Bolivia**, the pilot helped develop an improved SHS tender, which is being financed with funds from (i) GPOBA/DFID and (ii) the DGIS/BMZ funded EnDev Bolivia project.

## Lighting and Pico PV

**Lighting Africa** is a World Bank Group initiative that aims to strengthen and expand markets for safe, clean, and affordable lighting alternatives for the 500 million Africans who currently use dangerous, polluting and uneconomical fuel-based lighting. The project co-financed market research studies for Ethiopia, Ghana, Kenya, Tanzania, and Zambia are now available on the Lighting Africa website. With other funding support, Lighting Africa is developing a quick and low-cost quality screening methodology for selecting reliable and high-quality LED lamps, and testing solar lanterns.

In **Cambodia**, the project test-marketed a LED lantern, which was found to be too expensive for the poor. In January 2009 the rental scheme was revised and the retail price of the lantern reduced. Some 2,000 households were targeted in this pilot project.

In **Nicaragua**, the project found that it would be feasible to deliver pico PV systems to potential customers. The demand for these products is being estimated through focus groups, test sales and household surveys, with 90 Pico PV lamps procured by GTZ.

In **Bolivia**, the project helped design a pico PV pilot, and an implementation scheme for GPOBA has been drafted. An ongoing Bank project (IDTR) has tendered 900 lamps, while a DGIS/BMZ project (EnDev) will take up important elements of the national Pico PV approach. Further, **IFC**, found significant demand for pico PV products in Potosi. IFC's client, TDE, has purchased 40 solar LED lanterns identified by IFC, and delivered them to a selected community. TDE will monitor progress on the use and impact that these lanterns have had in a follow-up study it plans to engage during the second semester of 2009.

### *Pico hydro*

In **Bolivia**, **IFC** is developing criteria that would allow a phased approach to the implementation of this technology in rural area. IFC has committed over US \$ 30,000 in Trust Fund resources that will be used to co-finance the capital equipment costs of a pilot.

## Cookstoves: Household and Commercial Use

In **Cambodia**, the Program supported a pilot to introduce efficient cookstoves in the rural areas, formulate a strategy for a National Efficient Cookstove Program for rural Cambodia. The pilot disseminated over 8,000 improved cookstoves, and established that while it is feasible to disseminate a large number of efficient cookstoves in rural areas, a number of issues still need to be addressed before a successful

large-scale program can be launched. These barriers are being addressed in the proposed National Efficient Cookstove Program, which aims to disseminate 1 million efficient cookstoves in rural areas over a 4 year period. This US\$3.6 million National Efficient Cookstove Program is a scaling-up activity based on the pilot project funded under the Energy SME Program.

In **Haiti**, the project trained local artisans to produce improved stoves which are expected to lead to 40% savings in fuel use, and provide health and environmental benefits. Some 12,000 stoves have been produced and sold, with almost all users (97%) indicating that they would buy the stove again. The project has faced a number of constraints:

- Significant efforts are required to organize the artisan, and to ensure quality control
- The difference in the capital cost between traditional and improved stoves (about \$1.20) remains a major barrier in promoting the improved stoves.
- The project operated in a difficult political/economic context, in which food prices increased, and there were security concerns.

### ***Commercial use***

In **Cambodia**, the project demonstrated an improved Palm Sugar Stove, which reduces firewood consumption by 40%. Through a payment scheme of three installments, as well as pre-financing the construction, 40 efficient palm sugar stoves were sold.

In **Nicaragua**, the project supported the building of an improved charcoal kiln, and the training of 15 charcoal producers, currently, three charcoal producers are applying the improved charcoal kiln technology. Validation of improved charcoal kiln to demonstrate saving potential will take place during 2009 under GEF funding available in an ongoing World Bank-GEF project.

The absence of large-scale energy entities from the rural areas is accompanied by an absence of the framework, financing, and skills needed for the successful operation of the SMEs in rural areas. In many cases, the technologies that the SMEs could use are also not time-tested or available off-the-shelf. Consequently, projects selected focused on filling these gaps as a necessary first step to promoting investments and service provision by SMEs.

The two household cookstove projects (Haiti and Cambodia) have been able to deliver some results on the ground, partly because of the relatively low capital cost of the stoves, and partly because there is little need for a formal legal and institutional framework.

The pico PV (solar lantern/LED) promotion programs are still in the initial stages of testing and finalizing the technology and financing schemes, except in the case of Bolivia, where the project has strong links to an ongoing World Bank program.

While there has been considerable progress in developing the framework for renewable energy power generation (grid and off-grid), these SMEs may still need assistance in getting commercial loans to finance their investments. The difficulties that SMEs face in obtaining commercial financing are an overarching issue that transcends the energy sector, and would be difficult to overcome without significant efforts and interventions by the World Bank energy sector teams, going beyond this project.

In some cases, progress was hampered by country-specific issues. In some countries, the projects were formally terminated because of implementation delays. In other countries, changes in the local political or economic conditions made progress difficult. While the larger urban-based energy sector entities often have the staying power to weather changing conditions, this is often not the case with fledgling SME programs.

## **Next Steps – An overview of Follow up Plans to the Pilot Initiatives**

Under the recently endorsed ESMAP Strategic Business Plan (2008 – 1013), ESMAP proposes to launch a new program: the ESMAP SME Energy Services Technical Assistance Program will support client countries to develop and implement policy reform measures and robust strategies to enhance the effectiveness of SMEs in delivering clean, reliable, and affordable energy services to the poor and peri-urban areas. Selected promising energy services business models will be adapted and replicated in participating countries.

The results of each pilot program have undergone a preliminary evaluation to determine the best course of action specific to each country. Over the next 3-6 months, ESMAP will conduct further in-depth assessments designed to revamp its activities, to better support SMEs in each country. Haiti, Cambodia, Lao PDR, Bolivia and Peru have been selected for immediate reconnaissance assessments. Based on the results of the reconnaissance assessments, ESMAP will design a program action plan and an appropriate monitoring and evaluation plan specific to each country to be implemented. Solutions recommended by ESMAP will be carefully weighed for appropriateness to local market and SMEs. ESMAP will work with carefully selected local partners, such as governments, relevant local government agencies, cooperatives and micro finance institutions to provide oversight and access to finance of SMEs.

### **InfoDev / ESMAP Partnership**

ESMAP is exploring partnership opportunities with InfoDev, a business unit within the World Bank that manages a business incubation program with a global network of over 175 business incubators assisting more than 10,500 SMEs in more than 75 developing countries. These incubators provide SME start-ups with access to ICT services, business services, financial and technical assistance, training and business mentoring. The Info Dev incubator network has enabled SMEs to develop and commercialize innovative technology solutions, such as water purification systems and hospital administration information systems and SME support networks to conduct field assessments.

Bringing their respective areas of expertise and experience on energy and SMEs, a joint InfoDev and ESMAP team will (i)conduct a country assessment, (ii)develop, and (iii)implement an action plan.

- (i) The country assessment will assess the financial and technical assistance needs of the renewable energy SMEs and any gaps in the provision of this assistance, and whether further incubation of the SMEs of the program could assist in ensuring their longer sustainability. This will include an initial assessment of the business incubation environment in the countries concerned, and the SME capacity of energy services delivery.
- (ii) Based on the results of the assessment, the team will develop an action plan for both countries. This action plan should include recommendations for further promoting the creation, development and sustainable growth of renewable energy SMEs in Peru and Bolivia, possibly through business incubation. The action plan should indicate the level of existing business development services and any existing gaps.
- (iii) Upon successful completion of the action plan, ESMAP and InfoDev may consider collaboration on a second phase entailing implementation of the action plan, including possibly establishing or scaling up business incubators, as well as other related interventions. (Anecdotal evidence from developing countries indicates that business incubators improve the success rate of startups from less than 20% to over 75%).

### **The Russian Energy SME Trust Fund**

During the Russian presidency of the G8, the Government of Russia committed USD30 million to support energy SMEs in Sub-Saharan Africa aligned with the Global Village Energy Partnership (GVEP). The Government of Russia has requested the World Bank to manage this trust fund. The objective of this program is support additional financing and technical assistance activities designed to strengthen SMEs in providing energy services to poor communities in Sub-Saharan Africa. There will be particular focus on building capacity of the local private sector and community based organizations to develop and manage

energy service delivery and utilization. The benefits from the trust fund activities include an increased flow of strategic and technical knowledge to energy SMEs, an improved public and private financing environment to support energy SME projects. Project funds will help facilitate the adjustment of local institutions and design country-specific financing mechanisms aimed at promoting domestic entrepreneurship and investment in infrastructure services in support of shared-growth and poverty reduction.

The following table states the countries that will be supported by the The Russian Energy SME Trust Fund and the ESMAP Energy Services Technical Assistance Program.

ESMAP Energy Services – Technical Assistance Program	The Russian Trust Fund
<ul style="list-style-type: none"><li>• Haiti</li><li>• Cambodia</li><li>• Lao PDR</li></ul> <p><i>InfoDev / ESMAP Partnership</i></p> <ul style="list-style-type: none"><li>• Bolivia</li><li>• Peru</li></ul>	<ul style="list-style-type: none"><li>• Burkina Faso</li><li>• Cameroon</li><li>• Guinea</li><li>• Tanzania</li><li>• Zambia</li><li>• Lighting Africa (Regional)</li></ul>

## V. Logical Framework:

### *Performance: Objective Verifiable Indicators*

Goal	Objective Verifiable Indicators (OVI)	Project Performance
1. Engage the local private sector in providing access to sustainable and affordable energy services	<ul style="list-style-type: none"> <li>• % of poor people, communities and enterprises with sustainable access to affordable modern energy services</li> <li>• % of SMEs engaged in energy services or multi-service delivery in each country</li> </ul>	<ul style="list-style-type: none"> <li>▪ No available data</li> <li>▪ No available data</li> </ul>
2. Build up entrepreneurs' and local government capacity to develop and implement effective business models and regulatory frameworks in the delivery of energy services	<ul style="list-style-type: none"> <li>• % of energy investments in each country with local private participation</li> <li>• Increase in the number of SME private energy or multi-services providers</li> <li>• Increase in the number of governments contracting SMEs for the delivery of decentralized energy services</li> </ul>	<ul style="list-style-type: none"> <li>▪ No available data</li> <li>▪ No available data</li> <li>▪ No available data</li> </ul>

---

3. Assessment of enabling environment and incentive framework	<ul style="list-style-type: none"> <li>• Number of stakeholder workshops facilitated in each country</li> <li>• 3-6 case studies completed</li> <li>• 6 baseline country specific assessment reports prepared and disseminated</li> <li>• Country specific barriers to SME development identified and disseminated in at least 3 countries</li> </ul>	<ul style="list-style-type: none"> <li>▪ 15 workshops held in 10 countries: Cameroon, Bukina Faso, Guinea, Tanzania, Cambodia, Mongolia, Haiti, Peru, Bolivia, and Nicaragua</li> <li>▪ 7 case studies completed: Bolivia, Cambodia, Cameroon, Haiti, Lighting Africa, Peru and Tanzania</li> <li>▪ 10 country specific diagnostic studies completed</li> <li>▪ Country specific barriers to SME development identified in 9 countries</li> </ul>
<hr/>		
4. Mobilization of stakeholders and institutional strengthening	<ul style="list-style-type: none"> <li>▪ Stakeholders consultation and strategy development undertaken in 6 locations to seek consensus on appropriate business models</li> <li>▪ White papers / policy documents circulated for comments in at least 4 locations</li> <li>▪ Strategy papers in target countries published and adopted by at least 2 local governments</li> <li>▪ Political recognition of local private sector. Guidance notes and documented cases to feed into dissemination strategy</li> <li>▪ Institutional capacity building experience documented</li> </ul>	<ul style="list-style-type: none"> <li>▪ Stakeholder consultations held in 6 countries</li> <li>▪ Policy documents circulated in at 2 countries</li> <li>▪ Strategy papers adopted by 2 local governments</li> <li>▪ NOT REALIZED</li> <li>▪ NOT REALIZED</li> </ul>

---

5. Design, development and implementation of pilot projects	<ul style="list-style-type: none"> <li>• 6 pilot projects developed</li> <li>• 3-5 business models for the delivery of energy services prepared and disseminated</li> <li>• Mechanism to ensure that the pilot and follow up projects put in place</li> <li>• Guidelines and lessons documented</li> <li>• An ESMAP flagship paper prepared on the design and implementation of SME based power and water services</li> <li>• ESMAP business handbook for delivering decentralized energy services in developing countries published</li> </ul>	<ul style="list-style-type: none"> <li>▪ 11 pilot programs were developed in almost all countries with the exception of Burkina Faso and Mongolia</li> <li>▪ 3 business models developed in Zambia, Cambodia, and Lao PDR</li> <li>▪ Tanzania had mechanisms in place for follow-up</li> <li>▪ Guidelines and lessons documented in 5 countries and Lighting Africa</li> <li>▪ NOT REALIZED</li> <li>▪ NOT REALIZED</li> </ul>
6. Facilitation of Financing Mechanism	<ul style="list-style-type: none"> <li>• Inventory of existing local financiers and risk management instrument accessible to SMEs developed in 3 countries</li> <li>• Financing instrument supply-demand gaps identified</li> <li>• New financing and risk management instruments accessible to SMEs designed and existing ones adapted</li> <li>• Government supported funding mechanism to buy-down the cost of energy services to the poor in isolated areas designed and adopted</li> <li>• Pilot projects on financing facilitation for energy sector SMEs developed and operationalized</li> </ul>	<ul style="list-style-type: none"> <li>▪ Guinea completed a study which resulted in an inventory of existing local financial players</li> <li>▪ Financing supply-demand gap identified in Cambodia, Lao PDR and Mongolia</li> <li>▪ Burkina Faso, Guinea and Tanzania established new financing instruments</li> <li>▪ NOT REALIZED</li> <li>▪ Cameroon, Burkina Faso, Guinea, Cambodia and Mongolia established pilot financing facilitation</li> </ul>

---

7. Capacity Building	<ul style="list-style-type: none"> <li>• At least 10 training programs undertaken for SMEs</li> <li>• At least 3 private sector fora organized</li> <li>• At least 6 projects awarded to local SMEs to increase access to energy in decentralized or isolated areas</li> </ul>	<ul style="list-style-type: none"> <li>▪ 5 training programs were undertaken in Guinea, Cambodia, Mongolia, Haiti and Nicaragua</li> <li>▪ 3 private sector fora were organized in Haiti, Nicaragua and for Lighting Africa</li> <li>▪ One project in Cambodia</li> </ul>
<hr/>		
8. Learning from results	<ul style="list-style-type: none"> <li>• Monitoring system for the extension of supply of energy services and renewable energy by SMEs developed through the pilot projects, and as part of scaling-up</li> <li>• Results disseminated with local entrepreneurs through chambers of commerce, semi-annual learning events</li> </ul>	<ul style="list-style-type: none"> <li>▪ NOT REALIZED</li> <li>▪ Dissemination of results with local entrepreneurs was done in 2 countries: Guinea and Tanzania</li> </ul>

---

**VI. Project Performance by country: Review of country specific goals and results achieved**

## Cameroon: Capacity Building among Small-Scale Off-Grid Energy Suppliers

### 1. Prepare a diagnostic study on the institutional and regulatory framework within which small and medium sized enterprises in the power sector are allowed and/or required to operate through

- *Analysis of specific regulatory procedures and structures relevant to registration and operation of energy SMEs*

Activities performed:	Results:
<ul style="list-style-type: none"> <li>• A draft consultant report on “Diagnostic of the Institutional and Regulatory framework” for SME in the energy sector submitted in January 2007</li> </ul>	The diagnostic study showed that the existing institutional and legal framework was not conducive to SME participation in energy projects in remote and under-served regions of the country and that Cameroon lacked a mechanism to provide SMEs with financing to become a supplier to or operator of rural energy projects. The Minister of Energy requested for the establishment of an institutional and financial mechanism.

- *Formulation of recommendations for the government of Cameroon on legal and regulatory measures to promote the development of energy services SMEs*

Activities performed:	Results:
<ul style="list-style-type: none"> <li>• Draft report on “Propositions and Recommendations” submitted in May 2007</li> <li>• Final report integrating both reports submitted in January 2008</li> </ul>	N/A

### 2. Framework for accessing finance for energy sector SMEs

- *Develop mechanism for AER to access HIPC finance*

Activities performed:	Results:
<p>In line with recommendations of PANERP, a Rural Energy Fund (REF) was established as a financing window to allow SMEs to:</p> <ol style="list-style-type: none"> <li>participate in energy projects as consultants for feasibility and other related studies</li> <li>become operators of rural energy projects, as the design of the REF follows the electricity law which foresees private participation in energy projects; and;</li> </ol>	This approach follows best practice examples from other African countries such as Mali and Senegal, who have been successful in developing the participation of SMEs in rural energy projects.

iii. provide technical assistance to SMEs to become suppliers and operators of rural energy projects and help them raise co-financing from local banks and microfinance institutions.	
<ul style="list-style-type: none"> <li>Evaluation of appropriate institutional structure and implementation mechanism for an SME-based REF</li> </ul>	<ul style="list-style-type: none"> <li>Initiation report in February 2008</li> <li>Interim report in April 2008</li> <li>Final report in November 2008</li> </ul>
<ul style="list-style-type: none"> <li>Validation seminar of the institutional and strategic approach with all sector stakeholders on April 17, 2008</li> </ul>	<ul style="list-style-type: none"> <li>Consultant presentation and minutes submitted by the Minister of Energy to the Prime Minister, about 45 participants from government ministries and agencies trained in best practice principles for SME based REFs</li> </ul>
<ul style="list-style-type: none"> <li>Facilitation of the adoption of the required legal framework (local consultant contract)</li> </ul>	<ul style="list-style-type: none"> <li>Draft law and decree for the creation of the REF</li> </ul>
<ul style="list-style-type: none"> <li>Validation seminar of proposed legal and regulatory texts for the SME based REF on September 11-12, 2008, including presenters from REFs in Mali and Senegal to discuss experiences in attracting SMEs to rural energy projects</li> </ul>	<ul style="list-style-type: none"> <li>Consultant presentations, adoption of the draft law and decree for the creation of the REF, about 40 participants from government ministries and agencies trained in best practice regulation for SME based REFs</li> </ul>
<ul style="list-style-type: none"> <li>Operating Manual for the SME based REF which details institutional, administrative and financing procedures for accessing investment subsidies for private SME operators for rural energy projects in Cameroon – October 2008</li> </ul>	

- Identify Cameroonian commercial institutions potentially interested in financing energy SMEs through loans or through equity participations

Activities performed:	Results:
NOT REALIZED	NOT REALIZED

### 3. M&E Dissemination

- Integrate M&E activities into AER and at the level of the Ministry of Energy

Activities performed:	Results:
NOT REALIZED	NOT REALIZED

- Workshops and selected publications

Activities performed:	Results:
NOT REALIZED	NOT REALIZED

## ***Burkina Faso: Capacity Building among Small-Scale Off-Grid Energy Suppliers***

This programme in Burkina Faso was terminated in July 2008

### **1. Prepare a diagnostic on the institutional and regulatory framework within which small and medium sized enterprises in the power sector are allowed and/or required to operate through**

- *Analysis of specific regulatory procedures and structures relevant to registration and operation of energy SMEs*

Activities performed:	Results:
Identification of institutional structures involved with energy SME operations	Updated list of relevant institutions

- *Formulation of recommendations for Government on legal and regulatory measures to promote the development of energy services SMEs*

Activities performed:	Results:
NOT REALIZED	NOT REALIZED

### **2. Framework for accessing finance for energy sector SMEs**

- *Prepare detailed financing procedure and rule book for SMEs*

Activities performed:	Results:
DFID-funded Energy SME resources were used as important seed money to prepare a US\$0.8 million sub-component to support SMEs as part of the Bank-financed Energy Access Project (US\$38.80 million) presented to the board in July 2007.	Available credit line to pursue energy SME activities in Burkina Faso beyond DFID financing

- *Identify Burkinabe lenders and equity investors in SMEs*

Activities performed:	Results:
NOT REALIZED	NOT REALIZED

### 3. M&E Dissemination

- *Integrate M&E activities into General Directorate of Energy (DGE) and at the level of the Ministry of Energy*

Activities performed:	Results:
NOT REALIZED	NOT REALIZED

- *Workshops and selected publications*

Activities performed:	Results:
<p>The report on the workshop on energy SMEs conducted in November 2007 was finalized. This workshop regrouped about 50 participants coming from the SME community, NGOs, the commercial banking sector, and the public sector.</p>	<p>The report outlined weaknesses and strengths of the SME sector in the country. It proposed an action plan to improve legal and regulatory frameworks to sustain SME activities and to improve financing mechanisms to support them.</p> <p>A preliminary report on an action plan to address identified SMEs weaknesses through institutional and legal framework revisions was delivered in June 2008.</p>

## Guinea: **Scaling up SME participation in rural electrification in Guinea**

Specific objectives were to assist BERD and AGER in the following:

- *Ensuring that experiences from the current BERD SME model are captured, reviewed and adequately integrated in AGER's strategy and work plan*

Activities performed:	Results:
NOT REALIZED	NOT REALIZED

- *Developing a rural access scale up strategy, which would articulate the place for SMEs, together with other potential service providers (utility, NGOs, communities etc)*

Activities performed:	Results:
<p>A strategy for conversion of BERD into AGER has been agreed upon</p> <p>Consultants financed by this project have produced a draft sustainable rural electrification strategy and identifies financing sources for the continuation and scale up of the SME program</p> <p>A workshop was held in March 2009, with SMEs, government and some donors on the implementation challenges and scaling up of the SME rural electrification program</p> <p>The replication and scale-up of activities initiated by this project is unsure due to the fragile political situation in Guinea. For this reason, it is unlikely that the new SME electrification strategy will be adopted in the short-run. Similarly, the implementation of the solar pilots is uncertain because the availability of World Bank funds for investment is uncertain. In general, donor funding for replication/scale-up is uncertain until the political situation clarifies.</p>	<ul style="list-style-type: none"> <li>• BERD has identified and designed 4 pilot programs for solar PV micro concessions, based on recommendation of a consultant hired under this program</li> <li>• 4 SME operators have been identified and signed the concession contracts. These operators have been assisted by this project on the supply, installation, operation and maintenance of PV systems</li> <li>• 2,000 systems are currently being procured in bulk to reduce the costs for the SME providers</li> <li>• An additional pilot opportunity has been identified for a mining sector by an ESMAP consultant to extend the BERD SME electrification concept to mining areas, financed by Corporate Social Responsibilities (CSR) of the mining company. The pilot is currently under discussion between a multi-national mining company and BERD</li> </ul>

- *Adapting the SME model to expand to other technologies and services; in particular renewable energy and possibly household fuels*

Activities performed:	Results:
NOT REALIZED	NOT REALIZED

- *Assisting SMEs to successfully face the challenge of scaling up their activities*

Activities performed:	Results:
NOT REALIZED	NOT REALIZED

- *Developing sustainable sources of funding*

Activities performed:	Results:
NOT REALIZED	NOT REALIZED

## Tanzania: Integrating SMEs in Tanzania's Rural Energy Initiatives

### 1. Assessment of the enabling environment and incentive framework

Activities performed:	Results:
1. A demand assessment was carried out in a remote pilot area - Rukwa region – with SIDA funds.	The assessment identified high demand for electricity services, with demonstrated capacity to pay (through current expenditures) of US\$4, US\$5, and US\$9 monthly, for the groups defined as 'poor households', 'less poor households' and 'affluent households', respectively.

### 2. Mobilization of stakeholders and institutional strengthening

Activities performed:	Results:
<p><b>Workshops</b> with the renewable small-scale private sector developers and subsequent consultations led to the <b>identification of legal/regulatory constraints</b> as one of the key barriers to the development of small scale renewable projects. Subsequently, the following activities have been concluded or initiated</p> <p>EWURA and the Bank organized a workshop to discuss the new Guidelines and suggested revisions to regulatory rules with SPPs in February 2009. The workshop was attended by key Government officials, the national utility and representatives of SPPs and reported in the local newspapers. (The workshop was budgeted to be financed by ESMAP but due to the depreciation of pound sterling in which ESMAP funds were held, alternative funding had to be secured)</p> <p>Under separate financing (CF Assist), but closely coordinated with the ESMAP activity, a carbon-finance capacity-building workshop was held with REA, SPP Working Group and several SPPs. This has led to the development of a CF-Assist sponsored program to develop a CDM Program of Activities for Tanzania SPPs, with REA serving as a coordinating entity.</p>	<ul style="list-style-type: none"> <li>• A <b>new Electricity Act was adopted</b> in 2008 that sets out key principles for access expansion and renewable energy, including principles of light-handed regulation in access expansion (section VII), drawing on the principles for light-handed regulation developed under an earlier DFID-financed ESMAP project: "Four Regulatory Principles to Support Diverse Electrification", ESMAP Knowledge Exchange, February 2006.</li> <li>• <b>Standard power purchase agreement and tariff</b> (SPPA/T) for small renewable projects were developed (calculated as utility's avoided costs of generation), and consulted with all stakeholders. The SPPA/T for the main grid was formally approved by the Tanzanian regulator (EWURA – Order 08-015), and the SPPA/T for isolated grids has been submitted EWURA and it is at the final stage of EWURA's official consultation period (expected to be formally adopted in May 2009). (SPPA/T were financed under Sida Trust Fund, with capacity building financed by ESMAP.)</li> <li>• Guidelines for Developers of Small Power Projects in Tanzania have been developed. This is a "how to" manual on commercial and regulatory procedures leading to the development of a small power projects. The Guidelines were adopted by EWURA in principle and submitted to the official public consultations. The Guidelines are expected to be formally issued by EWURA in May 2009. (The Guidelines were fully financed by ESMAP).</li> </ul>

	<ul style="list-style-type: none"> <li>• Simplification of EWURA's regulatory processes. The development of Guidelines has led to the recommendations for further simplifications of regulatory processes carried out by EWURA. The regulatory changes have been incorporated to the guidelines and are subject to the same consultation process. EWURA is currently drafting the new rules, which will be issued together with Guidelines. (The proposed revisions were fully financed by ESMAP).</li> <li>• The simplified regulatory framework and guidelines cover the following scenarios: (i) SPPs selling power to Tanesco's main grid, (ii) SPPs selling power to isolated mini-grids, and (iii) Greenfield SPPs with a mini-grid, selling power directly to final users.</li> <li>• Simplified tariff-setting mechanism for SPP was established, through an improved coordination between REA and EWURA (removing duplication of tariff approvals by the two institutions) – based on recommendations financed by ESMAP.</li> </ul>
--	--

### 3. Design, development and implementation of pilot projects

Activities performed:	Results:
<p>Over the period of June-September 2007, several workshops and consultations with key stakeholders were held</p>	<p>This helped to <b>identify the key priorities of SME</b> involvement in the electricity sector, with a potential to benefit from REA/REF funding as follows:</p> <ul style="list-style-type: none"> <li>• Small renewable projects (under 10MW), and their mini-grids providing service to surrounding communities</li> <li>• Village micro-generation facilities and micro-grid (e.g. village micro-hydro, village jatropha-fuel systems etc.)</li> <li>• Solar home systems and other low-cost lighting products (e.g. solar lanterns).</li> </ul> <p>An agreement was reached with GoT that specific windows will be established for each of these categories under REF.</p>
<p>A pipeline of 22 of priority SPPs in advanced stage of project development (small hydro and biomass), a vast majority of them local SMEs. Of these, eleven projects will sell their electricity to the main grid, while five projects will sell their electricity into existing mini-grids. The remaining six projects are Greenfield mini-grids. The installed capacity of these projects ranges from 0.1 to 10MW, but</p>	<p>At this time it is too early to know if this target will be achieved. These SPPs are still facing difficulties in accessing loans from commercial banks.</p>

together these projects contribute to over 70MW of installed capacity. If all of them are developed, this would contribute to about 5% of total installed capacity in Tanzania.	
---	--

#### 4. Facilitation of Financing Mechanism

Activities performed:	Results:
The Bank team has initiated discussions with IDA, AFD, GVEP and the Dutch government about supporting a credit line for small renewable energy projects in Tanzania. The World Bank TEDAP project also already provides output-based grants for new connections, which would improve the financial viability of the SPP mini-grids. .	N/A

#### 5. Capacity building

Activities performed:	Results:
This project is providing additional capacity building assistance for new SPPs, covering technical, business development and financing aspects, including transaction advice to reach financial closure.	N/A

#### 6. Learning from results

Activities performed:	Results:
<p>The new Tanzanian law applies principles of earlier ESMAP-funded work on light-handed regulation.</p> <ul style="list-style-type: none"> <li>• The strategy for low-cost lighting products, currently under development in Tanzania, <b>builds upon lessons learned from the Lighting Africa</b> initiative (also supported by the ESMAP SME facility).</li> <li>• ESMAP SME program <b>financed a study tour to Sri Lanka</b> for the Small Renewable Project Working Group, involving participants from Government and the private sector. <b>On this basis the Tanzanian Standard Power Purchase Agreements and Tariffs were developed.</b></li> </ul> <p>A separate ESMAP financed Africa Electrification Initiative (under AFREA financed by the Government of Netherlands) will feature</p>	N/A

Tanzania SPP regulatory framework in a workshop on electrification experiences for Africa practitioners to be held in Maputo in June 9-12, 2009.	
--	--

## Zambia: Strengthening Small-Scale Off-Grid Energy Suppliers

Support for this program was terminated in July 2008.

### 1. Market assessment of Solar PV

- **Assess national market potential, including consumer willingness to pay**

Activities performed:	Results:
<p>ECON was commissioned to produce a market assessment for Sustainable Solar Market Package (SSMP).                      Complete a rapid rural survey on consumer willingness to pay for such energy services.</p> <ol style="list-style-type: none"> <li>Public Facilities Survey and photovoltaic (PV) market assessment for SSMP areas.</li> <li>Technical design and costing of PV packages for SSMP</li> <li>Preparation of model business plan and feasibility study</li> <li>Preparation of estimates of targets and budget requirements over a five year period for the pilot SSMP packages and assess economic viability</li> <li>Subsidy analysis</li> </ol>	<p>The project focused on developing pilot projects                      One district was selected to pilot SSMP                      Development of Sustainable Solar Market Packages (SSMP), Zambia                      Progress Report Task 1-5</p>

- *Evaluate technology and supply options*

Activities performed:	Results:
NOT REALIZED	NOT REALIZED

### 2. Technical Assistance to Rural Electrification Agency (REA) for Solar PV and isolated grids

- *Light handed regulation and subsidy schemes via the Rural Electrification Fund Operational Manual*

Activities performed:	Results:
NOT REALIZED	NOT REALIZED

**3. Capacity Building for off-grid (mini-hydro and biomass power plants) MSMEs**

- *Targeted training workshops and seminars, advisory services and business support to MSMEs*

Activities performed:	Results:
NOT REALIZED	NOT REALIZED

- *Consumer promotion campaign*

Activities performed:	Results:
NOT REALIZED	NOT REALIZED

**4. Facilitating access to financing through capacity building to financial institutions**

- *Training to local financial institutions in off-grid options*

Activities performed:	Results:
NOT REALIZED	NOT REALIZED

**5. Support to developing and implementing pilot projects**

- *2-3 pilot projects in both off-grid priority rural electrification packages (PREP) in potential mini-hydro and biomass sites*

Activities performed:	Results:
NOT REALIZED	NOT REALIZED

- *3-4 sustainable solar market packages in selected districts*

Activities performed:	Results:
NOT REALIZED	NOT REALIZED

## Cambodia: SMEs in Decentralized Energy Services

### 1. Diagnostic study and initial assessment

- *Energy SMEs*

Activities performed:	Results:
Baseline assessment and strategy study submitted July 2007	Description of potential pilot projects and dissemination strategies to be supported by the ESMAP SME program

### 2. General sector support for decentralized energy access to Ministry of Industry, Mines and Energy (MIME)

- *Low-cost and regulatory standards*

Activities performed:	Results:
NOT REALIZED	NOT REALIZED

- *Stakeholder mobilization and monitoring and evaluation*

Activities performed:	Results:
<p>1) The first stakeholder workshop was on the delivery of rural energy services: This workshop was held in Phnom Penh on the 25th of June 2007. The purpose was 1) to advice rural NGOs on energy technologies that have potential to improve rural livelihoods and increase income levels, 2) to seek the views of NGOs on the appropriateness of the technologies for implementations in remote communities and methods of dissemination and 3) presentation were made on gender mainstreaming by the representatives of MoWA chief of local governance and the MIME gender focal point. A discussion group was also organized as part of the workshops program. This had representation from NGOs, MoWA, MIME, MAFF and WeNetCam. It discussed how gender mainstreaming could be integrated into the WB-ESMAP Program.</p> <p>2) A forum on the future of REEs was held in Phnom Penh on 25 March 2008. The objective of the forum was to discuss the future institutional structure for rural electrification and possible funding mechanisms to accelerate this. MIME, REF, EAC, EDC, IFC and the Bank participated in this stakeholder consultation to discuss</p>	<p>1) a. Identified a number of potential pilot projects to be supported under the ESMAP SME program b. Prepared proposal and secured funding from GAPFund to assess the gender aspects of the pilot projects</p> <p>2) a. Identified key issues to be addressed in the Cambodia Rural Energy Strategy</p> <p>3) a. Lessons learned from decentralized energy programs</p>

<p>the following issues: (i) pace of rural electrification; (ii) rethinking Government's approach to rural electrification; (iii) update target of 70% electrification rate by the year 2030; (iv) the vision for REEs going forward and the role of stakeholders; and (v) action plans and resources to achieve the vision.</p> <p>3) A regional conference titled 'SMEs in Decentralized Energy Services' was held in Phnom Penh in June 2009 in which stakeholders drawn from the public and private sectors were invited to participate. The workshop supported the sustainability of SMEs as energy service providers through stimulating cross-fertilization and sharing of information amongst Energy SME entrepreneurs, energy policy decision makers and donors. The workshop showcased the results and experiences of the ESMAP funded Energy SME Program in Cambodia and Laos and other decentralized energy projects in the region.</p>	
---	--

### 3. Training for Rural Energy Enterprises

- *Technical and Management Training*

Activities performed:	Results:
<ul style="list-style-type: none"> <li>• Centre Kram Ngoy (CKN) provided technical, safety and business management training to REEs in Northern Cambodia</li> <li>• EDC-Training Center provided technical, safety and business management training to REEs in Southern Cambodia</li> <li>• "Access to Finance" study funded for energy service providers resulting in several recommendations and options for enhanced access to finance for REEs</li> </ul>	<ul style="list-style-type: none"> <li>• EDC Training Center trained 118 individuals (61 owners and 58 technicians) from a total of 61 REEs</li> <li>• CKN trained 122 individuals (61 owners and 61 technicians) from a total of 61 REEs as well, totaling 122 REEs.</li> <li>• Up to 20% savings in diesel fuel reported by some REEs</li> <li>• Further training is planned.</li> </ul>

### 4. Design and implementation of technical assistance for pilot projects that complement ongoing Bank programs on grid-based access

- *Design a program that supports the promotion and large scale investment and installation of biomass gasification equipment in Cambodian rice mills and other rural SMEs to reduce operating costs and their dependency on imported diesel fuel oil*

Activities performed:	Results:
<ul style="list-style-type: none"> <li>• SME Cambodia was contracted to collect and analyze data from</li> </ul>	<ul style="list-style-type: none"> <li>• SME Cambodia over achieved their target of developing 5</li> </ul>

<p>rice mills and other SMEs to establish the potential financial benefits possible from biomass gasification technology.</p> <ul style="list-style-type: none"> <li>• Economic analysis showed rice mills to have the most potential for gasification</li> </ul>	<p>projects using their integrated turn-key approach including loan facility. They financed and installed 12 gasifiers during the pilot project period and received orders for over 20 more gasifiers.</p> <ul style="list-style-type: none"> <li>• SME Cambodia submitted a report on the pilot implementation and an Action Plan on scaling up the project. Proposed funding for the Action Plan comprises \$4.5million for a loan scheme, \$350,000 for staff training and development of a technical and financial management capability in Cambodia, and \$222,000 for the establishment and regulation of equipment standards and to ensure the source of biomass supply are environmentally sustainable.</li> </ul>
---	--

- *To test and prove technology and business models for broad scale production and distribution by existing and newly established SMEs of improved / more efficient stoves for use by households and industries*

Activities performed:	Results:
<p>Efficient Cookstove dissemination project was piloted by GERES, to introduce the Neang Kongrey efficient cookstove in rural Cambodia. To overcome the lack of capacity to produce a high quality efficient cookstove, a model production facility was piloted with funding support from the Asia Sustainable and Alternative Energy Program (ASTAE). The estimated cost of the National Program is \$3.5 million and is proposed that a donor partnership be developed to provide the funding.</p> <p>A draft strategy for a National Program has been developed by the ESMAP SME Team in cooperation with GERES and MIME.</p>	<ul style="list-style-type: none"> <li>• Over 8,000 improved cookstoves were disseminated to rural areas of Cambodia</li> <li>• The model production facility would be replicated regionally in the National Program to meet market demand and reduce transport costs, the latter is particularly important in ensuring efficient stoves are affordable to the poor</li> <li>• The target of the National Efficient Cookstove Program is to achieve the dissemination of 1 million efficient cookstoves in rural areas over a 4 year period</li> </ul>
<p>Pilot program implemented by GERES-Cambodia supported the commercialization of an improved Palm Sugar stove, the “Vattanak”. The total cost of the stove including manufacturing of ceramic parts, transportation and installation by masons was \$70, which was found to be too expensive in relation to the income of producers. In order to overcome this, a payment scheme of three installments as well as pre-financing the construction was offered by GERES-Cambodia and its partner company, ECO-Biz. The pilot dissemination project was successful in demonstrating the feasibility of introducing efficient</p>	<ul style="list-style-type: none"> <li>• The Vattanak stove reduces firewood consumption by 40%, produces better quality palm sugar, and eliminates smoke</li> <li>• Eco-Biz and GERES-Cambodia have sold 40 efficient palm sugar stoves</li> <li>• Eco-Biz started packaging and promoting granulated palm sugar from the sugar producers using the stove.</li> <li>• The stove has potential for other small scale industries such as noodle makers, rice wine, soya-bean processing</li> </ul>

palms sugar stove technology.	
-------------------------------	--

- *The LED Lanterns program was an additional pilot program which was not mentioned in the Program Memorandum*

Activities performed:	Results:
<ul style="list-style-type: none"> <li>• Research Development International (RDI) was contracted to implement the LED lantern pilot project as an alternative to using kerosene</li> <li>• RDI developed a rental scheme and 5 month repayment scheme</li> <li>• To make the lanterns available in rural villages, RDI sponsored a business training center that selected 25 interested villagers to become retailers. They followed a three-week training course during which they gained basic accounting, and entrepreneurial skills including promotion and finding potential customers. These entrepreneurs designed several payments schemes including an option for rent-to-own in order to make the technologies available to the poor. From their experience they found that poor households are able to pay a daily payment for the lantern equal to what they currently spend on kerosene for lighting. During the first two months of operation after the training the entrepreneurs sold 1400 LED-Lanterns.</li> </ul>	<ul style="list-style-type: none"> <li>• A total of 2000 lanterns disseminated</li> <li>• At the start of pilot implementation the RDI lantern was found to be too expensive to be purchased outright by poorer households, and required several areas of improvement, concerning quality, manufacturing, cost and dissemination strategy</li> <li>• Quality, cost and dissemination issues were addressed by RDI and trained entrepreneurs are offering rental schemes for the lantern equal to what poor households currently spend on kerosene for lighting.</li> </ul>

**5. Facilitating access to financing by assessing financing needs and required terms and conditions of the SME energy sector and helping mobilize domestic financing**

Activities performed:	Results:
<p>The Program funded a study on “Access to Finance” in Cambodia for SME Energy Service Providers, and resulted in several recommendations and options for enhanced access to finance for REEs. One option presented was a risk sharing facility (RSF) with local commercial banks to encourage financial support to the REEs. This model has proven effective in the region for financing renewable energy and energy efficiency projects. The consultant that prepared the study, under funding from AusAID, will continue to develop the Risk Sharing Facility.</p>	<ul style="list-style-type: none"> <li>• Risk sharing facility with local commercial banks developed to support REEs</li> </ul>
<p>During project implementation, funds were secured for 2 additional</p>	<p>i. support for the private sector development program for the</p>

pilot projects from the Asia Alternative and Sustainable Energy Program (ASTAE)	ii. National Biodigester Program (\$70,000); and the development of a Model Production Facility for the improved cookstove (Neang Kongrey Model) (\$50,000)
The World Bank ESMAP Project also coordinated two research projects	The first was funded by the Japanese Consultant Trust Fund (\$45,000) and generated data on the benefits of the energy technologies at the village level in order to improve dissemination strategies A second project, funded by the GAPFund (\$45,000), analyzed the gender dimensions of each of the pilot projects and formulated recommendations for gender mainstreaming of sustainable and efficient energy service delivery.

**6. Training to Ministry of Mining and Energy (MIME) senior staff on budget planning and economic analysis of SMEs**

Activities performed:	Results:
NOT REALIZED	NOT REALIZED

## Lao PDR: SMEs in Decentralized Energy Services

### 1. Diagnostic study and initial assessment

- *Energy SMEs*

Activities performed:	Results:
Baseline assessment and strategy study submitted March 2008	Description of potential pilot projects and dissemination strategies to be supported by the ESMAP SME program

- *Survey in selected rural areas and feasibility studies of energy service projects in the area. Understand the resources available and demand/supply balance through renewable (biomass) resource*

Activities performed:	Results:
NOT REALIZED	NOT REALIZED

### 2. Options for service delivery

- *Using baseline assessment of Energy SMEs, conduct workshops for dissemination and consensus building on proposed delivery models*

Activities performed:	Results:
NOT REALIZED	NOT REALIZED

### 3. Addressing regulatory and financing issues

- *Strengthening institutions related to energy service delivery and rural electrification on regulatory issues associated with concessions and also subsidy schemes*

Activities performed:	Results:
NOT REALIZED	NOT REALIZED

#### 4. Design and implementation of pilot projects

Activities performed:	Results:
<p>Rural Electrification Fund Advisor has been hired and is supporting the DOE mainly focusing on 3 areas:</p> <ul style="list-style-type: none"> <li>• Preparation of REF Operational Manual with a view to open the access to the REF to not only DOE but to other participants including the private sector</li> <li>• Support in implementing the internal organizational strengthening activities with regard to REF management</li> <li>• Assist in the preparation of the REP II project document</li> </ul>	<p>The REF Operations Manual was delivered at the end of April, 2009</p>
<p>Biomass gasification technology for off-grid village electrification: SME Cambodia was contracted to identify sites that have potential for local grid electricity generation and distribution system using biomass gasification technology To complete a pre-feasibility study on the sites with the most potential</p>	<p>The SME Cambodia team completed first site assessment in May 2008 in Phongsali province The second site assessment was completed in January 2009 in Xaignabury province. A third site assessment was conducted in March 2008 on the selected site in order to collect data to prepare a pre-feasibility study.</p>

## Mongolia: Capacity Building among Small-Scale Off-Grid Energy Suppliers

The program in Mongolia was terminated

### 1. Capacity building of SMEs selling solar home and wind turbine systems

- *Assist certified suppliers to set up support mechanism at the soum (village) center level targeting herder/nomadic population*

Activities performed:	Results:
Operational Manual for SME Funds has been completed in consultation with key stakeholders	
Certification and accreditation of eligible SMEs has also been completed	
<p>The project facilitated two workshops:</p> <p>i. Soum component kick off Workshop (October 4 and 5, 2007)</p> <p>ii. Herders' Component kick-off Workshop (October 10 and 11 2007)</p>	<p>All 27 soum centers identified for receiving REAP support in construction of renewable-diesel hybrid systems, rehabilitation of local grids, and sustainable operation and management of soum center electricity services were invited to a workshop, and 24 Soum Governors were present. During the workshop, presentations were given on</p> <p>i. the project and the soum center component in particular</p> <p>ii. the equipment to be provided (network rehabilitation and renewable energy systems); and</p> <p>iii. the management systems to be established in participating soums (Soum User Associations and Soum Utilities).</p> <p>In the Herders Component, three national dealers and fourteen regional sales and service centers (SSCs) were selected to participate in the retail sales program.</p>

- *Increase the number of private dealers in Mongolia and make them more bankable to financial institutions*

Activities performed:	Results:
NOT REALIZED	NOT REALIZED

### 2. Capacity building of small community-run utilities in the soums

- *Improved management systems and operating hybrid diesel-renewable energy electricity generation systems*

Activities performed:	Results:
NOT REALIZED	NOT REALIZED

- *Focus on technical, management, and financial capacity building of local suppliers. Will be initiated in 15 communities and depending on results, could be replicated with Japanese funding*

Activities performed:	Results:
NOT REALIZED	NOT REALIZED

## Haiti: Dissemination of Improved Cook-stoves

### 1. Capacity building and business support services

- *Training to potential stove makers; Stove producing artisans will now buy bulk stove kits from large metal workshops, thereby greatly increasing their productivity and guaranteeing the supply of the right metal*

Activities performed:	Results:
<p>Baseline assessment produced an inventory of producers of traditional stoves</p> <p>Identification of participants to the project</p> <p>The local firm in charge of training prepared training manuals.</p>	<p>Inventory of producers of traditional stoves (including the ones who were already trained to produce was performed, with corresponding coordinates (database)</p> <p>144 artisans have been trained as potential producers of the MIRAK stoves</p> <p>80 of whom are certified and allowed to use the Quality and Energy Efficiency label (QEEL)</p> <p>The artisans who did not obtain certification are to undergo additional training</p>
<p>Creation of a cooperative, intermediary between consumers and producers</p>	<p>Significant boost in stove sales (up to 67% of total sales in June 2008)</p>
<p>Three workshops were organized:</p> <ol style="list-style-type: none"> <li>May 2007 workshop with potentially interested local SMEs for provision of consulting services (training, label etc.)</li> <li>Oct 2007 workshop with WB team and 6 SMEs contracted for training, promotion, quality control, M&amp;E, and labeling to review coordination between activities and prepare workplans;</li> <li>Feb 2008 workshop to present the Strategy and the SME Project to key stakeholders</li> </ol>	

- *Technical advice on how to run a business, access finance, etc*

Activities performed:	Results:
	<p>23 traders and 49 artisans received training in business and accounting</p>

## 2. Improved branding

- *The energy efficiency labeling program will promote all types of efficient stoves including charcoal, kerosene, and LPG*

Activities performed:	Results:
A quality control exercise revealed some variation in the savings from the stoves, indicating a need for further efforts to ensure that the desired savings are actually realized	A quality label was designed by a local consulting company. A protocol for certification and quality control was designed in coordination with the Government and World Bank

## 3. Customer awareness and publicity campaigns

- *Designed to stimulate demand and better inform the households of the improved stoves and the energy efficiency and quality label.*

Activities performed:	Results:
<ul style="list-style-type: none"><li>• Advertisements featuring a local celebrity have been produced and running on 5 radio stations and two major television stations.</li><li>• 7 public events have been organized, including a high visibility demonstration during the annual Port-au-Prince Carnival and mobile promotion applied in low income residential areas</li></ul>	

## Peru: Small and Medium size Enterprises for Energy Services Delivery

### 1. Assess and identify the potential for energy SMEs in the sector

- *Diagnostic study led by the project coordinator in coordination with MEM, ADINELSA, OSINERG, local governments/communities and other stakeholders.*

Activities performed:	Results:
<p>A diagnostic study was completed in 2007 with the active participation of the sector regulator (OSINERGMIN), the Ministry of Energy and Mines (MEM), distribution companies, energy sector SMEs and NGOs</p> <p>The study identified the level and experience with SME participation in rural electrification by distribution companies and in off-grid communities assisted by NGOs in Peru</p>	<p>The study identified the main barriers to SME participation as lack of access to investment subsidies and operating cross-subsidies. These are limited to distribution concession holders who do not invest in communities unless their operations can be financially sustainable.</p> <ul style="list-style-type: none"> <li>• Current full tariffs do not fully cover operational costs and asset replacement in the most remote communities</li> <li>• An estimated 70% of 1.3 million rural households can be served by SMEs by 2016 if barriers can be addressed</li> </ul>

- *Identify potential SMEs and market opportunities available to them as concessionaries or intermediate actors.*

Activities performed:	Results:
<p>ESMAP assistance to two types of micro-hydro systems operated SMEs:</p> <p>Conchán is an SME operated and municipality owned micro-hydro based rural grid. The Conchán system is operated by an SME under a management services contract.</p>	<p>In 2008, Conchán was certified as the SER under LGER</p>

- *Analyze potential technologies focusing on options for off grid systems and renewables*

Activities performed:	Results:
NOT REALIZED	NOT REALIZED

- *Review the relevant regulatory/legal framework and the potential barriers SMEs might face and identify potential pilot projects/SMEs to be pursued under Task (ii).*

Activities performed:	Results:

<p>Stakeholder's workshop was conducted in December 2007. Attention was focused on the key barriers that constrain the development of SMEs</p>	<p>Policy and reform changes included:</p> <ul style="list-style-type: none"> <li>• Coordination with the regulators and ministry officials in determining documentation and procedures for certification and award of CER</li> <li>• Recommendations on the regulations for Legislative Decree 1041 on the qualification and certification of SERs.</li> <li>• Methodology for calculating full cost tariffs for individual PV systems installed by distribution concession companies was agreed informally with the OSINERGMIN. This follows the regulator's establishment in the third quarter of a special tariff category for households connected with individual PV systems, which establishes that the distribution companies will receive the "full tariff" for services to these customers. This had been one of the main policy results targeted as a follow-up to the 2007 assessment. The tariffs will be in effect for four years from November 2009.</li> <li>• Discussions were held with MINEM on the regulations for Legislative Decree No. 1002, which, inter alia, governs the sale of energy to the grid by SME operated small and micro hydro systems, and ESMAP participated in drafting a submission to the ministry on this matter. The satisfactory conclusion of the regulations for Legislative Decrees no. 1002 and 1041 are critical in opening up the mainstream framework for the participation of SMEs.</li> </ul>
--	---

## 2. Capacity building through pilot projects

- *Define simplified concession arrangements or the necessary institutional and legal agreements for the pilot SMEs (eg operating agreements between ADINELSA/ distribution companies and energy SMEs).*

Activities performed:	Results:
<ul style="list-style-type: none"> <li>• Assistance is being given in partnership with ITDG, an NGO in the preparation of Conchán's business plans and rural concession applications for micro-hydro systems</li> <li>• ITDG contributes supervision assistance and facilitation with the local municipality</li> <li>• Eilhicha has been operating in a somewhat informal legal status and the aim of the pilot project is to regularize it as a rural electricity distribution concession holder with 3,000 –</li> </ul>	<ul style="list-style-type: none"> <li>• ESMAP Consultant completed the initial reports, prepared the data, analysis and documentation in Conchán's application for the award of CER.</li> <li>• A detailed schedule was developed in collaboration with ITDG for the completion of the Conchán concession in early 2009.</li> <li>• Eilhicha submitted the original SER application to MEM on 25 August.</li> </ul>

<p>10,000 customers</p> <ul style="list-style-type: none"> <li>ESMAP has assisted Eilhicha to revise and resubmit its SER application by consolidating key operating information, reviewing legal and regulatory requirements, and agreeing with key officials the documents required for application</li> <li>Assistance is being given to two distribution concession companies, Electoro Oriente S.A. (ELORSA) and Electro Nor Oeste S.A. (ENOSA) to develop PV fee-for service connections for dispersed households in off-grid communities in 4 areas that will be served by the SMEs contracted by the companies. Feasibility reports on the PV investments were reviewed by ESMAP consultants</li> </ul>	<ul style="list-style-type: none"> <li>A detailed schedule for PV pilots was developed and comments provided to the ENOSA and ELORSA on steps to improve the feasibility studies.</li> </ul>
---	--

- Create key business development tools for SMEs in the electricity business (eg. Standardized and simple financial accounting, billing practices, potential business models, etc.)*

Activities performed:	Results:
NOT REALIZED	NOT REALIZED

- Outline strategies for navigating legal/regulatory challenges.*

Activities performed:	Results:
NOT REALIZED	NOT REALIZED

## Bolivia: Strengthening Small-Scale Off-Grid Energy Suppliers

### 1. Strengthen the solar home system (SHS) supply chain

- *Introduce new players, strengthening existing players and supporting selected quality control measures.*

Activities performed:	Results:
<ul style="list-style-type: none"> <li>• An analysis of IDTR subsidy and tender lessons has helped to inform future GOB SHS tenders under the Universal Access Program. Based on the above, an improved version of the Medium-Term Service Contract (MSC) has been adopted by GoB. The successful IDTR tender award achieved significant efficiency gains.</li> <li>• A new tender for SHS supply using the improved MSC is planned under the GPOBA Project later in 2009.</li> <li>• Supply shortages in the local SHS market and local costs of IDTR SHS providers were analyzed against international benchmarks to inform GoB decisions and improve the national supply market where possible.</li> <li>•</li> </ul>	<p>The winning IDTR bids exceeded the Government's user-per-area target by 25% on average and unit subsidies were lower than for comparable previous projects in Bolivia. The total subsidy amount of US\$10m corresponds to an efficiency gain worth about US\$2.5m compared to US\$500,000 in overall costs of tender preparation and process.</p> <p>25% more users will receive subsidized SHS</p>

### 2. Develop Pico PV market

- *Analyze and jumpstart new, promising market segment for PV based access. "PV Pico Pods" ie, PV modules from 5 to 15 Wp powering enhanced, portable ICT Lighting-Kits which will be sold (or leased) by rural MSME and allow to serve the lowest income strata which cannot be reached by traditional SHS (with lighting, radio, cell phone, dry cell charging and possibly small b/w –TV).*

Activities performed:	Results:
<ul style="list-style-type: none"> <li>• Very small solar systems called "Pico-PV" (an expression actually coined for the Bolivia and Nicaragua ESMAP SME projects in collaboration with the GTZ) represent a new opportunity for "pre-electrification."</li> <li>• At a cost of US\$ 20 to 100, these PV-powered flashlights and lanterns potentially (i) reach users who won't be electrified in the medium term and (ii) meet needs that traditional solutions cannot cover (for instance, they can be carried to the field and often allow for cell phone or radio charging).</li> <li>• Due to rapidly falling LED prices, a growing number of</li> </ul>	<ul style="list-style-type: none"> <li>• Development of a complete set of field survey instruments (8 questionnaires) that were agreed for use with GoB and GTZ and shared with GoN and the ESMAP SME project in Nicaragua.</li> <li>• Implementation of six pilot focus groups in three representative eco-regions, test sales (lamp auctions) and household surveys (lamp rotations between households for direct comparison of lamp preferences) completed in April 2009 by a local SME consulting firm paid and supervised by ESMAP SME, using seven different types of PicoPV lamps procured by GTZ, based on a GTZ lab test that was shared before publication with ESMAP SME as a result of the</li> </ul>

<p>manufacturers (often from Asia) offer such products, and the first PV lamps have already reached Bolivia. However, quality varies widely, and LEDs often stop working after a few weeks.</p> <ul style="list-style-type: none"> <li>• The ESMAP SME component helps GoB and local SMEs to assess the potential of this new product (by providing market information on supply and demand side), while building awareness for quality issues in order to protect customers.</li> <li>• This component achieved a unique level of direct cooperation with GoB, GoN, GTZ, EnDev, the World Bank Lighting Africa Initiative and the World Bank managed IDTR and GPOBA projects.</li> </ul>	<p>direct cooperation.</p> <ul style="list-style-type: none"> <li>• Interviews and dissemination activities with local Micro, Small and Medium Enterprises (MSMEs).</li> <li>• Funding for a PicoPV Pilot designed with ESMAP SME funding, proposed to GPOBA and taken up for funding.</li> <li>• 900 PicoPV lamps already bid out by IDTR.</li> <li>• Cooperation between IDTR, GPOBA and GTZ for additional field tests and a broader diffusion via local SME agreed and to be started in 2009.</li> <li>• Lighting Africa, the Nicaragua ESMAP-SME study and GTZ EnDev have coordinated their focus group methodologies and questionnaires with the Bolivia study in order to increase efficiency and compare results.</li> <li>• The PicoPV early lessons have been accepted for oral presentation at several international conferences: Ulm Offgrid PV Symposium; AEI Maputo workshop; Hamburg EUPVSEC.</li> </ul>
---	---

### 3. Capacity building to small scale village suppliers

- *Provide technical and financial training to suppliers (about 60 existing suppliers).*

Activities performed:	Results:
<ul style="list-style-type: none"> <li>• Several workshops held for local SHS technicians and microfinance institutions to increase interest in participation in SHS tenders and ability to qualify for them.</li> <li>• ESMAP SME funds were used to: i) define elements of a capacity building program for Bolivian village grid suppliers and ii) support utilities and cooperatives in extending service through grid densification.</li> </ul>	<ul style="list-style-type: none"> <li>• The Government's first and second technical workshop for SHS providers and installers in 2007 and 2008 has profited from results of an ESMAP-funded SHS supply chain analysis.</li> <li>• The proposal for TA to village grid operators has been finalized but not taken up yet by GoB. However, the second item was very successful: With ESMAP funding for design, significant grid densification subsidies were bid out in late 2008 and have received go-ahead in April 2009 for 8000 new connections.</li> </ul>

### 4. Revision of the current regulatory framework in order to include MSME-specific solutions

Activities performed:	Results:
An analysis of IDTR subsidy and tender lessons has helped to	An improved version of the Medium-Term Service Contract (MSC) has

<p>inform future GOB SHS tenders under the Universal Access Program</p> <p>Technical assistance was provided to the Office of Technical Monitoring (OTM), in charge of monitoring and evaluation of PV projects within the GoB. Given that the direct counterpart VMEEA has recently assumed the role of sector regulation, the good practice procedures established for the OTM with help of ESMAP SME funding will directly influence future national regulation of PV systems.</p>	<p>been adopted by GoB</p> <p>A new tender for SHS supply using the improved MSC is planned under the GPOBA project later in 2009</p>
---	---

## Nicaragua: Technical Assistance for Improved Small-Scale Energy Supply

### 1. Strengthening biomass market

- *Co-sponsor the “Second Mesoamerican Wood-energy Forum” in Managua in 2007.*

Activities performed:	Results:
The project co-sponsored the Second Mesoamerican Wood Energy Forum (Managua, June 2007) which brought participants from the public and private sector from Brazil, Bolivia, Colombia, Cuba El Salvador, Guatemala, Honduras, Mexico, Nicaragua Peru and the U.S.A. The objective of the Forum was to: (i) share lessons learned among different ac; (ii) increase awareness of the polluting impact; and (iii) identify and promote a the development of strategic public-private alliances.	The following concrete actions were identified to enhance the development of sustainable wood-energy in the medium and long-term: (i) development of a legal framework to provide linkages between environmental laws and health laws; (ii) development of national awareness raising programs and marketing programs; (iii) development of technical capacity building for the promotion of wood energy; and (iv) promotion of research and development in academic institutions. The Brazilian model was later identified as suitable for the improved charcoal kiln.

- *Provide TA to CNE and other national stakeholders on biomass technologies and market development; analyze ongoing programs for improved stoves.*

Activities performed:	Results:
NOT REALIZED	NOT REALIZED

- *Provide TA to MSME and support technology transfer.*

Activities performed:	Results:
<ul style="list-style-type: none"> <li>• TA for the improvement of the charcoal kilns (“hornos de media naranja”). Support provided to improve the design and functioning of the charcoal kilns, as well as for determining the local production costs for its manufacturing and dissemination in isolated rural areas</li> <li>• A meeting was held to exchange experiences among the producers participating in El Tránsito and traditional charcoal producers operating in the north of the country.</li> <li>• Three site visits (September, October and November 2008) to El Transito by MEM to supervise charcoal production by the local producers.</li> </ul>	<ul style="list-style-type: none"> <li>• An improved charcoal kiln was built in the area of El Tránsito, in the Municipality of Nagarote in the Department of León, and 15 charcoal producers were trained.</li> <li>• Currently, three charcoal producers are applying the improved charcoal kiln technology.</li> <li>• Validation of improved charcoal kiln to demonstrate saving potential will take place during 2009 under GEF funding and executed by MEM.</li> </ul>

## 2. Capacity building to SMEs (hydro power and village grids, PV-based power supply)

- *Hydro power and village grids. Work with existing village groups where SME providers already have hydro and diesel grids. TA for installing battery banks to sell basic electricity to disperse HH who cannot afford solar home systems and also improve load factor of village grid.*

Activities performed:	Results:
NOT REALIZED	NOT REALIZED

## 3. Develop Pico-PV market

- *PV based power supply for remote uses. Aimed to develop and promote a scheme for energy supply to serve the lowest income strata. Strengthen new and existing players by passing on lessons learnt on sales, financing and O&M for Solar Home Systems (SHS) to diversify the local market which is currently dominated by one firm. Address local shortage in PV module supply. Increase M&E efficiency. Assess potential and develop and implement an incentive scheme for PV-Pico ie. PV modules from 5 to 20 Wp powering enhanced, portable ICT-Lighting Kits which will be sold (or leased) by rural MSME and allow to serve the lowest income strata.*

Activities performed:	Results:
<ul style="list-style-type: none"> <li>• The program analyzed a new market segment: PV—modules from 5 to 20 Wp powering enhanced, portable ICT Lighting kits which will be sold (or leased) by rural MSME and allow to serve the lowest income strata which cannot be reached by traditional grid connections</li> <li>• A supply-side study was completed. The study undertook an analysis of technology, an analysis of supply options, and to develop relevant technical quality criteria for Pico PV products for MEM's use and decision processes</li> <li>• A demand-side study was completed. The study assessed: (i) consumer preferences for supply-side identified lanterns; (ii) lantern performance under real usage; and (iii) market potential for Pico PV products.</li> </ul>	<p>The supply side study identified a shortlist of products to be used in the demand side study</p> <p>The demand study identified that there is a real demand for the lanterns in the lowest income rural areas. Consumers are willing to pay between US\$20 and US\$50 for the lamps, but face a financing barrier that could be overcome by some form of micro-financing for the products. Two of the lanterns identified in the Supply side study were identified as having the highest consumer preferences.</p>

## Lighting Africa: Small and Medium Enterprise and Financing Activity

**Policy and Public Sector Operations.** Lighting Africa is launching a multi-country program to map and analyze key policy and regulatory barriers such as import tariffs, taxes and subsidies for fossil fuels. This analysis will be the basis a policy dialogue with governments to mitigate these barriers. The activity will pay attention to their results on the ground, including the issues related to their enforcements in Sub-Saharan Africa.

Lighting Africa is helping to incorporate off-grid lighting services into World Bank–financed rural electricity access projects in Ethiopia, Ghana, Tanzania, and Zambia.

### 1. Market assessment

- *Characterize available products, from LED to renewable energy /mechanically-powered electric lights and determine their prices, estimated prices in Africa, design technical specifications etc..*

Activities performed:	Results:
Market research is underway to better understand consumer lighting requirements in Kenya, Ghana, Zambia, Tanzania and Ethiopia. Research International has been retained to undertake this study, which will provide participating companies with unique insights on end users needs, light and product design preferences, price points, and other economic, design attributes and behavioral information.	NOT REALIZED

- *Identify and assess existing/potential supply, distribution, and financing channels for low cost lighting products and services (local and international).*

Activities performed:	Results:
Work has also started to identify and map distributors in African countries in order to facilitate market entry for foreign companies. Value chain and distribution channels: Work has begun on mapping and analyzing the value chain and distribution channels for off-grid lighting products in Ghana, Kenya, Ethiopia, Tanzania and Zambia. Lighting Africa has begun to identify local businesses operating in the distribution channels in Africa. An online business director of African distributors will be compiled to assist in facilitating linkages between them and international lighting manufacturers	NOT REALIZED

<p>The Lighting Africa website offers a platform for international lighting companies and local distributors to build business linkages and exchange key market information. The website also includes forums and targeted help desk accounts to better capture and address specific business needs.</p> <p>Consumer outreach: Lighting Africa has begun to prepare for the launch of a consumer outreach campaign to inform consumers about the opportunities of modern lighting and help them make informed purchasing decisions concerning product quality. As part of this effort, the program has opened discussions with local artists involved with consumer awareness initiatives to solicit ideas and feedback on successful models for this campaign in Kenya and Ghana</p> <p>Lighting Africa is working, on an ongoing basis, to identify the financing needs of companies in the supply chain, as well as those of consumers; provide access to information on relevant existing financing sources; and develop new financial products, as needed.</p>	
---	--

- *Assess consumer needs for lighting products /services and willingness to pay (market survey questionnaires and survey plans for basic lighting products and small power applications, product concept evaluation, competition assessment etc.).*

Activities performed:	Results:
NOT REALIZED	NOT REALIZED

- *Document, characterize case studies of successful applications –eg Kenya, Bangladesh, Sri Lanka, China, and Bolivia to determine models that could potential work in Africa.*

Activities performed:	Results:
NOT REALIZED	NOT REALIZED

## 2. Identify and outreach to key SMEs and financial intermediaries

- *Identify / profile key SME players.*

Activities performed:	Results:
NOT REALIZED	NOT REALIZED

- *Identify /profile key financial institutions, including local financial institutions, micro-finance institutions, regional financial institutions/funds etc.*

Activities performed:	Results:
NOT REALIZED	NOT REALIZED

- *Outreach to SMEs /FIs.*

Activities performed:	Results:
<p>Lighting Africa Development Marketplace and Conferences: A Development Marketplace Grant competition was conducted in 2008. From the 400 proposals that were submitted, sixteen were selected as winners in Mayh 2008. These innovative results oriented projects are now being implemented with supervision from both the Lighting Africa and the World Bank's Africa Energy teams. To ensure sustainability of these projects beyond grant funding, they will benefit from Lighting Africa's Quality Assurance and Technical Services Program</p> <p>Lighting Africa aims to promote communications and disseminate knowledge through its website, which has 1,700 registered members. The site includes a Business Opportunities forum, various discussion forums, and regularly updated news. Participating organizations can display their product catalogs and other marketing materials</p>	

### 3. Training and Capacity building

- *Conduct needs assessment of SME /FI training needs.*

Activities performed:	Results:
NOT REALIZED	NOT REALIZED

- *Develop training curriculum for SMEs and FIs.*

Activities performed:	Results:
NOT REALIZED	NOT REALIZED

- *Host training workshops, conferences, events.*

Activities performed:	Results:
On March 26-27 2008 a <b>Lighting Africa Carbon Finance Training</b>	The Carbon Finance Training Workshop was attended by

<p><b>workshop</b> was organized in Dar Es Salaam, Tanzania. This two-day training workshop, entitled “Exploring Carbon Market Opportunities” addressed opportunities for energy efficiency improvements in the lighting sector and their synergies with the carbon market available through the Clean Development Mechanism (CDM).</p> <p>On May 6–8 2008, the first <b>Lighting Africa Conference</b> was held in Accra, Ghana. This attracted more than 500 representatives from nearly 50 countries representing the global lighting industry, local distributors, project developers, service providers, NGOs, governments, financiers, consumer groups, and other stakeholders.</p> <p>Quality Assurance and Technical Services Program: The quality assurance program is based on the outcomes of an international workshop. Lighting Africa has secured seed funding to support the development and launch of a quality assurance program for off-grid lighting products. This program is based the proceedings of an international workshop.</p> <p>LED Quick Screening Methodology: Lighting Africa is developing a quick and low-cost quality screening methodology for selecting reliable and high-quality LED lamps. A preliminary methodology is under review.</p> <p>Solar Lantern Testing: Over half of the products randomly selected by Lighting Africa have been tested, with all tests completed and publication of final results expected by April 2009</p>	<p>SMEs from all over Africa, and included half of all DM finalists. The conference succeeded in:</p> <ul style="list-style-type: none"> <li>• Unveiling the vast opportunities in the off-grid lighting market for Sub-Saharan Africa.</li> <li>• Establishing business linkages and partnerships.</li> <li>• Identifying new and innovative products, services, and business models.</li> <li>• Providing key market intelligence.</li> <li>• Offering insight to the Lighting Africa Team for incorporation into future program design.</li> </ul> <p>Apart from conferences, Lighting Africa’s website <a href="http://www.lightingafrica.org">www.lightingafrica.org</a> is the main vehicle for sharing knowledge.</p>
--	--

- *Monitor and assess performance/impacts of training and capacity building activities.*

Activities performed:	Results:
NOT REALIZED	NOT REALIZED

#### 4. Establish and deploy expert group

- *Create an expert group of consultants (international /local) for use in SME/FI strengthening and support to Bank/ donor task managers in project design and development.*

Activities performed:	Results:
NOT REALIZED	NOT REALIZED

- *Set up mechanism for promoting expert group services and providing quick response support as requested.*

Activities performed:	Results:
NOT REALIZED	NOT REALIZED

## 5. Integration with broader part / activities

- *Activities conducted above will be integrated into the broader Part I activities performed outside the scope of the ESMAP SME funding.*

Activities performed:	Results:
NOT REALIZED	NOT REALIZED

- *Activities above will feed into the development of franchise /standardized models for scale up of modern energy services in Sub-Saharan Africa.*

Activities performed:	Results:
NOT REALIZED	NOT REALIZED

## VII. Lessons Learned and Recommendations

The pilot programs presented an excellent opportunity to learn about challenges facing SMEs in energy delivery services. Many issues facing the SMEs are not energy specific, but rather applicable to all entrepreneurs. The pilots also highlighted the importance of the role of private sector enterprises in delivering energy services, the need for banks and financial institutions to exercise flexibility in their due diligence, and the role of government in providing infrastructure to support scale up activities. It is the responsibility of governments to set up smart subsidy structures in order to avoid market distortions and to consider the social impact of gender and the general living environment in planning and decision making activities.

Rural Electrification Funds were set up in some countries to provide much needed financing to SMEs, however their reliance on donor funds needs to be addressed in order to ensure their continuing role and long term sustainability.

The wide breadth of available technology applied in the pilot programs presented an opportunity to lead technology development. Issues with poor equipment quality demand the establishment of standards and the creation of a manufacturing industry. Equipment standards are needed to ensure that appropriate technology is properly installed. Once installed, there is a need to have maintenance systems that are affordable. Future initiatives should be implemented carefully to ensure success, whilst avoiding cowboys.

Although there is a need to move towards more commercial models in the rural energy sector, it is encouraging to find examples of public private partnerships which can stimulate growth, improve efficiency and make better use of subsidy funds that could be available. The pilots highlighted a need for a non-traditional approach to public / private partnership promotion, and a need to provide finance to integrated service providers in order to develop a sustainable sector.

The following are lessons applicable to all SMEs in energy delivery services:

- **Analyze different technology options.** The key to making successful choices is to ensure that choices are appropriate to local conditions and that there is adequate infrastructure to support investment and operations. "The technology has to work".
- **Characterize the sector as very entrepreneurial.** It is clear that people are not just technology focused but there is a lot of thought going into innovative business models.
- **Consolidate, build support networks and then grow.** Although there is a need to expand and "scale up" it is essential not to lose the experience gained in the process.
- **Access to energy should drive economic development.** Consumers should also be encouraged to engage in entrepreneurial activities which will result in income generation.
- **Access to finance.** Banks and financial institutions should consider alternative ways of doing due diligence for companies with little formal financial statements history
- **Build partnerships.** Public / Private / NGOs

### ***Technology specific lessons***

The pilot program focused on four areas of technology comprising hydro-power, biomass digesters, efficient cook-stoves and home solar systems. Barriers to development specific to area of technology and mitigation strategies are discussed below:

## Hydro power

The hydro power programs implemented consist of pico, and micro hydro. Both have similarities and shared issues of safety, affordability of connection costs and regulatory frameworks that are often unclear, or non-existent.

### Pico-hydro

Pico-hydro is a small household appliance that provides electricity (5KW) when put in the river. There is a high demand for this technology especially in large mountainous areas. The units are affordable at less than \$500 and there are no tariffs associated with use once the units have been acquired. The unit produces a high load factor which usually means more output and a lower cost per unit.

Poor quality units, bad installations, and low maintenance of units cause many problems including electrocution and breakage of electronic devices and light bulbs. These problems are exacerbated by electricity load fluctuations. Installations are often accomplished by trial and error, as the units are rarely distributed with any documentation. Few safety records exist, and there have been several fatalities associated with people and animals getting electrocuted. Units often do not conform to country electrical standards. Frequent maintenance is needed as units often get contaminated with debris from the river in which they are located.

### **Recommendations for Pico Hydro include:**

- Safety awareness campaigns to alert people about hazards associated with poor quality equipment and badly executed connections to homes.
- Set up demonstration sites and training. Successful and safe installations of pico-hydro technology depend on a significant amount of technical knowledge and experience. Demonstration sites will provide villagers with practical hands-on advice and training based on specific environmental and usage context of that particular village.
- Translate installation guides and manuals into local language, targeted at end users of pico-hydro technology.
- Electronic load controller devices installations will address the load fluctuation issue and could offer a financial advantage to both end users and service providers, with savings in damaged appliances and light bulbs.

### Micro-hydro

Micro-hydro produces 10KW–50KW of electricity for about 50 - 100 households, and no experience is needed for grid connection yet. It is an improvement on pico-hydro as it is more reliable, has low off-grid tariffs with a one time investment fixed for 25 years. It is commercially viable and has a lower cost per KW. Owners can sell extra electricity to the grid and there are many productive uses possible.

However, it is expensive with an initial investment of approximately \$100,000. It is a collective asset, owned by the village and therefore has co-ownership issues. It is technically feasible, but there are risks associated with revenue collection involved for the service provider. There are also project risks associated with constructing hydro systems.

### **Recommendations for micro-hydro include:**

- There should be a review of the regulatory framework and industry policies pertaining to the sector.

- Public / private partnerships should be established with government funded feasibility studies for micro generation and distribution projects.
- Banks should be enabled to facilitate access to financing with guarantees and risk sharing from government.
- Review the cost structure and determine socially acceptable generation rate, true cost generation rate and true cost distribution rate. All public investment funds, investment subsidies, and bulk subsidies should be open and transparent.
- Ownership should be diversified with high participation from the private sector.

## **Biomass Gasification**

The use of biomass gasifiers help to destroy methane, and offset the use of non-renewable resources such as coal, natural gas, and oil. SME Cambodia surveyed a sample of 30 SMEs in Cambodia, including 23 rice mills. The survey found that biomass gasification systems using their existing diesel engine could reduce overall milling costs by 50% with a payback period of 1-3 years. For households, biodigesters improved hygiene in their homes. Household waste and animal dung are cleared and fed into the biodigester. Although biodigesters resulted in negligible savings in cooking time, it made cooking easier, resulting in families cooking more dishes and heating water for hot showers.

### **Recommendations for biodigesters include:**

- Household use: focus on small biodigesters to provide health benefits. Households using wood and charcoal for cooking often generate black smoke which fills their houses.
- The biodigester program should include demonstrations on the proper use of lighting and cooking equipment.
- Use animal farms as power plants
- Use temples, schools or any centers of community as demonstration sites and for dissemination to reach as many people as possible. Schools with 20-30 students can generate enough waste to feed the biodigesters.
- Partner with local banks and micro-finance schema to provide financing for the poorer households that have generate enough animal waste to feed a biodigester, but do not have the means to have one constructed. The biodigester program does not benefit poor households with low incomes and less than 1 hectare of land.

## **Efficient Cookstoves**

A series of projects were developed to introduce efficient cook-stoves, mainly for households and for cottage industries. Although there were some successes, supply chain problems, quality control, and lack of standards resulted in the rejection of some of the stoves produced.

### **Recommendations for Cookstoves include:**

- Decentralize production to keep prices down. Set up production facilities close to market to prevent high loses during distribution.
- Negotiate with micro finance institutions to give better rates. Access to financing for micro enterprises is difficult because of high interest rates applied by micro financing institutions. Target women retailers, as traditionally, women make better borrowers, paying back on time.
- Keep production costs low. Mechanized stove production including hydraulic stove pressing should be evaluated as a possible solution to reduce high labor costs and make production facilities economically viable.

- Provide training on quality control. Research more efficient methods of production to improve quality. For example, in China, production facilities produce 18 stoves per minute.
- Support producers with basic skills and best practices in accounting, procurement of raw materials, stock-keeping, marketing and promotion activities.

## Home Solar Systems

It is important to understand the types of lighting energy used by households and how the LED lantern replaces or supplements the previously used lighting. Multiple uses of lanterns can fulfill various needs of householders. Depending on socio-economic class of each household, many are either connected to grid services or possess batteries to power florescent lights. These upper and middle income classes use kerosene lamps as a supplement to grid or battery charging. Many of the poorer households use kerosene as the main source of lighting.

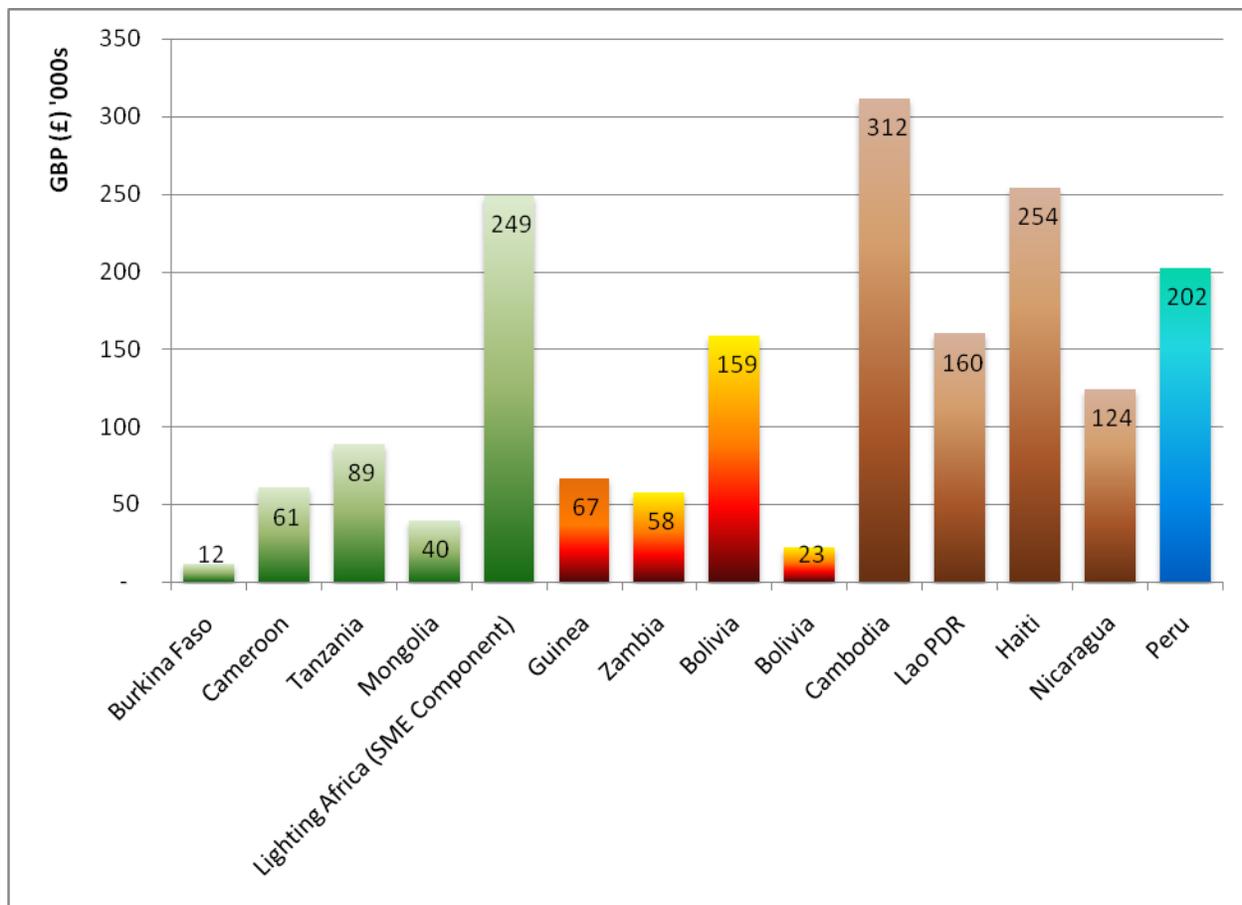
Solar panels are intended to provide a source of energy for poor households who do not have access to battery charging stations or grid electricity. However, householders found them to be too expensive to buy or rent in addition to the lanterns. There are also security issues with individual households, especially those that do not have anyone at home during the day facing several incidents of theft of solar panels, as they are quite small and can be easily carted off.

### Recommendations for home solar systems:

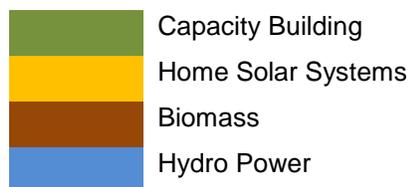
- Solar panels should be optional to buyers of lanterns, with the users having the option to have their lanterns charged by the retailer.
- The LED lanterns and solar panels should be made available on hire purchase. The LED lantern has great potential to benefit poor households in rural areas where there is a lack of access to energy services such as grid and battery charging. Many retailers said they cannot afford the initial capital to acquire the lanterns and solar panels, and have only agreed to sell as under the pilot program they are not required to put up any capital.
- The retailers are dominated by women who were already running micro and small business at the village level. Many have low literacy and lack capacity to ensure their business makes a profit, and will benefit greatly from training and capacity building.
- REF subsidies should be made available to the retailers and those household that want to own their lanterns.

The pilot programs made an important contribution to providing rural energy services. Several participants in the pilot programs expressed the hope that the World Bank would not bow out at a time when the projects need scaling up. The technical assistance provided by the ESMAP team had proven essential to start up and pilot effective business schemes.

## VIII. Summary of Country Specific Disbursements



### Projects undertaken



## **IX. Case Studies:**

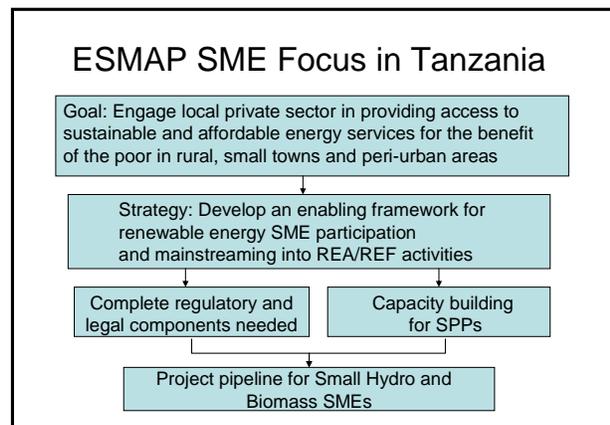
# ***Integrating Energy SMEs in Tanzania's Rural Energy Initiatives***

## **Overview**

The goal of the ESMAP SME project in Tanzania is to engage the local private sector in providing access to sustainable and affordable energy services for the direct and indirect benefit of the poorer in rural, small towns and peri-urban areas in Tanzania. The strategy to accomplish this was to develop an enabling framework for the participation of renewable energy SMEs and their mainstreaming into the activities of the new Rural Energy Agency and Rural Energy Fund (REA/REF) from the beginning of their operations. The concept of such an enabling framework is to simplify and facilitate the development of small renewable energy projects (both grid-connected and isolated mini-grids). The framework would comprise the legal and regulatory basis and guidelines for the participation of renewable energy SMEs in the Tanzanian power sector.

Inadequate provision of electricity has been recognized as one of the infrastructure bottlenecks to growth in the country. The power sector in Tanzania is small with a total installed generation capacity of 1191 MW (as of 2006), of which 47% was hydro. This capacity provided electricity to about 653,000 clients. Since then, however, the need to address shortages in power supply as a result of prolonged drought that resulted in low water levels in the reservoirs for hydro power facilities led to a program of load shedding and emergency procurements of power.

There is one vertically integrated national utility TANESCO serving Tanzania. The high-voltage grid covers only part of the country. Several urban centers have to rely on TANESCO's isolated diesel stations which provide low quality, high cost service yet are a drain to TANESCO because of a uniform national tariff policy. Due to the severe quality and supply constraints, several larger scale industries such as the mines and some rural private entrepreneurs generate their own power.



The GoT has given a high priority to reducing the growing power shortages in the country, while improving access to power supplies in the urban, peri-urban and rural areas. Recognizing the inadequacies of the power sector and their consequences, the GoT has put into place a strong basis for attracting investment for power sector development and to enable growth of the industry with an explicit role for renewable energy systems. These include:

- The National Energy Policy document (2003) stipulates the need to reduce the dependency on fossil fuel for isolated grids and remote locations and suggests additional research and development of renewable energy, particularly as part of rural electrification initiatives.

- A rural electrification policy statement which indicates that all lower cost technical options should be considered including renewable energy;
- The Rural Energy Act (2005) which established the Rural Energy Agency and Fund (REA/F) with a main task to allocate performance based subsidies for rural energy including renewable energy systems;
- The Energy and Water Utilities Regulatory Authority Act (EWURA) which provides the regulator with the responsibility of tariff setting affecting also the independent renewable energy power producers and
- The Electricity Act of 2008 (EA2008).

EA2008 formally recognizes the existence of small power producers (SPPs) with an installed capacity between 100 KW and 10 MW as generators. It also emphasizes the importance of light handed regulation for rural electrification operators, many of whom will also be operating SPPs.

However, the Tanzanian renewable energy industry is in its infant stage of development with a limited number of project promoters, renewable energy finance providers, and service companies. Non-TANESCO-owned renewable energy sources contribute less than 1% of the national energy balance despite documented good potential such as the recent rural electrification study supported by AfDB. The potential for small hydro power generation (under 10 MW) is estimated at about 250 MW of which about 10 MW has been exploited so far. A more limited number of sites could produce electricity at competitive cost in areas where demand exists. It is estimated that up to 50 MW could be developed economically soon.

GoT has received assistance from the World Bank and the Global Environmental Facility (GEF) for the Tanzania Energy Development and Access Project (TEDAP) which addresses improving availability of power supplies through, inter alia, generation expansion and off-grid electrification and lighting packages for very poor households. The off-grid component is supporting the institutional set-up for the REA and development, testing and demonstration of new scalable, economically and financially feasible off-grid electrification approaches. Such approaches should increase electricity access in rural and peri-urban Tanzania to productive enterprises, service delivery facilities (in health and education), and to households with the capacity to pay for electricity.

To accomplish this TEDAP is also supporting the establishment of a functioning institutional and regulatory framework for commercially oriented, sustainable service delivery for scalable rural electrification based on renewable energy. This component will finance Small Power Generation and Distribution (SPGD) subprojects which comprise, inter alia, renewable power generation and mini-grids. The funds are in the form of grants to the private sector (including NGOs and cooperatives) to partially offset investment costs of new service connections (through performance grants), and for the support of pre-investment studies, and business and market development, including productive uses (through matching grants). Given that SPGD is a new concept in Tanzania, it was necessary to adjust the Tanzania's electricity sector regulatory framework to SPGD special characteristics and to ensure that the SPP guidelines and rules issued by EWURA also accommodated SPGDs. As the first step, in the framework of TEDAP preparation, MEM, under a SIDA trust fund, financed drafting of the Standardized Power Purchase Agreements and Tariffs (SPPA/T) for small renewable projects.

## Regulatory and legal components track<sup>1</sup>

ESMAP SME's involvement in Tanzania coincided with the development of the Electricity Act of 2008. As a result, the program was able to assist GoT to incorporate the SPP concept into Section VII, Rural Electrification, of the Act.<sup>2</sup> This timely intervention laid the groundwork for the remaining ESMAP SME work on this track which includes:

- Model PPAs for grid and off-grid SPPs greatly reduce transaction costs for SPPs. They were formally submitted to EWURA and approved for three general “cases” of SPPs:
  - SPPs selling power to TANESCO's main grid,
  - SPPs selling power to isolated mini-grids, and
  - Greenfield SPPs with a mini-grid, selling power directly to final users.
- Model tariff setting mechanisms have been developed for all three of the above cases with the mechanism illustrated for the Tanzanian situation using Tanzanian data. They are now subject to the consultation process, after which they would be formally adopted by EWURA.
- Guide for Interconnection of Embedded Generators to the Main Grid and Isolated Mini-Grids in Tanzania (also referred to as “Guide for Developers of Small Power Projects in Tanzania.”) which is a “how to” manual on commercial processes, regulatory procedures and simplified tariff mechanisms for grid and off-grid SPPs).<sup>3</sup>
- Development of regulatory rules (currently in process) by the regulator, simplifying the SPP regulatory framework.

*“Small power project development arrangements are incentives for domestic companies to expand their business in power sector”*  
REA Project Manager, Ms Justina Uisso, 2/25/2009

---

<sup>1</sup> Both DfID and SIDA funding supported this track.

<sup>2</sup> This was based on recommendations from the DFID-financed global energy SME report, “Four Regulatory Principles to Support Diverse Electrification,” from the ESMAP Knowledge Exchange, February 2006.

<sup>3</sup> As of end of March 2009, this guide

The project drew upon principles and best practices developed in recent World Bank analysis of regulation of electrification.<sup>4</sup> The associated box describes these principles in some additional detail. The Energy and Water Utilities Regulatory Authority's Order 08-015, "In The Matter of Small Power Projects in Tanzania", December 30, 2008 formally adopted the two model documents. A final consultative workshop to agree on the SPP framework, guidelines and rules took place in Dar Es Salaam in February 2009. EWURA includes a separate section on its website ([www.ewura.go.tz](http://www.ewura.go.tz)) on SPPs, the status of implementation, and documents for comment.

### Capacity building for SPPs

The establishment of the SPP working group was the first step in this track. The group assisted throughout the project in reflecting the industry's perspective and issues in all of the work needed to get the framework right as well as identifying technical assistance that they needed to improve the "Guidelines for Developers of Small Power Projects in Tanzania." These guidelines are roadmap for navigating a SPP project through the rules. In addition, the "Model Application for Sale of Electricity and System Interconnection" will facilitate the application process. Members of the SPP working group attended the February 2009 workshop in Dar Es Salaam.

#### **BOX: LIGHT HANDED REGULATION FOR RURAL ELECTRIFICATION**

Light-Handed and Simplified Regulation (LHSR) promoted by the World Bank paved the way for Tanzania to open access to isolated, renewable energy projects. A well-functioning regulatory system is one that minimizes the costs of regulation because such costs get passed on to those who are the regulated consumers and to the economy in general. Most off-grid providers of electricity do not have "deep pockets." They are enterprises that are often just barely commercially viable so that any unnecessary regulation can destroy their viability. Poorer countries generally have much more complicated and extensive business regulation than developed countries, resulting in "de-facto" deregulation (no regulation) for entrepreneurs who cannot manage the rigors of the regulatory process.

It is not uncommon for a small private entrepreneur to buy a second-hand diesel generator, run wires to 100 or more households in a village, and supply them with electricity for several hours each evening, with monthly charges usually keyed to the number of light bulbs or small appliances that are connected rather than to kilowatt-hour consumption as measured by a meter. Such mini-enterprises can be operated by private entrepreneurs, cooperatives, or local government units. Existing regulation may require that the new concessionaire become incorporated, e.g., by creating a "shareholder company." This may be inappropriate for these isolated and informal operators particularly if they want to retain their original status as cooperatives or municipalities. Moreover, the reporting requirements and technical standards for concessionaires might be impossible to satisfy for many smaller rural systems.

The World Bank analysis proposed systems of graduated regulation for rural off-grid systems and a light-handed approach to tariff setting. Examples of LHSR for isolated mini-grids include flexible filing requirements, lower service quality standards and simpler tariff designs. One such proposal is to create different categories of rural off-grid suppliers, based on system load size (e.g., less than 500 kW) or on number of customers served (e.g., less than 20,000), and define less burdensome (or "lighter") forms of regulation for the smaller categories. Standards for reporting and quality of service in the smaller rural off-grid systems would be lower than for the main power grid, so that costs can be reduced and tariffs can be lower and electricity services more affordable for (future) rural users. This could allow them to become eligible to receive any much needed technical assistance available or gain access to subsidies available to concessionaires for serving low income, isolated rural consumers. Tariffs could be regulated by setting "maximum tariffs" of small operators limited through published Tariff Tables. These would specify a maximum allowed retail price (that is, a tariff ceiling) for mini grid operators under different circumstances. An operator would have the flexibility to charge any price up to the specified maximum.

<sup>4</sup> Reiche/Tenenbaum/Torres. "Promoting Electrification: Regulatory Principles and a Model Law." ESMAP and EW DEN - Washington DC - 2006

## Results and Remaining Challenges and Opportunities

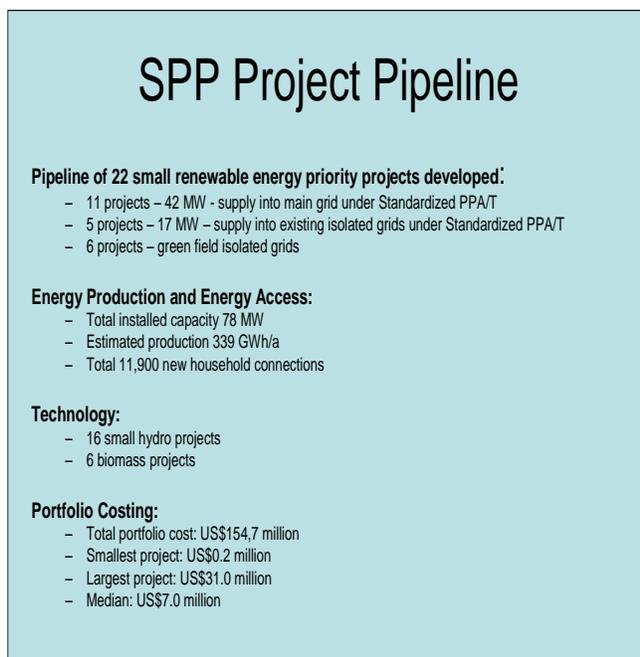
ESMAPs SME assistance, which began in 2007, built on this base to complete the regulatory and legal structure that would enable projects to enter the REA/F pipeline and to build the capacity of the nascent renewable energy industry to develop and complete projects. As part of its initial market analysis, ESMAP identified the specific institutional facilitation that would be needed to get projects into the pipeline. These included:

- Segmentation of renewable energy projects into three potential lines: small power generation and distribution, photovoltaic systems, and biomass generation.
- Establishment of the small power producer (SPP<sup>5</sup>) working group which helped to identify their key constraints of regulatory support and financing.

Given the limited funds available to the ESMAP project, it concentrated on 1) removing the remaining regulatory constraints identified and 2) building the capacity of SPPs to create a project pipeline of micro-hydro and biomass generation projects.

DfID and SIDA monies have established a supportive institutional, legal and regulatory framework that currently does not exist in any other African country.

- Combining three components in one program: SMEs, renewable energy and electrification.
- Close coordination of related activities financed by two donors, DfID and SIDA
- A transparent and stakeholder approved process for the steps necessary to develop and operate a SPP and increased market power of the SPPs.
- Linkages established to sources of funding within the country (REA/F)
- Substantial leverage from donor funds and other WB group operations.
- REA has assembled a list of priority SPPs in advanced stage of project development. It has registered 22 small power projects so far worth \$154.7 million from various developers in the country. These include: 16 small Hydro Power Projects and 6 biomass projects. REA expects the 78 MW represented by these projects to generate around 339 GWh that will be supplied to 11,900 new household connections mainly found in rural settings.
- Under the standardized PPA, it is estimated that at least 300 MW of new small renewable energy projects could be developed on a least cost basis.<sup>6</sup>



<sup>5</sup> SPPs or small power producers are on- and off-grid SMEs.

<sup>6</sup> Ralph Kalhamer.

- WB TEDAP will provide output-based grants for new connections and additional capacity building of new SPPs.

This comprehensive supportive institutional, legal and regulatory framework currently does not exist in any other African country, thus serving as a model for the rest of the region. It is particularly important that the established framework is complete, including standardization of documents, feed-in tariffs, simplification of processes, light-handed regulation, and detailed "how to" guidelines to the developers, capacity building, and grants for financing new connections. Most efforts to date have developed only part of the framework.

The success in developing this mix of instruments to support small renewable projects is a result of more-than-usual (though time consuming) cooperation among the Ministry, Rural Energy Agency and the Regulator, as well as TANESCO. The Ministry led the work on developing SPPAs and established and hosted the working group; REA is providing grants and capacity building activities; and EWURA has led the work on guidelines and simplification of processes, as well as formal approval of SPPA and tariffs. Close coordination has been established between REA and EWURA on tariff issues, so that there is a joint review of tariffs when a developer applies for grants to REA. In addition, TANESCO was a part of the process from the beginning, and their inputs / concerns were accommodated.

Nevertheless some challenges remain, primarily in the areas of finance, particularly access to commercial finance where new financial instruments might be needed. Discussions are underway with the WB, AFD, GVEP and the Dutch government about supporting a credit line for small renewable energy projects. PPIAF will include Tanzania in its review of "light-handed" regulatory frameworks supporting electricity access and expansion.

# ***Building the Runway for the Take-Off of Electricity SMEs in Cameroon***

## **Overview**

Electricity access in Cameroon is estimated at about 46% overall but only 11% for rural households. Only about 14% of the 15,000 villages have electricity. About four-fifths of the rural population still uses wood or charcoal to meet their energy needs. Limited access to reliable electricity takes a toll on the economy (costing upwards of 2% of the GDP growth) and ranks amount the top five obstacles to doing business in Cameroon.

In the late 1990s sweeping policy and structural reforms were put in place for the electricity sector, including the creation of a rural electrification agency (AER) in 1998. Reforms have continued throughout the 2000s, including the privatization of the utility Sonel in 2001, with measurable benefits in quantity and quality of power supplied by the single vertically integrated electric utility (AES Sonel) without subsidies from the government of Cameroon (GoC). While the master plan for rural electrification completed in the year 2000 found numerous opportunities for electrification by grid extension, isolated grids, mini-hydro systems with mini-grids, and by smaller systems that could be supplied by micro-hydro, biomass or photovoltaic based generation, in total serving around 400,000 households, it was never adopted.

The GoC signed on to the Millenium Development Goals (MDG) in 2000 and in 2003 adopted a strategy to meet the poverty reduction goals in the MDG. In 2006 a widely accepted national energy action plan for poverty reduction (PANERP) was developed by GoC and a group of donors (UNDP, ESMAP, and the World Bank). It contained six strategic axes for improving access to energy services to reduce poverty. See Box. The specific energy related actions that became the basis of ESMAP SME intervention in Cameroon were:

- Develop and consolidate energy SMEs,
- Capacity building of stakeholders involved in supply of energy services,
- Promote an harmonized institutional environment integrating access to modern energy services as the basis for social and economic development, and
- Implement pilot energy/poverty micro-projects.

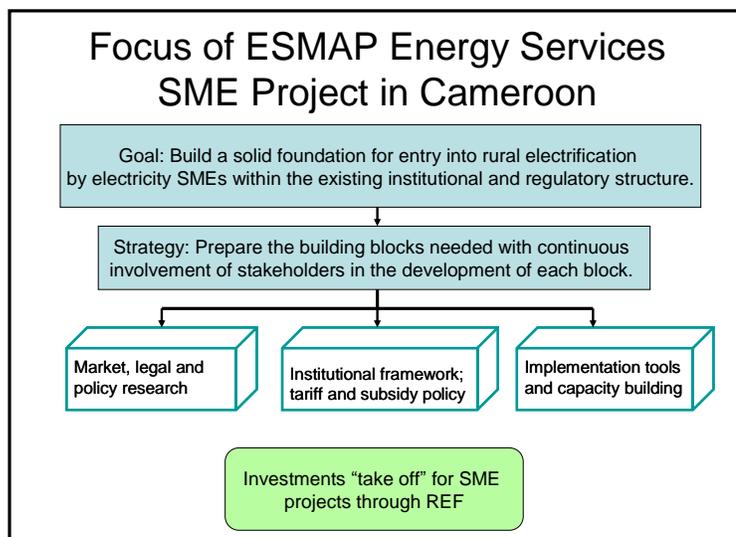
**PANERP: Six Strategic Axes for Improving Access to Energy Services to Reduce Poverty**

- Reinforce the capacity of all stakeholders in the development and maintenance of energy systems, particularly focusing on local cooperative organizations
- Improve access to modern cooking fuels for rural and peri-urban populations
- Improve the quantity and quality of social and community services
- Improve the quality of life of poor populations
- Improve access to productive uses of energy services to increase productivity of poor populations
- Promote local production of equipment and materials needed for energy services and energy efficiency.

While a unique financing window for rural energy projects was proposed in PANERP, AER was not given a clear mandate or adequate resources to implement the Plan. The PANERP had

estimated that investment requirements would be on the order of US\$250 M. AES Sonel has fulfilled its concession obligations for increased electrification by expanding primarily into urban and peri-urban rather than villages and other rural areas. Cameroon government bodies, non-government organizations and donors typically acting from an economic or poverty reduction mission have intervened with small scale rural electrification projects but without coordination and often failing to meet technical or sustainability standards. As a result, no notable progress in increasing electricity access rates in rural areas and in promoting SME participation in rural electrification was achieved.

This was the situation encountered when the ESMAP Energy SME program began working in Cameroon. Its goal was to build a solid foundation for entry into rural electrification by private sector energy entrepreneurs (Energy SMEs). Its strategy was to prepare the necessary building blocks as identified in careful market, legal and policy research and continuous, methodical involvement of the numerous stakeholders in the development of each building block. The main ones were: 1) market, financial, legal and institutional analysis and 2) development, acceptance and adoption of the draft laws and decrees, rules, regulations and operating procedures necessary to create and implement the Rural Energy Fund (REF).



Prior to preparing the building blocks, ESMAP SME brought in an experienced consultant group (MARGE) that had best practice experience in other African countries (Mali and Senegal) in similar rural electrification contexts. MARGE followed the project through all its stages, preparing the institutional set up, strategic orientation and operational procedures for the REF. At two key points in their assistance, “validation” seminars were held to get stakeholder agreement on findings or materials developed to that point and on next steps to be taken in the project. One was held to review the institutional and strategic approach along with training in best practice principles for SME-based REFs and a second one covered legal and regulatory texts for establishing the REF along with training on best practices in regulation for SME-based REFs.

As result of this effort, a solid integrated institutional approach to GoC investment assistance for Energy SMEs was adopted, related tariff policies for such energy services were agreed, an operating manual for the SME-based REF was delivered, and best practice training was provided in the regulation and operating of SME-based REFs. Follow on technical assistance has been committed on the order of US\$ 45 M from ESMAP and the World Bank and other donors are also promising funds for project development once the REF is operational.

## **Diagnostic of Market, Institutional and Financial Situation**

A survey of existing energy SMEs in Cameroon found 20 to 25 with interest in participating in the market but not yet prepared to act as rural energy service providers (FSER) although they had the technical and managerial capacity to do so. Likewise foreign businesses would be interested in entering the market if conditions were favorable. Financial institutions too (such as FEICOM and PPTE and BICEC) expressed interest in participating in rural electrification and some had already become involved. Commercial banks and microfinance organizations also were interested. Municipalities and villages were found to be possible stakeholders with their newly acquired responsibilities in public lighting and electrification of “needy” areas. The findings were presented in the report “Diagnostic of the Institutional and Regulatory Framework” (January 2008). The diagnostic showed that the existing institutional and legal framework was not conducive to SME participation in energy projects in remote and under-served regions of the country and that Cameroon lacked a mechanism to provide SMEs with financing to become a supplier to or operator of rural energy projects. The diagnostic provided a solid basis upon which specific Energy SME supporting activities were designed, concentrating on capacity building and creating a rural energy fund for co-finance of investments in rural Energy SMEs.

### **Rural Energy Fund**

As a result of the diagnostic, the Minister of Energy requested that the program pay particular attention to the establishment of such an institutional and financial mechanism. In line with the recommendations of PANERP and with ESMAP SME technical assistance, it was decided to establish a Rural Energy Fund (REF) as the financing window to allow SMEs to

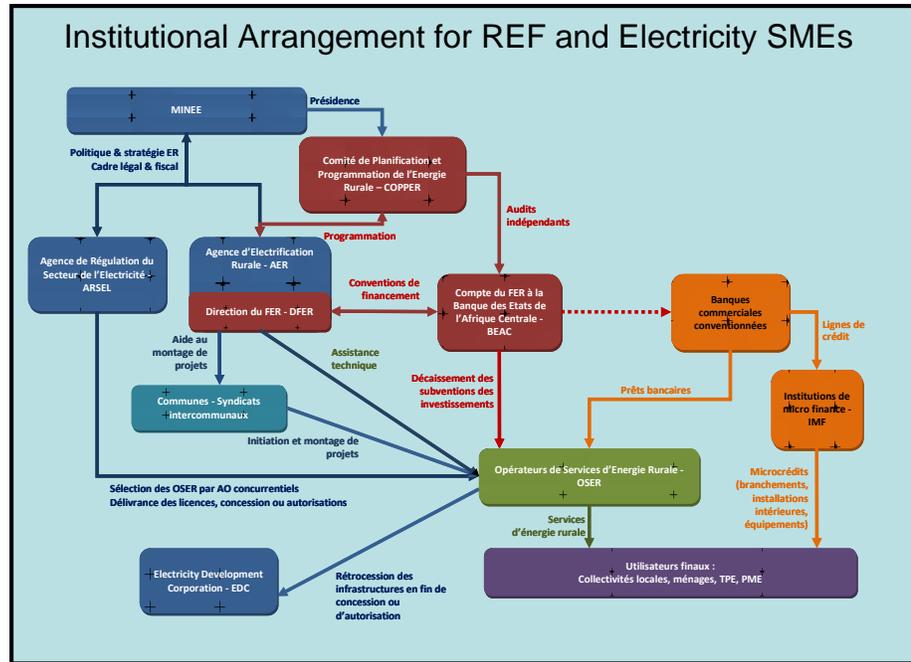
- Participate in energy projects as consultants for feasibility and other related studies,
- Become operators of rural energy projects, as the design of the REF follows the electricity law which foresees private participation in energy projects; and
- Provide technical assistance to SMEs to become suppliers and operators of rural energy projects and help them raise co-financing from local banks and microfinance institutions.

This approach draws from best practice examples from other African countries such as Mali and Senegal that have been successful in developing the participation of SMEs in rural energy projects.

It was decided that REF would be housed under the already existing AER and overseen by a REF Directorate, thus minimizing new institutional structures. It would:

- Execute annual investment programs based on an updated Rural Electrification Master Plan approved by the rural energy planning and programming committee (REPPC) uniting all sector stakeholders, including representatives of private sector operators and energy SMEs.
- Provide technical assistance to rural energy service providers (RESPs), including energy SMEs, municipalities, villages and communities, in developing project proposals to serve consumers in rural areas which could be local communities, households, SMEs, etc.
- Develop financing agreements with RESPs from the REF account to be housed at the Central Bank.

Private sector operators could draw from REF investment subsidies but O&M costs would be recovered through tariffs. ARSEL, the electricity regulator, would oversee competitive selection of RESPs, issue authorizations and submit licenses and concessions for signature to MINEE (Ministry of Energy). Supported by potential guarantees from the REF, commercial banks would provide loans to RESPs to implement their business plans and lines of credit to micro-finance institutions to assist households with the cost of connection and related equipment. The ministry of energy (MINEE) would oversee sector policies and chair the planning committee. The rural electrification agency AER would provide technical assistance to conduct pre-feasibility and feasibility studies for future projects. The Box shows the interaction of these different market actors.



ESMAP SME assistance helped the draft the laws and decrees needed to establish the REF. Additionally, an operating manual was developed for the SME-based REF which details institutional, administrative and financing procedures for accessing investment subsidies for private SME operators for rural energy projects in Cameroon.

## Results

The SME project had substantial impact on the ground, helping to unblock a stalemate situation for the participation of SMEs in energy projects in the absence of an appropriate institutional structure and financing mechanism since the creation of the Rural Electrification Agency AER in 1998 which is charged with the promotion of SME participation in energy projects. The program institutionalized a private-sector driven model and a sustainable financing mechanism for SME participation in rural energy projects in Cameroon, thereby creating large-scale opportunities for SME's to become operators and suppliers of rural energy projects in Cameroon.

Recognizing that immediate follow on assistance was needed to continue the progress toward implementation of the REF, a World Bank energy sector development project, effective as of the end of January 2009, provides technical assistance (US\$ 3.5 M) to the REF that includes a capacity building component for AER to assist in the identification of and bidding for the first 5

pilot areas and to provide investment subsidies. The World Bank's Energy Sector Development Project for Cameroon will also provide an additional US\$65 M to develop the electricity sector, of which roughly US\$ 40M will be for investment subsidies for rural electrification through the REF to support rural energy projects, capacity building for all sector stakeholders (particularly MINEE, ARSEL, AER, and EDC) and sustainable development of grid and off grid electrification projects. With these funding actions, the sustainability of the effort to develop Energy SMEs is virtually assured.

Other donor funds are poised to provide additional gap filling assistance, particularly for the identification of and development of new energy projects, such as the Energy Facility of the EU which will make around US\$ 27 M available to GoC for electrification projects implemented by energy SMEs. The African Development Bank is equally interested in participating in the funding of the SME-based REF mechanism.

## Lighting Africa

### Overview

About 1.6 billion people in the world still lack electricity access, despite billions of dollars of power sector investments in the last 20 years. By 2030 1.4 billion globally are expected to continue to be without power. The problem is most acute in Sub-Saharan Africa where over 500 million people presently lack electricity access.



For poor households, fuel-based lighting (mostly kerosene, but also candles and paraffin) is often the most expensive energy use, typically 50% of energy expenditures and 10-15 % of total household income but up to 33% in the poorest areas. Yet, despite the very high unit cost of fuel-based lighting, users receive little in return. Those in Africa without access to an electricity grid spend about \$17 billion a year on energy for inefficient lighting devices that offer poor-quality light, pose fire hazards, and pollute the indoor environment. Recent very high oil prices have further exacerbated this situation. Making the switch to higher-quality, more efficient electric lighting can enable people to read and study during evening hours, increase productivity, and raise incomes and quality of life.

The advent of new lighting technologies, such as compact fluorescent light bulbs (CFLs) and light emitting diodes (LEDs), promises clean, durable, lower-cost, and higher-quality lighting, particularly if coupled with battery recharging capability or photovoltaic electricity sources. Drawing on the range of new lighting products incorporating these innovations and harnessing existing delivery systems could provide a consumer-market or product-line approach to serve one primary need: higher quality lighting services. This simplified product approach and highly efficient lighting technology allows for packaging lighting services into smaller products that reduces costs across the value chain and reaches consumers at more affordable price points.



Solar powered outdoor area/security lighting

The lighting industry is presently seeking new markets as other markets are becoming saturated. The industry's interest has been piqued by insights showing that the fuel-based lighting market already represents a very large market (on the order of US\$ 38 B globally spent on fuel based lighting.) In Africa alone the market represents approximately US\$ 17 B. This market is already

functioning as a commercial market with an established value chain, payment systems, and spare parts and repair services. However, the new lighting product industry has not yet tapped this market opportunity because of significant barriers, such as a complex market structure, lack of data on the end user needs, lack of knowledge on the part of the consumer that new, better products exist, non-existent financing, and consumer perception of technology risks (related to a new, possibly untested product).

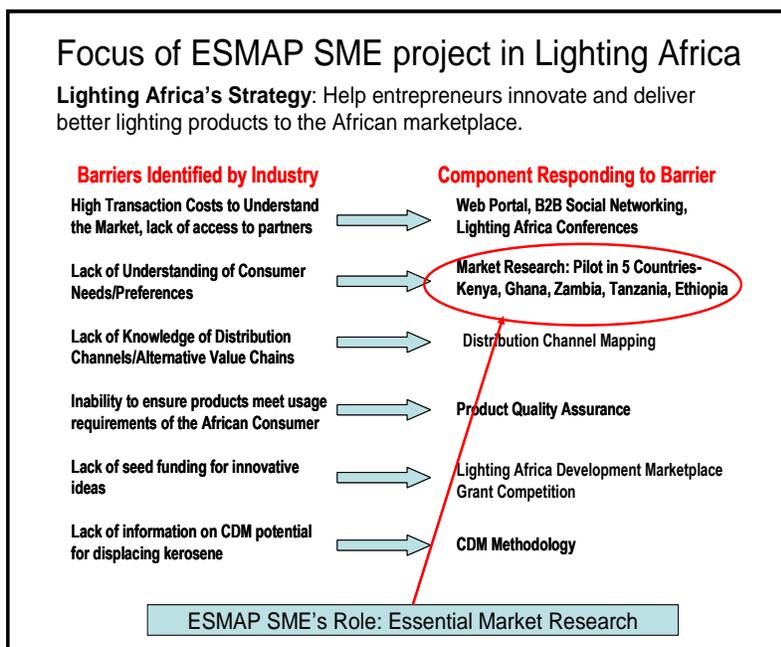
Recognizing the need to complement grid extensions with innovative off-grid solutions, *Lighting Africa* is a World Bank Group (WBG) long-term initiative aimed at helping 250 M people in rural, urban and peri-urban areas of Sub-Saharan Africa gain access to non-fossil-based, low-cost, high-quality, safe, and reliable lighting products by the year 2030. Its strategy to accomplish this goal is to support the private sector to develop, accelerate, and sustain the market for modern off-grid lighting technologies tailored to the needs of African consumers and taking a product line approach instead of a total energy services approach.

*Lighting Africa* was officially launched in September 2007 and is jointly managed by the World Bank and the International Finance Corporation (IFC), leveraging the comparative advantage of both organizations to support

the rapid scale-up and delivery of modern off-grid lighting to Sub-Saharan Africa. *Lighting Africa* builds upon the pioneering work of the Lighting the Bottom of the Pyramid (LBOP) program, which was created by IFC.

Consultations with more than 100 private companies, NGOs and other stakeholders during the *Lighting Africa* design phase identified areas where WBG interventions would help to accelerate market scale-up and meet the needs of off-grid households and businesses. These consultations helped LA to develop effective program components that would help to remove the barriers identified by industry to their entry into this market.

*ESMAP's Energy SME program was one of the first donors to commit funds to the program, and its approximately US\$400,000 of assistance allowed Lighting Africa to conduct market research in 5 countries (Kenya, Ghana, Zambia, Tanzania, and Ethiopia) in order to better understand consumer lighting requirements and preferences. As shown in the Box, the ESMAP SME support targeted one of the six components deemed essential by industry to open up this market sustainably. The results of the market research are already being used by major*



*lighting product producers in two ways: 1) to justify their expansion into this new market with significant investments and 2) to develop new products.*

*Furthermore, the ESMAP Energy SME program is credited with the insights that led to targeting existing SMEs to become purveyors and distributors of lighting products as well as users of such products. IFC funds are being made available for providing business development services in Kenya and Ghana as a result of a needs assessment of these business entrepreneurs. IFC is also working with telecom SMEs selling SIM cards to develop a loan mechanism. Major resource extraction companies are considering acting as aggregators for their communities to purchase the lighting products in bulk. Cell phone operators are exploring off grid charging of cell phones as another spin-off that would take advantage of distribution networks of lighting products that could also charge small batteries such as cell phones have. Major purveyors of other products in Africa, like Coca-Cola with its hundreds of thousands of kiosks in Africa, are lining up to improve the operations of their existing distribution systems with better lighting products.*

## **ESMAP SME's Market Research for Lighting Africa**

Because the off-grid lighting market in Africa is largely undeveloped and unexplored, essential market information was formerly largely absent. This included data on market potential, an understanding of consumer needs and lighting preferences, product attributes and design characteristics, and distribution channels for product delivery. Obtaining this essential market and consumer information was onerous and expensive for individual companies and entrepreneurs to obtain yet needed by all who were considering market entry. The main objective of the research was therefore to provide information on the suitability of different types of lighting products in the African market, as well as quantifying the approximate size of the potential market in volume and value terms for those products and providing other information for the use of manufacturers.

Households and micro businesses without access to electricity in Kenya, Ghana, Zambia, Tanzania and Ethiopia were interviewed. For households, face-to-face interviews using a structured questionnaire were conducted with the main (or joint) household decision maker – i.e. head of household – regarding the household and its purchases. Owners or managers of retail businesses in informal settlements in urban and rural trading centers were also interviewed face-to-face using a structured questionnaire.

Interviews focused on:

- Consumer demographics and characteristics,
- Current lighting habits, attitudes, preferences, and needs,
- Assessment of need for modern lighting,
- Lighting product preferences (e.g. product performance, specific design), and
- Consumer economics (e.g. optimum price and capacity to pay for lighting).

Results from the market research studies are available on the *Lighting Africa* website. This market research provides participating companies with unique insights on end-users needs, light

and product design preferences, price points, and other economic, design attribute and behavioral information. The *Lighting Africa* team is preparing a consolidated report on the findings from the five countries for dissemination to business enterprises. All market intelligence work is being developed following a “franchise approach” by which additional countries can be added easily to these efforts by using standardized questionnaires, TORs, web-based tools etc. As a result expansion to francophone Africa has begun.

## **Other Components of Lighting Africa Build on Completed Market Research**

*Value Chain and Distribution Channels:* This work entails mapping and analysis of value chain for off-grid products to identify key players and analyze price and costs build-up, identifying potentials for streamlining. Stakeholder workshops in each of the five target countries will discuss findings and help distributors advertise their products through the website. To further enhance this work, the *Lighting Africa* website is collecting and compiling detailed information on distributors. *Lighting Africa*'s website features a help desk to tend to distributors' specific needs and collect additional information on their work. In targeting distributors, the program will identify and recruit traditional, non-traditional, and small distributors like electronics shops, kerosene suppliers, NGOs, farmers associations and microfinance associations.

*Lighting Africa Development Marketplace (LADM) Winners:* The concept of the LADM was to solicit innovative, results-oriented projects in off-grid lighting products and services for Africa. The program received over 400 proposals from 54 countries, including 38 African countries. 54 finalists, including small and medium enterprises (SMEs), were selected to fully develop their business plans. From this group, *Lighting Africa* selected 16 winners in May 2008 to receive seed capital of up to \$200,000 each. This activity is funded through GEF, IFC, PPIAF, REEEP, Good Energies Inc and the Netherlands. Implementation is underway for these with supervision from both the *Lighting Africa* and the World Bank's Africa Energy teams. To ensure sustainability of these projects beyond grant funding, LADM projects will benefit from *Lighting Africa*'s Quality Assurance and Technical Services Program (see below). At the same time, feedback from the LADM projects will help fine-tune the program's offerings to stakeholders.

*Lighting Africa 2010 Conference:* Following the successful *Lighting Africa* 2008 Conference held in Accra, Ghana in May 2008, at the request of the international and Africa off-grid lighting industry and service providers, a *Lighting Africa* conference will be held in early calendar year 2010. The conference will expand the off-grid lighting network to West African Francophone countries, support international and African lighting partnerships and disseminate market and good practice knowledge. The Renewable Energy and Energy Efficiencies Partnership (REEEP) and Good Energies Inc. have expressed interest in co-sponsoring this event.

*Lighting Africa* aims to minimize the threat of significant buyer dissatisfaction and potential market spoilage resulting from a potential influx of lighting products that do not meet the needs of consumers in Africa and/or fail to empower them to adequately evaluate performance and select products appropriate to their needs. Activities performed to protect the African consumer base and help the industry develop and disseminate a range of high demand products to the African marketplace include:

- *Quality Assurance and Technical Services Program:* The *Lighting Africa* program has secured seed funding to support the development and launch of a quality assurance program for off-grid lighting products that incorporates a code of principles for industry stakeholders as well as a cost-shared technical assistance service to stimulate the rapid development of high-quality, affordable, off-grid lighting products for African markets through the provision of demand-driven testing and technical advisory services to manufacturing and distribution companies.
- *LED Quick Screening Methodology:* *Lighting Africa* is developing a quick and low-cost quality screening methodology for selecting reliable and high-quality LED lamps. To date, the program has finished examining the world market to get an overview of lighting systems and testing standards. A preliminary methodology is under review and will then be applied toward specific product testing and subsequently refined with industry feedback.
- *Solar Lantern Testing:* *Lighting Africa* has taken on product quality testing across product classes and aims to disseminate performance information. For the solar lantern testing work, over half of the products randomly selected by *Lighting Africa* have been tested, with all tests completed and publication of final results expected by April 2009.
- *Finance Needs Assessment:* Through its *Value Chain and Distribution Channels* work, the LADM program, and continued interaction with market players through its website and conference events, *Lighting Africa* is working to identify the financing needs of companies in the supply chain, as well as those of consumers; providing access to information on relevant existing financing sources; and developing new financial products, as needed. This work is ongoing and its design continues to evolve based on the expressed needs of stakeholders.

Aiming to reduce market barriers through close collaboration between stakeholders, *Lighting Africa* knows that communications and knowledge dissemination are crucial.

- *B2B Website:* With over 1,700 registered members, the *Lighting Africa* website is interactive and dynamic and offers a Business Opportunities forum with advanced search functions, discussion forums on topics ranging from quality assurance to sustainability issues, and dynamically updated news and events sections. Participating organizations have the opportunity to edit and expand their online profiles to market their organizations to other *Lighting Africa* members, e.g. by displaying product catalogs and other marketing materials.
- *Monitoring and Evaluation:* As the *Lighting Africa* program continues to lay the ground work for the off-grid lighting market and receive feedback from stakeholders on its impacts, it has developed a preliminary framework for its monitoring and evaluation program. This system will help track program progress and results.

In order to address the numerous regulatory and policy barriers that are stifling the development of off-grid lighting markets in Africa, *Lighting Africa* is launching a multi-country policy program. The program is designed to map and analyze policy and regulatory barriers such as import tariffs, taxes and subsidies for fossil fuels. On the basis of this, a policy dialogue with respective governments will be conducted to mitigate such barriers and improve business environments.

- *Policy Support:* In order to address the numerous regulatory and policy barriers that were articulated during the *Lighting Africa* 2008 Conference, *Lighting Africa* has begun the design of and identified funding sources for a policy study which would provide an analytical framework to understand better the nature and the extent of these barriers and propose possible mitigating measures. The report will draw on information from 5-7 countries and analyze the results of different policy actions applied in different countries. The cross-country comparison will allow the identification of the most common barriers. The effort will not only identify the key policy actions, but also pay attention to their results on the ground, including the possible issues related to their enforcement in Sub-Saharan Africa. This activity includes organization of a regional workshop with policy makers, government agencies, industry, and other key stakeholders to disseminate the results of the report and agree on follow up actions on its recommendations.
- *Integrating Off-Grid Lighting into World Bank-Financed Rural Energy Operations:* *Lighting Africa* is leveraging existing World Bank activities by helping to incorporate off-grid lighting services into World Bank–financed rural electricity access projects in several African countries. Currently, *Lighting Africa* is cooperating with World Bank projects in Ethiopia, Ghana, Tanzania, and Zambia.

## ***Combining Forces to Strengthen Small-Scale Service Provision: Electricity in Bolivia***

### **Overview**

Energy access in Bolivia is among the lowest in the region. Bolivia is the poorest country in South America with a GNI per capita at US\$ 1,100 in 2006. The country's electricity coverage is approximately 65%, with an enormous gap between urban and rural areas. While over 85% of urban households have access to electricity, the coverage in rural areas is only about 30%, the second lowest in the LAC region, after Nicaragua. With a population of slightly over 8.5 million, and over half living in rural areas, Bolivia's challenge is great in extending electricity service to the more than 770,000 homes that do not already have it.

Because of its sparse population (8 people per km<sup>2</sup>) and low per capita income, Bolivia has by far the lowest density of economic activity in South America, resulting in high unit costs of infrastructure, particularly in rural areas. The low population density of the country and the difficult topographic conditions often cause rural communities to suffer from considerable isolation. The provision of infrastructure services to rural Bolivia is therefore particularly desirable, but also comparatively costly. More than one-third of the non-electrified rural households are too far from the national grid to permit grid extension. It is recognized that their electrification will require innovative off-grid technologies and supply schemes to match typical demand in a flexible and cost effective manner.

In 2006 Bolivia adopted a new Universal Access Strategy (called "Programa Electricidad para Viver con Dignidad" or Electricity for a Decent Living Program) which was launched by Bolivia's "Vice Ministerio de Electrificación y Energías Alternativas" (VMEEA or Vice Ministry for Electrification and Alternative Energy<sup>7</sup>) to meet the electrification challenge, aiming at universal electricity access (defined as >97% coverage) in urban and rural areas by 2025 with an intermediate 2010 target of increasing rural access from 33% to 50%, and urban access from 87% to 95% (of which 210,000 would be in the rural areas). The program comprises extension of the grid to new areas, "densification" (i.e., connection of additional users who already live close by an existing grid) and alternative energy (e.g., micro-hydro and photovoltaic systems).

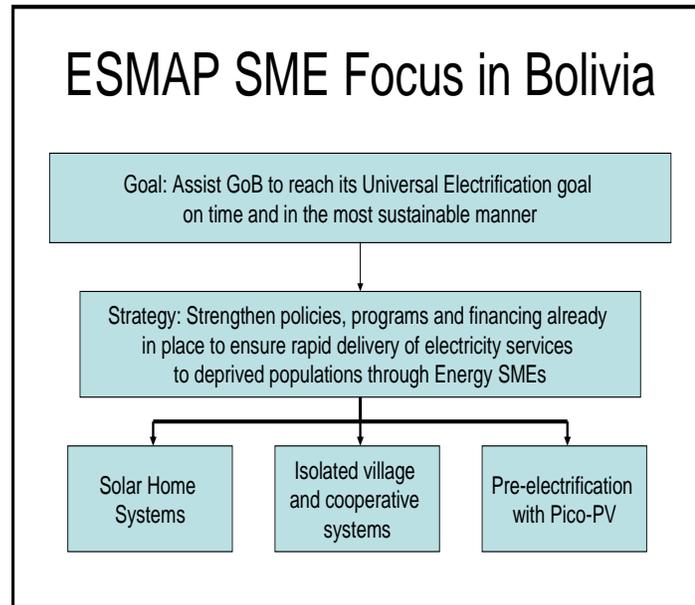
A number of donor initiatives aim at helping the country meet the universal access goals. In 2003, the Decentralized Infrastructure for Rural Transformation (IDTR) Program (supported by the World Bank International Development Association or IDA) was initiated in Bolivia. With initial funding of \$20M, IDTR aims at increasing rural access to (and usage of) electricity in remote rural areas via decentralized public-private partnerships (PPP). The new "Decentralized Electricity for Universal Access" project, funded by the Global Partnership on Out-based Aid (GPOBA), which is administered by the World Bank, plans to extend electricity access to at least 7,000 poor households, micro-enterprises and social uses in remote and dispersed rural areas

---

<sup>7</sup> The Vice ministry of Electricity and Alternative Energy, within the Ministry of Petroleum and Energy, is in charge of establishing policies and designing the regulation for the electricity sector.

(benefiting some 50,000 Bolivian citizens in these areas) through the installation of solar home systems (SHS). Another example is the assistance from Energising Development Bolivia (EnDev, a DGIS/BMZ-funded program executed by GTZ) to split the cost with GoB for the first 20,000 households of the densification efforts in 2008. In addition, decentralized government tiers are using proceeds from fiscal decentralization in part for new electrification projects.

The ESMAP SME program’s strategy was to help strengthen the role and capacity of local energy SMEs in ways that build on and complement the various government activities, donor funding and programs operating within the Bolivian environment to accomplish universal access. After consultations with the main stakeholders and additional market analysis to determine where its assistance could be most useful, the Bolivian ESMAP SME team decided to focus on three areas: (i) solar home systems, (ii) village minigrids and grid densification and (iii) pre-electrification with new “Pico-PV” systems. The type of assistance to



provide in each component was based on findings of market assessments and linked to the ongoing activities of the Bolivian Government and of other donors. Technical and financial barriers to alternative energy development were identified for each of the three areas.

*All three areas of ESMAP SME focus have already resulted in (i) improvements to the Bolivian Universal Access Program, (ii) increased capacity of local SMEs, (iii) PPP pilot scheme proposals that have meanwhile been taken up for funding and (iv) significant increases in the numbers of households that are or will soon be electrified via one of the three routes. For instance, the GPOBA SHS project mentioned above was designed in large part based on ESMAP SME findings; and improvements adopted by GoB for their SHS procurement method are expected to allow about 25% more households to be served with the amount of funds available. Over 3,000 households will benefit shortly from the new GPOBA Pico-PV funding, which has been granted based on ESMAP SME findings. Another 8,000 households will soon receive new connections as a result of the IDTR grid-densification component which has been redesigned and increased based on ESMAP-SME findings.*

### **Launching a national market for “Pico PV“**

Very small solar systems called “Pico-PV” (an expression actually coined for the Bolivia and Nicaragua ESMAP SME projects in collaboration with the GTZ) represent a new opportunity for “pre-electrification.” At a cost of US\$ 20 to 100, these PV-powered flashlights and lanterns potentially (i) reach users who won’t be electrified in the medium term and (ii) meet needs that

traditional solutions cannot cover (for instance, they can be carried to the field and often allow for cell phone or radio charging). Due to rapidly falling LED prices, a growing number of manufacturers (often from Asia) offer such products, and the first PV lamps have already reached Bolivia. However, quality varies widely, and LEDs often stop working after a few weeks. The ESMAP SME component helps GoB and local SMEs to assess the potential of this new product (by providing market information on supply and demand side), while building awareness for quality issues in order to protect customers.

This component achieved a unique level of direct cooperation with GoB, GoN, GTZ, EnDev, the World Bank Lighting Africa Initiative and the World Bank managed IDTR and GPOBA projects.

The following results were achieved:

- Development of a complete set of field survey instruments (8 questionnaires) that were agreed for use with GoB and GTZ and shared with GoN and the ESMAP SME project in Nicaragua.
- Implementation of six pilot focus groups in three representative eco-regions, test sales (lamp auctions) and household surveys (lamp rotations between households for direct comparison of lamp preferences) completed in April 2009 by a local SME consulting firm paid and supervised by ESMAP SME, using seven different types of PicoPV lamps procured by GTZ, based on a GTZ lab test that was shared before publication with ESMAP SME as a result of the direct cooperation.
- Interviews and dissemination activities with local Micro, Small and Medium Enterprises (MSMEs)
- Funding for a PicoPV Pilot designed with ESMAP SME funding, proposed to GPOBA and taken up for funding.
- 900 PicoPV lamps already bid out by IDTR.
- Cooperation between IDTR, GPOBA and GTZ for additional field tests and a broader diffusion via local SME agreed and to be started in 2009.

### **Strengthening the Solar Home System Supply Chain**

This component focused on introducing new market players, strengthening existing players and improving the quality of systems supplied to consumers, in cooperation with GOB, IDTR and GPOBA.

In 2005 an intensive road show by IDTR was able to attract enough bidders to implement the first-ever national bid for SHS service provision by off-grid providers. Of the more than 200 firms contacted, half maintained general interest over time, leading to 14 consortia requesting prequalification. The Government of Bolivia successfully bid out performance-based subsidies to encourage private operators (two bidders out of 11 pre-qualified consortia, and subsidy

contracts for all 14 service areas) to install up to 15,000 individual SHSs over a period of three years in four provinces of the country. The contracts signed with the two successful companies (one local SME and one consortium of an international PV manufacturer with an SME from Ecuador) specified the nature and duration of the service obligation, a maximum price for the SHSs to be installed, and the quality-of-service standards that operators must satisfy, as well as the method for monitoring compliance with these standards.

### Medium Term Service Contract for SHS

Medium Term Service Contract is a new SHS business model that can be used when governments wish to subsidize rural off-grid electrification. It combines the strengths of the fee-for-service and dealer models.

- Companies must bid on a proposed number of connections (the bidding variable) for a fixed total level of subsidies per area. Subsidies are provided in return for five- to seven-year obligations to develop and serve small local markets.
- The winners of the MSCs will have the obligation to install a minimum number of systems over a period of less than three years, to service systems during an additional four years (starting from the date of installation), to develop the local SHS markets on the demand and supply side by educating users about SHSs and training future local spare parts suppliers, to report on their own performance, and to conduct user interviews for project evaluation.
- Since the operators are free to choose between cash sales, microcredit, finance or lease, they have considerable freedom to find the best business plan for their geographic areas.

The successful IDTR tender award achieved significant efficiency gains. The winning bids exceeded the Government's user-per-area target by 25 percent on average, and unit subsidies were lower than for comparable previous projects in Bolivia. The total subsidy amount of about US\$10 million corresponds to an efficiency gain worth about US\$ 2.5 million, compared to about US\$500,000 in overall costs of tender preparation and process. These efficiency gains are passed on directly via the Government (which pays the lower resulting unit subsidies) to the rural users (as 25 percent more users will receive subsidized SHS). The heart of this successful bid was the newly developed concept of Medium Term Service Contracts (MSC – see Box).

ESMAP SME SHE activities were designed to improve SHS system and service quality under IDTR as well as future SHS tender processes, with a special focus on the role of local SME. They included:

- Several workshops held for local SHS technicians and microfinance institutions to increase interest in participation in SHS tenders and ability to qualify for them.
- An analysis of IDTR subsidy and tender lessons has helped to inform future GOB SHS tenders under the Universal Access Program. Based on the above, an improved version of the Medium-Term Service Contract (MSC) has been adopted by GoB.
- A new tender for SHS supply using the improved MSC is planned under the GPOBA Project later in 2009.
- Supply shortages in the local SHS market and local costs of IDTR SHS providers were analyzed against international benchmarks to inform GoB decisions and improve the national supply market where possible.

- Technical assistance was provided to the Office of Technical Monitoring (OTM), in charge of monitoring and evaluation of PV projects within the GoB. Given that the direct counterpart VMEEA has recently assumed the role of sector regulation, the good practice procedures established for the OTM with help of ESMAP SME funding will directly influence future national regulation of PV systems.

### **Support to grid densification and mini-grids**

The electricity sector in Bolivia was privatized in the early 1990s and was unbundled into generation, transmission and distribution. The supply is dominated by thermal generation (60%), while hydropower (40%) has a smaller share in its generation mix compared to other South American countries. Six existing distribution companies enjoy a geographic monopoly in their concession areas. There are also three areas where there are generator/operators of smaller non-interconnected grids (for less than 100,000 households in total). In some cases, especially in the high plateau, cooperatives and community organizations access the distribution companies' network and sell electricity to small rural communities. Sometimes, those are organized enterprises that provide the service to middle-size towns, but in most cases, they are small organizations that serve family communities. This situation faces a legal vacuum since the consumers benefiting from these schemes, who do not consume the minimum amount of power established legally, cannot be considered as regulated ones. In addition, these consumers are situated outside the distribution companies' concession areas, so they cannot receive the companies' service. In practice, the distribution companies often resell electricity to these organizations outside the legal framework.

Other small, isolated village mini-grid operators are often “spontaneous” rather than “nurtured” enterprises. About 150 such enterprises operate in Bolivia. Historically, they have not been regulated, either because no regulatory entity existed or, if a regulatory entity did exist, its rules and regulations were usually ignored. In other words, the norm is de facto deregulation. About 50 operators of the existing isolated village mini-grids were surveyed in 2002. Bolivian energy law requires that these enterprises obtain a formal concession from the national electricity regulator if their installed generation exceeds a maximum local generation capacity of (originally) 300 kW, but the rule was not enforced in most cases. Faced with this conflict between what the law requires and what is economically feasible, Bolivia found itself with a de facto system of bimodal regulation: full regulation for the largest distribution concessions and nonexistent regulation for the bulk of the isolated mini-grid operators.

To address the conflict between “cooperative” and “concession” status, a new type of transitional contract known as “contrato de adecuación” was introduced as a partial, interim solution in 2000. This new regulatory arrangement allowed the cooperatives to continue providing electricity service to their members without having to acquire concession status. The transitional contracts have an initial four-year term with the possibility of an extension of four more years. Because of their isolation and only recent “inclusion” in the regulatory system, technical assistance is an important concern for the small rural village grid providers because their technical and administrative capacity is often low. A 2002 survey of Bolivian off-grid providers confirmed that many of them recognized this lack of capacity and asked for training.

ESMAP SME funds were used to: i) define elements of a capacity building program for Bolivian village grid suppliers and ii) support utilities and cooperatives in extending service through grid densification. The proposal for TA to village grid operators has been finalized but not taken up yet by GoB. However, the second item was very successful: With ESMAP funding for design, significant grid densification subsidies were bid out in late 2008 and have received go-ahead in April 2009 for 8000 new connections.

## **Results and Outlook**

All three new electrification approaches proposed by ESMAP SME have been accepted for scale-up under the national access program “Electricidad para Vivir con Dignidad”. The unusually strong focus on cooperation and local partnerships has allowed a combination of resources that overcame limitations and drew on strengths of each funding source. As a result, as many as 18,000 households will have access to electrification or pre-electrification within a year, many of which would never have happened or would have been significantly delayed without ESMAP SME assistance.

Funding has been secured for all pilot schemes developed with ESMAP contribution:

- Funding for two Pico PV Pilot schemes for more than 3,000 users and for an improved SHS tender for 7,000 users have been secured from (i) Bank implemented GPOBA/DFID and (ii) the DGIS/BMZ funded EnDev Bolivia project.
- A large densification component for more than 8,000 connections, designed with ESMAP-SME funding, will be funded by the Government/ Bank/GEF financed IDTR project.

Extensive knowledge sharing occurred during the project. In the Pico PV track, a very intensive donor cooperation produced joint survey tools, lessons and methodologies together with:

- The World Bank Group Lighting Africa Initiative,
- The GTZ LET Initiative,
- A related study in Nicaragua (part of the ESMAP-SME program),
- DGIS/BMZ-funded EnDev programs in Bolivia, Nicaragua, Honduras, Mozambique, Senegal and Uganda;
- The ESMAP-funded Africa Electrification Initiative (AEI) and
- GPOBA and ESMAP/IFC Bolivia.

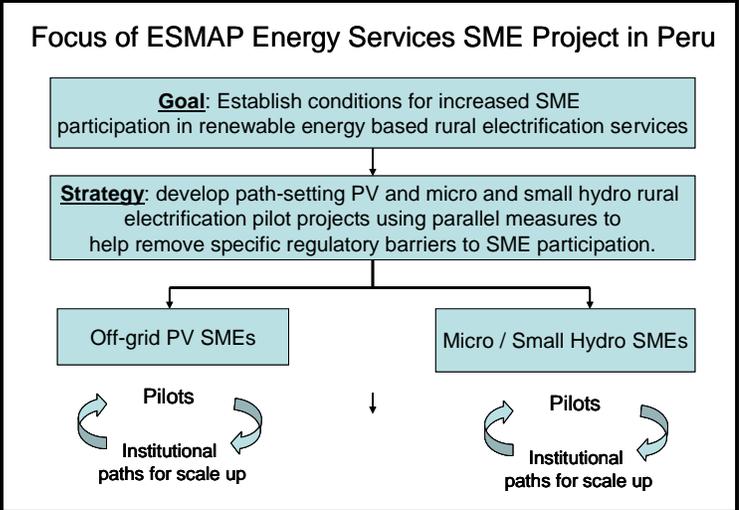
Implementation has already started for the innovative PPP approaches proposed by the ESMAP project (see above).

# Opening Mainstream Pathways for Electrification via Rural Off-grid Energy Services SMEs in Peru

## Overview

According to the 2007 national census, only 29.5% of rural Peruvian households had been electrified, with 1.14 million as yet having no connection. The ESMAP Peru Energy SME Project set out to provide assistance to GoP to increase the degree of electrification by strengthening the role of SMEs in entering rural on- and off-grid energy supply chains.

ESMAP’s first step was a market assessment to better understand market dynamics and the regulatory regime and to identify promising means to increase energy SMEs role in the market. The diagnosis identified significant energy SME activity already in the regulated market and additional market potential in both the regulated and unregulated markets for other energy SMEs. Approximately 30% of the 500,000 rural households connected to the grid were served by a type of energy services SME (known by the Peruvian acronyms CASES and CAPs as described in BOX) that provides services for the distribution companies that outsource a wide variety of routine functions such as meter reading, billing and collections, and minor maintenance depending on the needs of the company and primarily for cost-reduction purposes. This existing base of energy services SMEs and the established, standardized and well-functioning contractual arrangement provided evidence to ESMAP that pathways could be developed for mainstreaming off-grid renewable energy SMEs within the Peruvian context.

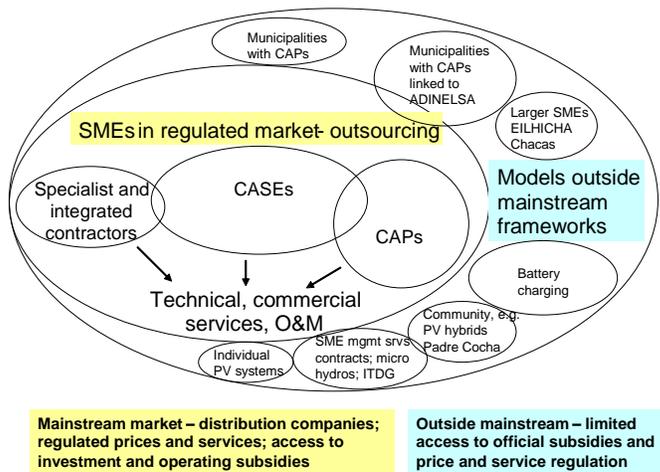


Yet existing and proposed off-grid projects using renewable sources of energy had been playing on an uneven field as they were blocked from access to the national tariff subsidies and had not yet been able to benefit from the investment funds for rural electrification from the GoP’s Rural Electrification Project (FONER). The reasons were primarily of a regulatory and institutional nature where concession contracting, finance, subsidy and tariff setting procedures developed primarily for grid extension had not been adapted to accommodate the different type of project that rural renewable businesses represent. The diagnosis estimated that 910,000 rural households (i.e., 70% of the 1.3 million rural households expected to have grid connections by 2016) could be served by SMEs. That would assist the distribution companies with providing services both on and off-grid.

The findings led directly to the project strategy agreed by all stakeholders of using pilot projects that could be immediately initiated in concert with regulatory reforms to establish new pathways

to access for rural off-grid renewable energy based SMEs. Two types of pilot projects were targeted: photovoltaic (PV) systems through distribution companies and independent micro and small hydro systems. The project then worked to develop solutions in collaborations with the government, distribution companies, NGOs, and potential and actual service providers. The existing market structure and the regulations covering electricity supply provided the project with a natural segmentation of energy SME types: those that could serve the “regulated” market of the existing distribution companies and those that serve or could serve areas currently outside the regulated market.

## Peru’s Energy Services SMEs



The pilot projects were developed and the regulatory barriers addressed with the ESMAP project providing analysis, advocacy and technical assistance in collaboration with a wide number of sector stakeholders. The main pilot track was the development by two distribution companies of regulated services using individual PV systems for dispersed households and communities that cannot be economically served by the grid that would be serviced by the SMEs. The second pilot track assisted two SME operated micro-hydro projects to pilot applications to become identified officially as service providers, differentiated by their sizes in order to test the different regulations pertaining to systems larger and smaller than 500 kW.

## Regulatory Barriers Encountered

The assessment study found, as of 2007, incomplete regulatory frameworks that have limited the growth of SME services in the off-grid renewable energy based market. The 2006 General Law on Rural Electrification (LGER) and its 2007 regulations<sup>8</sup> established the broad regulatory framework for electrification in rural areas, which had not been dealt with in the 1992 Electricity Concessions Law (LCE), including for standards, tariffs, subsidies and concessions for rural electrical systems and the promotion of renewable energy. However, obstacles remained that constrain SME participation. The main regulatory barriers found that constrain SME participation as service providers are listed in the associated BOX.

The assessment found support across the distribution companies and official sector institutions for clarifications and completions to the LGER framework for small scale distribution and generation and the use of renewable energy in rural electrification that would have the effect of enhancing SME participation.

Several were already the subject of analysis and submissions to MEM in the second half of 2006 during the preparation and approval of the ESMAP project. However, these had not been established by the end of 2007.

Particularly important for the viability of independent off-grid energy services SMEs that are currently outside the mainstream frameworks is their being able to access the FOSE or Electricity Social Compensation Fund which was established in 2001. FOSE, is a cross-subsidy fund supported with a 3% surcharge on the tariff paid by consumers on the National Interconnected System (SEIN) with consumption above 100 kWh. FOSE finances fixed discounts to consumers in the less-than-30 kWh and over-30 but less-than-100 kWh bands, and a proportional discount to ones in the band of less-than-30 kWh per month consumption. Roughly 60% of residential clients at national level benefit from FOSE. The discounts are larger for rural consumers than urban ones. Most rural households that are served by regulated distribution companies consume less than 30 kWh per month and receive a 62.5% discount on their “energy charge”, with the distribution company receiving this discounted amount in a payment from FOSE.

### **Regulatory Barriers Constrain SME Participation as Service Providers**

- Lack of Clarity in Certifications of Small Rural Electricity Systems (SER)
- Incomplete Procedures for Awarding Rural Concessions to SERs
- Lack of Access to Investment and Operating Subsidies for SERs without Concession Award
- Lack of Full-cost, Regulated Tariffs for Distribution Company Services Using Individual PV Systems
- Lack of Access to FOSE Operating Cross-subsidy for Distribution Company Services Using Individual PV Systems
- Lack of DFC/DGER Investment Guidelines for Rural Electrification Capital Cost Subsidies for Renewable Energy
- Lack of Regulations for Connecting Small Renewable Generation to Grid

---

<sup>8</sup> The LGER (2006, Law 28749) and its Regulation (2007-05-03 ) established the framework for rural electrification, including regulation, promotion and planning, organization and funding, and includes a separate section on private investment. The earlier Rural, Remote, Isolated and Frontier Electrification Law (2002, Law 27744) had not been applied as it, *inter alia*, contradicted the Decentralization Law and the Regional Governments Law.

Customers of SME operators of independent micro and small hydro generation and distribution systems that are excluded from these supports generally pay higher tariffs for lower levels of services without regulatory controls on service quality, and in other cases pay tariffs that are below cost recovery levels, jeopardizing the sustainability of their operations. Likewise financial viability of the SMEs is threatened by inability to access investment funds from FONER. The DFC/DGER operates the FONER project fund for capital cost subsidies of up to 90% for rural electrification investments.<sup>9</sup> Removing these two barriers became a necessary focus of ESMAP assistance to energy SMEs.

The other major constraint was that the national regulatory framework for electricity tariffs did not cover services of distribution companies using individual PV systems. Without a regulated cost reflective tariff, services that would be provided by distribution companies using individual PV systems are not eligible for the FOSE cross-subsidy; the full tariffs would be unaffordable to most of the dispersed households in Peru's remote rural communities. Also, projects using PV and other renewable energy technologies did not have access to the subsidy funding for rural electrification investments that is available under FONER as guidelines had not been issued. The absence of a regulated tariff and access to the FOSE and FONER financing bars the distribution companies from using PV even in cases in which it represents the least cost option for basic lighting and connectivity. Mainstreaming PV services by incorporating full cost tariffs and establishing access to the national cross subsidy and investment funds became the other necessary focus of the ESMAP assistance to assist energy SMEs.

### **An Important Energy SME Precedent: CASEs AND CAPs**

On-going SME participation in rural electrification in Peru is extensive within the regulated market. The distribution companies regularly contract SMEs to carry out operational and commercial tasks in rural communities. The two main types of distribution SMEs are referred to as CASEs and CAPs. CASEs – or centros de administración de servicios eléctricos – are SMEs of two to ten persons that operate exclusively as agents of a distribution company. A CASE does the meter reading and distribution of bills, accepts payments and receives new connection applications. Activities of some CASEs, include new installations and connections, disconnections, line maintenance, complaints handling and minor maintenance. CASEs can also operate CAPs to receive customer payments. CAPs – or centros autorizados de pagos – are SMEs with small offices or shops in rural centers where customers can pay their monthly bills. The employment in the CAPs on distribution company business is often part-time, as these SMEs typically have other businesses, for instance as retail shops selling sundry consumer goods. SMEs are also contracted as CAPs for municipal systems owned by ADINELSA, the state enterprise responsible for most of the rural municipal systems that have not been transferred to one of the distribution companies. The distribution companies pay CASEs and CAPs on a fee per activity basis. CASEs can also receive a fixed monthly amount for preventive and minor maintenance.

In the allocation of activities between the distribution company and the CASEs, and in some cases their CAPs, the distribution companies maintain control of the customer data base and billing software, while the CASEs and CAPs are in charge of those functions that require close

---

<sup>9</sup> <http://www.foner.gob.pe/>

contact with the customer as shown in the Table below. Other SME models used by the distribution companies are variations on the CASE and CAP models. Integrated service providers are larger SMEs that deliver a wide range of services, for instance assessing new connection requests, undertaking more major maintenance and often operating multiple CASEs and CAPs. Another variant is the specialist service contractor that provides a specific technical service, for example, new installations, line maintenance and trouble-shooting.

**Table: Commercial and O&M Responsibilities: CASE/CAP and Distribution Company**

<b>CASEs and CAPs</b>	<b>Distribution company</b>
<ul style="list-style-type: none"> <li>• Receiving new requests</li>   <li>• Meter reading</li> <li>• Bills delivery</li> <li>• Collections (may be through CAPs)</li> <li>• Delivery other notifications</li> <li>• Cut-offs and reconnections</li> <li>• Minor preventive maintenance</li> </ul>	<ul style="list-style-type: none"> <li>• Feasibility of new installation</li> <li>• Work orders to specialist contractors for new installations</li> <li>• Billing</li> <li>• Printing of bills and other documents</li> <li>• Billing software and customer data base</li>   <li>• Work orders for cut-offs and reconnections</li> <li>• Major preventive maintenance</li> <li>• Corrective maintenance</li> </ul>

### Off-grid PV SMEs

GoP's indicative rural electrification master plan targets 343,000 households to be electrified with PV based services by 2016; although the means for achieving the goal is unspecified. The aim of the ESMAP efforts to improve prospects for PV services was to remove barriers to

**Best Practices CASEs and CAPs**

- **Standardized distribution company procedures and internal controls for SME service contracts, performance monitoring and fiduciary control across all CASEs and CAPs contracted by a distribution company.**
- **Timely Payments to the CASEs on a per activity basis plus a fixed amount per month for minor and preventive maintenance; payments to CAPs are only on a per activity basis**
- **Frequent on-site visits by company staff to the SMEs for support and supervision**
- **Continual training of SMEs at company headquarters and in the field in company policies and procedures, basic skills refreshment and motivation**
- **Maintenance of customer billing software at the main company office**
- **On-line, real time connectivity between the company office and the SME operated CASEs and CAPs, whenever possible**
- **Strong distribution company branding of CASEs to ensure that the customer experience with a CASE is as though it were directly with the company and to transfer the corporate culture to the agent.**

the distribution companies deploying individual PV systems in remote communities where these represent the least cost option. It was expected that companies would likely provide such PV based services by adapting their well established SME CASE and CAPs delivery model to manage billing operations and maintenance for service using individual PV systems.

Examples of assistance provided to facilitate PV service include: adapting standard contracting and operational procedures for PV systems provided by SMEs, development of a tariff framework for PV systems that was adopted by the regulator, OSINERGMIN, and development of official guidelines for investment funding of rural electrification projects.

The key results of the ESMAP efforts were that, for the first time, the regulator established a tariff band for individual PV systems within the national tariff framework, the DFC/DGER introduced FONER guidelines for rural electrification capital cost subsidies that covered subprojects with regulated PV based services, and two electricity distribution companies (ENOSA and ELORSA) prepared and submitted to FONER for financing Peru's initial projects for providing regulated services using individual PV systems. The pilots cover PV connections for 2,000 households and other users with SMEs providing the commercial and O&M services. The preparatory steps have been taken to assist six additional companies to develop projects for connecting up to additional 4,000 customers. There is a tentative agreement between the regulator and distributors that customers with individual PV systems will pay a tariff equivalent to those of grid connected rural consumers with equivalent levels of service with the distribution utilities receiving the balance of the full tariff through payments from the national cross subsidy fund (FOSE), as is the practice for other rural customers with monthly consumption less than 30 kWh.

These advances enable distribution companies to access mainstream investment subsidies for their PV based services as well as full cost recovery tariffs for these services, to be paid through a combination of a regulated retail tariff and the national FOSE cross-subsidy. Prior to the ESMAP project, this mainstreaming was impossible. These will be Peru's first experiences with a scalable model that deploys PV systems for electrification in remote communities.

### **Micro- and Small Hydro SMEs**

There were a number of micro- and small hydro developments in Peru catalogued during the ESMAP market analysis. SMEs operating small **micro-hydro based community** grids serving isolated rural communities of 40 to 3,000 households have been promoted and supported by donors and NGOs for several decades, usually with the capacity building support of the NGOs. The micro-hydro business models have included direct local government and community group operation, but the most promising, and still least used, appear to be **SME based management models** developed in response to the weaknesses experienced in operating with the municipal and community models. ITDG – Soluciones Practicas pioneered the model. While the potential for future operations of this type is more limited than for distribution company services using PV, this additional Peruvian precedent encouraged ESMAP (and other stakeholders) to pursue an SME model for micro- and small hydro systems.

Here the regulatory pathways to open up were related to getting the SMEs formally designated and certified as small rural electricity systems (SER) and then awarded rural concessions (CERs) under existing Peruvian legislation, which would establish their access to the mainstream regulatory supervision and national cross subsidy and investment financing. ESMAP therefore started pilot projects with already operating micro- and small-hydro systems in Conchán in Cajamarca and Chacas in Ancash. Through technical assistance to the system owners and operators and discussions, submissions and resubmissions of analyses and applications with officials, these pilots aimed at the first SER certifications and CER awards for SME operated small rural electricity systems. The assistance included recommendations to determine or clarify documentation and procedures for certification of a SER and for awarding a CER to an SME

operated system and on the regulations for Legislative Decree No. 1002, which, inter alia, governs the sale of energy to the grid by SME operated small and micro hydro systems, and drafting a submission to the ministry on this matter.

The Conchán system, which is operated by an SME under a management services contract, was certified by DGER as a SER in August 2008, establishing a precedent for < 500 kW SME operated and municipality owned systems. EILHICHA was certified as a SER in February, 2009, establishing the precedent for > 500 kW SME owned and operated small hydro based rural grids. The key remaining step is the award of the CERs. As of March, 2009, the very reiterative process of completing the CER applications and removing regulatory barriers to these path-setting rural concessions had achieved the establishment of clear procedures and criteria and the initial awards were pending.

## **Results and Remaining Challenges and Opportunities**

As the ESMAP project ended, all of the pilots were moving forward and had indeed found areas that needed to be strengthened or modified before a smooth pathway for energy SME projects might be expected, particularly in tariff setting and certification procedures. The PV pilot projects are expected to leverage – directly and through parallel or immediate follow-on projects by other distribution companies that have shown significant interest – up to \$16.0 million of investment funding that is available for renewable energy based investments from the Peru Rural Electrification Project (FONER) which World Bank/GEF helped to design and implement, along with an additional \$2.0 million of distribution company investments, bringing connections to 15,000 to 20,000 households. The mainstreaming potential is considered to be almost 1 M households.

The business model of providing PV systems using SME CASEs and CAPs to perform collections and service functions is expected to be adopted by most of the distribution companies because their use makes a controllable business function for the distribution companies. In order to gain customer acceptance of electricity service that differs from grid provided electricity, there may need to be some “social conditioning” and the articulation of a clear strategy that includes PV systems as part of “pre-electrification” where the grid is likely to be extended at some point.

The overall potential for micro- and small-hydro projects is considered to be less than for PV systems as the grid is extended ever further. Nevertheless, the certification of existing proto-SERs as SERs and the award of CERs would allow more of them to remain operating while waiting for the grid. The work completed through the ESMAP project to establish and clarify regulations and procedures and for SERs/CERs to gain access to investment and tariff subsidies will encourage new micro-hydro projects where the grid will not arrive soon, bringing access to electricity closer to the GoP’s electrification goals.

Additional energy service SMEs might follow the same paths as blazed by ESMAP. These could include irrigation pumping SMEs and battery charging SMEs using renewable energy sources.

## Facilitating the Improved Cook Stoves Product Chain in Haiti

### Overview

Haiti is one of the most densely inhabited regions in the Caribbean and the poorest in the western hemisphere with 70% of its population living below the poverty line. Along with the recent political upheavals and natural disasters, environmental and socio-economic damage from deforestation is overwhelming efforts to reduce poverty. Deforestation is exacerbated by the ever increasing demand for wood for use as cooking fuel. The government of Haiti (GoH) has recognized the extreme, and possibly irreparable, damage being caused by deforestation and with the assistance of ESMAP in April 2007 completed the development of a strategy to alleviate the pressure of fuel demand on national wood fuel resources [see Box].

#### The 5 pillars of Haiti's Strategy to Reduce Fuel Demand to Save National Woodfuel Resources

1. Update and apply **rules and regulations** to support the course of actions,
2. Reduce **woodfuel demand**: Promotion of improved stoves,
3. Promote **alternative fuel imports**,
4. Foster **local options to substitute charcoal** and firewood, and
5. **Boost supply** by promoting: an upgrading of professional standards in the charcoal chains, the integration of firewood within the programs for rural development, and the promotion of a more effective and efficient management of forestry areas.

Approximately 55% of all of the energy used in Haiti is in the form of firewood (of which almost 90% is consumed in HH). Another 11% of the energy used is in the form of charcoal, again with almost 90% consumed by HH. Charcoal use for cooking is basically an urban phenomenon as around 98% of the rural HH still use firewood for cooking. The price of charcoal is still rising although less rapidly than the prices of alternative fuels such as kerosene and gas. Given that these fuels are generally much more expensive, there is continuing pressure to keep using wood or charcoal for cooking and virtually all poor HH do so. Nevertheless, the poorest consumers can only afford to purchase fuel in small quantities, thus paying at times 75% more than the same fuel in larger quantities.



Cooking in poor households is a basic affair usually accomplished on a **traditional stove**. For those using charcoal to cook, the stove is basically a highly inefficient, crude metal device (one-piece, three-legged and with the charcoal holding grill built into it) with a very short lifespan. In the Port-au-Prince metropolitan area alone, approximately 400,000 charcoal stoves are replaced annually. Starting in 1995 an effort supported by CARE, USAID and the Bureau of Mines and Energy (BME) to introduce more efficient cook stoves into Haiti identified and introduced the improved (or

fuel efficient) stove design dubbed the “Recho Mirak” (literally miracle stove). The new design relied on the same traditional materials (primarily recycled metal) used in the traditional stove

but was redesigned as a two-piece device: a small cylinder on three legs about 12 inches in diameter and 10 inches tall, closed at the bottom and a perforated saucer shaped grill set on top. A small door-like opening on the side of the cylinder is designed as an air control vent to improve combustion and heat retention.

The new design was shown to reduce charcoal usage by 30% or more over the traditional stove, but the price of the stove was almost double that of the traditional stove. While the stove's savings in charcoal would pay for itself in one month, households found it difficult to put aside enough funds to make the purchase. Even so, over 30,000 sold in the space of 9 years going from 1995 to 2004.



However, after the project ended, production and demand fell off to the point where almost no Miraks were available in the marketplace. The key impediment to a sustainable market model was found to be the project's strategy of purchasing a large quantity of the stoves from the small stove producers so that they would buy scrap metal in bulk and produce a stock of stoves for sale. Producers eventually stopped producing the stove *except on demand* because they could not afford to stock the materials.

Evaluation of the CARE/USAID/BME effort yielded insights for improving the sustainability of the efficient stove product chain. The main ones were to:

- reorganize the informal sector production into a better structured Small and Medium Enterprise type of production,
- sustain the market development over a longer period, such as five years, and
- aim to have the Recho Mirak sold at a price of not more than 15% above that of the traditional stove.

Finally, upgrading and incorporating the informal sector businesses into SMEs and making them more efficient, including partly mechanized production of stove parts, was proposed. These lessons were incorporated into the design of the ESMAP SME project.

As the ESMAP SME project got underway, it endeavored to build on the experience of this former project while modifying the elements that were deemed to have led to ultimate market collapse. As a result ESMAP and GoH agreed to collaborate on a new household energy strategy that focused on efforts to restart the production of and creation of market demand for more efficient stoves to support one of five main pillars of the 2007 strategy.

The Mirak Recho had already been proven to save significant amounts of charcoal and therefore operating costs. A large number of stoves had been sold in the prior project once their merits had been recognized by potential users. Haitian artisanal producers had already demonstrated that they could use the skills provided through training to produce a large quantity of good quality stoves.

So, the ESMAP project decided to re-introduce the Mirak Recho, initially focusing on three key actions to rebuild the product supply and demand chain shown in the Box: 1) training of

producers to improve their production capacity and quality, 2) maintaining the quality standards that guarantee the expected stove performance for purchasers, and 3) promotional activities to increase public awareness of the benefits of the newly available stove.

### Training of Producers and Traders



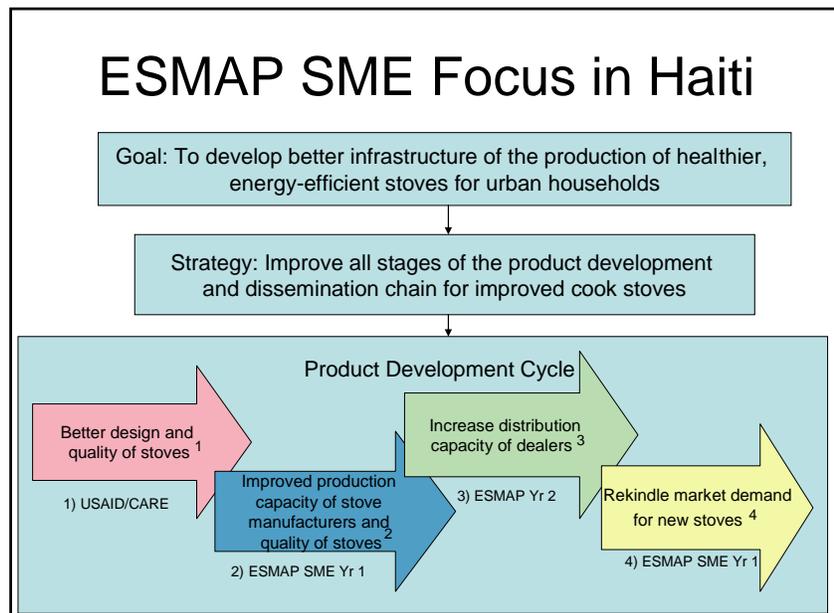
Training was undertaken under the aegis of CAFEM, a local firm operating in the field of technical and financial assistance. Using provided tools (compass, poincon, tape measure) and models (Gabari/patron) 30 training sessions of about 4 hours each on how to produce standard stoves took place over 15 months inside the shops of the artisans. Attendance varied from 4 to 12 per event. Metal sheet was not provided, but the standard stove produced for evaluation and certification was purchased by the trainer the same day. As of the end of

February 2009, after only 15 months of actual project implementation time (due to delays at the beginning), 144 artisans had been trained (target was 135), of which 127 were certified. In addition, 23 traders and 49 artisans received training in business and accounting together at the Bureau of Mines and Energy facilities during four (4) sessions with the aim of establishing links between them.

### Quality Standards and Labeling/Branding



The program introduced several activities to improve the quality of the stoves produced and to make it easy for consumers to identify those stoves that met the quality standards. As noted, the artisans themselves were offered certification. Only certified artisans can affix the Quality and Energy Efficiency Label (QEEL) developed to their completed stoves. The label is meant to be a visible symbol, reassuring customers that the stove sold meets the standards and will provide, at least, the advertised results. The BME distributed these labels to qualified producers and has taken on the activity of testing the efficiency and emissions of the stoves. The standards for certification were based on a protocol agreed by the GoH and the ESMAP program.



Only certified artisans can affix the Quality and Energy Efficiency Label (QEEL) developed to their completed stoves. The label is meant to be a visible symbol, reassuring customers that the stove sold meets the standards and will provide, at least, the advertised results. The BME distributed these labels to qualified producers and has taken on the activity of testing the efficiency and emissions of the stoves. The standards for certification were based on a protocol agreed by the GoH and the ESMAP program.

## Promotional Activities

Promotional activities included radio and TV advertisements featuring a local celebrity, the dissemination of a brochure in Haitian patois comparing the features and performance of the traditional stove and that of the Recho Mirak stove. Public events were held including a demonstration during Carnival and a mobile promotion was used in low income residential areas. A promotional video was also produced by UNDP using the project's materials with a Haitian cook praising the features of the stove. Evaluation of the promotional campaign indicated that sales were increased after such activities were instituted.

## Distribution capacity enhancements

For the distribution of the stoves a cooperative, serving as an intermediary between consumers and producers, was created by 2 local firms including CAFEM that was managing it. The Cooperative encouraged artisans to join, with a membership fee consisting of two *Mirak* stoves. The cooperative also financed an artisan turned distributor (see Box: "A Success Story...") and even acted as a wholesaler, setting up points of sale, placing orders for dozens of units and providing the stove producers with some assurance of regular sales. The cooperative is credited with a significant boost in stove sales (up to 67% of total sales in June 2008).

### A success story: the wholesaler Pericles

Pericles is a pretty handy craftsman and makes small charcoal stoves. But he considers himself more than just a skilled laborer: he's a businessman. He learned how to make the new improved stoves during a training session organized by the Office of Mines and Energy (OME) for the MIRAK Project back in 2000. So this new training can't teach him anything new. But he wants to make sure he gets certified. He plans to set up a network of street vendors in his native Leogane, a small town about 30 minutes Southeast of Port-au-Prince, and build on the interest ignited there by the earlier improved stove effort.

Convincing his fellow stove makers to work together and produce more stoves was a challenge. Maybe they saw how enterprising he was and decided to take a chance and see if he could deliver the sales he promised. Maybe they understood that if they worked together, they might have access to some credit to purchase sheet metal.

The next step for Pericles was to set up his sales network. He knew a lot of the street vendors in Leogane. These were mostly hardworking women who came to the markets on the edge of Port-au-Prince to buy their wares and head straight back out of town. He would start with them and use word of mouth. He'd get his cousins back home to help too. The Coop that got involved has some interesting proposals to look into.

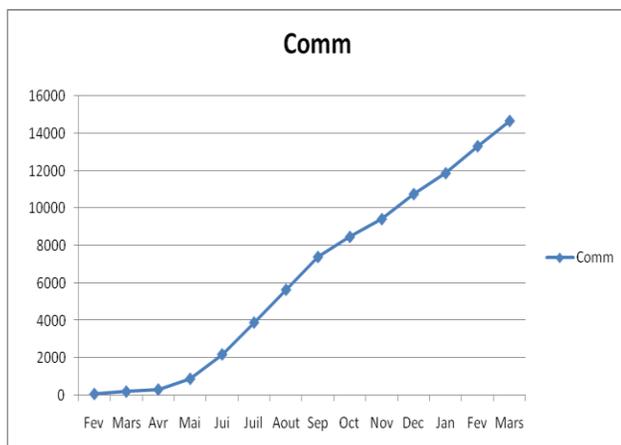
At the evaluation meeting ten months later, it was announced that the region that purchased the most Recho Mirak stoves during the project was not within the vast Port-au-Prince metropolitan area. It was the little town of Leogane. An artisan by the name of Pericles is selling the new stoves there by the dozen.

## Customer satisfaction

Customer appreciation was found to be quite high. In a survey of users, 94% considered it a "very good stove," and almost all users (97%) said they will purchase another *Recho Mirak* for themselves when needed and would recommend this purchase to family and friends. Once the consumers are able to jump the hurdle of the higher price of the *Mirak* stoves, they have expressed their satisfaction with the visibly greater performance of the newer model.

## Results and Remaining Challenges and Opportunities

The ESMAP SME project built on the lessons learned from earlier experience in Haiti and elsewhere in developing countries with improved cook stoves. Findings from those efforts are that the chances of success are enhanced when people have an explicit need to save fuel, when the new stoves are a significant improvement over the local traditional stoves, when stoves can be made readily available by local industries or artisans at affordable prices, and if assistance to develop the market is available for a long enough period.



The ESMAP SME project was designed as a multi-year effort which is necessary to build a market for and capacity to supply the improved stoves. By the end of this first phase of the project – with a duration of only about 15 months and an expenditure of about US\$ 400,000 – more than 14,600 stoves with quality labels had been built, labeled and sold by the certified artisans as of March 2009. Customers were quite satisfied with the improved stove. An ongoing promotion campaign consisting of radio spots, special events connected to holidays such as carnival, and advertising had been created and widely used with demonstrable effect on sales. A quality control and labeling operation was in place following a protocol reviewed by Government and stove tests were being undertaken by the laboratory of the implementing agency (Bureau des Mines et de l’Energie). The 30% plus savings expected were indeed documented. Some encouraging developments in improving the distribution capacity for the stoves also occurred, particularly the sales cooperative and its sponsoring of a “model” businessman who topped the charts as a stove salesman by utilizing village market sellers as outlets.

**For every 12,000 improved stoves sold, charcoal consumption is reduced by 2,700 tons per year at a saving for poor households of 1 M US\$ per year and between 300 to 700 hectares of the forest resource of Haiti.**

Funding for the second phase of the project is being sought from several sources including ESMAP itself and through a carbon credit mechanism. The new phase will strive for a critical mass to support a sustainable business cycle for the stoves and will focus on:

- Further improving stove production capacity including reducing the cost of input materials possibly by bulk purchases, introducing the kits and developing credit lines,
- Improving distribution channels to increase the “sales force” to create a steadier demand for the product, including building on the cooperative model and the “sales network” model introduced in the first phase.
- Reducing costs associated with delivering stoves to marketplaces,
- Continuing quality control improvements,
- Continuing promotional activities, and
- Devising payment schemes that will reduce the reticence of purchasers to pay a “premium” for the improved device.

### **Competition Among Energy SMEs**

The pervasive use of wood as a source of fuel has also generated an important economic dependency on this energy market. Woodcutting and charcoal manufacture as well as the distribution and sale of these products constitute a substantial source of employment and revenue in the rural areas. An estimated 16% of rural revenues are generated by these activities in a context of constantly high unemployment. Hence, another key issue in solving Haiti’s energy-environment puzzle is providing alternative employment opportunities to the rural populations.

In addition, the next phase will tackle the economic “downside” of improved cooking stoves: decreased demand for charcoal. Replacing these unsustainable existing energy SMEs with more sustainable ones is a challenge that must be addressed.

## ***Advancing Decentralized Energy Services SMEs in Cambodia***

### **Overview**

Approximately 80 percent of Cambodia's 14 million inhabitants live in rural areas and about 37 percent of this population lives below the poverty line of less than 50 US cents per day and more than half live on less than US\$1 a day. Seasonal food shortages are prevalent. Thirty percent of poor rural household expenditure is for energy -- with cooking comprising 70% of this cost. Therefore, to help alleviate poverty, reducing the cost of rural energy supply is a crucial component and ESMAP Energy SME project in Cambodia's overall goal to improving and increasing decentralized energy services to the rural poor.

In 2005 about 77% of all energy used in Cambodia was supplied by wood energy and various other types of biomass including dung and other agricultural residues. Wood and charcoal provide almost all these supplies for industries and households. Ninety percent of the rural population of 2.1 million households depends on firewood and charcoal for cooking. The supply chain for wood energy comprises thousands of small SME suppliers and also around 50 stove producers. The present household demand for wood is more than 4 million tons per year, and there is an increasing demand by industries, the most notable of which is charcoal production for cities like Phnom Penh. These trends place heavy pressure on Cambodia's natural resources and, if managed unsustainably, can have severe socio-economic implications for the country.

Given the option, most rural and urban Cambodians will generally choose electricity – from the grid or self-generated or from batteries – in place of the poorer alternatives for lighting and appliance use that they now have to resort to.<sup>10</sup> Rural residents have very limited access to electricity, e.g., currently only two percent of Cambodia's rural population is connected to the National grid and another seven percent have electricity from Rural Electricity Entrepreneurs (REE) or from their own generator sets. Despite being a low-income country, Cambodia has some of the highest electricity tariffs due to the very limited coverage of the National electricity grid. Most of the rural population therefore uses kerosene, batteries and candles for lighting and batteries to operate small appliances. As grid electricity will not reach many villages in the next 10 years, and car batteries (at \$40 each) are too expensive for about 30% of rural families, these families will spend around \$3 per month on average (with costs rising as oil prices rise) to light with kerosene.

The ESMAP Energy SME project, "SMEs in Decentralized Energy Services Program in Cambodia," is stimulating the Cambodian rural economy by helping to develop and test economically viable business models (Energy SMEs) that provide sustainable and more efficient energy services to the rural poor and investment and finance vehicles to expand their use. SMEs comprise the bulk of the private sector in Cambodia. The project fosters local, private sector

---

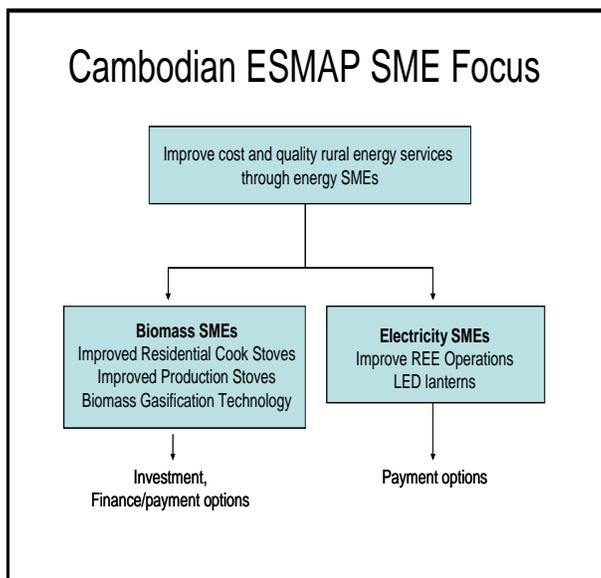
<sup>10</sup> UNDP, Residential Energy Demand in Rural Cambodia: an Empirical Study for Kampong Speu and Svay Rieng, March 2008.

entrepreneurship and investment in the provision of energy services in the remote regions of Cambodia.

Guided by the objectives of the government’s Wood Energy Working Group and the national policy on rural electrification, the project has a dual energy focus: improving the efficiency with which biomass is used and improving access to electricity or, if this was beyond reach, then improving the devices that are commonly substituted for lighting in rural areas.

To enhance the role of SMEs in energy services, the Cambodia ESMAP SME project features several components, including:

- Motive Power (Biomass Gasification) SMEs: Supporting the development of a replicable and financeable business model for biomass gasification via pilot projects,
- Supporting pilot projects to introduce new or improved, affordable energy using technologies and strategies to scale them up. These include:
  - Improved household cook stoves
  - Improved production of stoves (see also box), and
  - Solar powered LED lanterns to replace kerosene and candles.
- Electricity SMEs: Technical and managerial training to the country’s licensed REEs in order for them to provide better quality and more competitive electricity services to end-users.



Finally, the project developed new structures to increasing access to private sector finance for energy SMEs by identifying potential donors and banks and hosting workshops to generate interest and awareness.

As a result of the assistance provided by the ESMAP SME project,

- A joint venture has been formed to offer turn-key project services offering a one-stop integrated service after 5 biogas projects were developed and demonstrated, financing schemes were tested and 30 gasifiers were sold
- The improved household cook stove pilot project in rural areas spurred the development of a GoC-led Action Plan to introduce 1 million new cook stoves in 4 years and funding from AusAid and other interested donors will support the implementation of the Action Plan.

- A social venture company will pick up the production and marketing of the granulated palm sugar including financing the installation of the efficient palm sugar stove. The granulated palm sugar can be exported as a high quality aromatic and organic sugar.
- Many REEs improved their system efficiency and safety with a few reporting a 20% reduction in diesel consumption. As a result of their request for more advanced training and on-the-job training to improve their performance, the Rural Electrification Fund (REF) supported by IDA and GEF will continue similar training courses to new licensed REEs and also provide advanced training to those REEs that attended the first training.

The solar powered LED lantern project ended inconclusively as the lantern sold primarily to wealthier households because of the cost and despite efforts to provide payment options more appealing to lower income households.

### **Motive Power SME using Biomass Gasification Technology**

During the course of the Biomass Gasification Pilot, ESMAP SME Cambodia worked with a consulting firm, SME-Cambodia, to collect and analyze market information and data in order to determine which productive enterprises might benefit from substituting gas produced from biomass for increasingly expensive diesel fuel. It determined that rice mills and a few other types of SMEs (e.g., brick and ice plant operations) had high fuel substitution potential. There are more than 500 rice mills with greater than 1 ton per hour capacity operating in Cambodia of which about one half would have significant benefits from biomass gasification systems. A typical rice mill could reduce its diesel consumption by 60,000 liters per year, thus substituting rice husks for imported fossil fuels and saving around \$6,000 per year. If 250 converted to biogas, about 15 million liters of diesel would be saved.

Economic analyses to establish the potential financial benefits possible from adopting this technology showed that rice mills had the greatest potential as fuel costs represent about 70% of the cost of operations of milling rice and the rice husks as a biomass fuel are readily available at no cost. Reducing diesel fuel consumption and expenditures by 70%-75% by substituting the resulting “producer gas” for 70%-75% of diesel fuel currently consumed in existing diesel engines would thus save over 50% of total operating costs. Rice mills and other SMEs using 100% “gas” engines could reduce current diesel fuel consumption by 100% but doing so would require additional investment in a specially designed 100% gas engine.

SME Cambodia demonstrated the value of an integrated service approach by developing several projects and doing trials of alternative financing schema. This approach was developed by SME-Cambodia in cooperation with E&Co, a not for profit ethical investment organization. They formed a joint venture company SME-Renewable Energy Ltd. to offer turn-key project services. During the project, SME-Cambodia received orders for over 30 gasifiers. The final report was structured as an Action Plan.

The Plan identified a high potential for gasifiers in medium size enterprises. To establish a sustainable gasifier industry the proposed funding for the Action Plan comprises \$4.5 million for a loan scheme and \$350,000 for staff training and development of a technical and financial management capability in Cambodia and \$220,000 for the establishment and regulation of

equipment standards and to ensure the source of biomass supply are environmentally sustainable. In addition, two existing REEs that were once utilizing diesel are replacing their systems with biomass gasification technology and will provide improved, cleaner electricity to over 2,000 households.<sup>11</sup> The IFC is considering funding of the project. The loan facility is at commercial rates of interest with a grace period and therefore similar to other projects supported by IFC.

## **Retail Product Manufacturing and Sales SMEs for Improved Energy Efficient Cook Stoves**

### **Improved Household Cook Stoves**

The Program provided support to introduce efficient cook stoves into rural Cambodia. Pilot activity was implemented through GERES-Cambodia, a non profit organization specializing in developing and disseminating more efficient stoves. An initial assessment examined existing cook stove supply and usage. It concluded that rural households showed a high interest to switch to improved cook stoves if the benefits of doing so were demonstrated and the features were better than their traditional stoves.

A new stove design was introduced and tested throughout pilot areas. Through the pilot trials 3,000 efficient Neang Kongrey Stoves (NKS) were sold in rural villages.<sup>12</sup> During the pilot a total of 8,214 improved cook stoves were disseminated to rural areas of Cambodia with the objective of commercialization through various approaches. The fuel savings, shorter cooking times and smoke reduction of the NKS was very much appreciated by households that tried them. Wood or charcoal savings over the traditional stove were found to be on the order of 25%.

The pilot trials established that it is feasible to disseminate a large number of efficient cook stoves in rural areas, but a number of issues need to be addressed. The project then identified improvements that could be made to improve the marketability of the stoves. The diagnostic found a lack of knowledge of the benefits of improved cook stoves in rural villages and only limited distribution to the village level. Women running village grocery shops and agreeing to sell the NKS were interested in continuing doing so but identified quality issues and the need for a larger size NKS. In addition, the present small-scale production capacity of the improved cook stove manufacturers enlisted in the pilot could not keep up with the pace of the pilot dissemination.

On the basis of the program results, a strategy for a National Efficient Cookstove Program (NECP) for rural Cambodia was formulated (by the ESMAP SME Team in cooperation with GERES and MIME) that will disseminate 1 million efficient cook stoves over 4 years. The Plan calls for establishment of 26 regional manufacturing facilities. ***The World Bank's ASTAE program has taken on improvement of stove production capacity and the development of alternative models of manufacturing.*** ASTAE's involvement includes the construction of a model production facility to demonstrate methods to increase productivity and quality, quality

---

<sup>11</sup> Note however that the project funding mechanism tested with the pilot SMEs is only viable with relatively large operations. It would not be suitable for funding new and small village biomass electricity grids, for example.

<sup>12</sup> The selection of the NKS was made after testing 9 parameters for four stoves suitable for rural dissemination found the NKS to perform the best.

standards, accreditation, licensing and labeling with stoves and support of distribution and sales. Partial funding for the NECP has been secured from World Bank/AusAID Trust Fund.

### **Improved Palm Sugar Stove**

The program supported GERES - Cambodia in the development of commercialization strategies for an improved Palm Sugar Production Stove, called the Vattanak stove.<sup>13</sup> In Cambodia – as in other countries in Southeast Asia – the *Borassus Flabellifer* palm tree is commonly grown in rural areas and produces a sweet sap. This sap is collected by sugar producers who boil the sap to evaporate the 80% liquid using a traditional stove to produce palm sugar. It is usually sold as a semi liquid paste or more rarely in solid pellet form.

The first activity was to survey potential energy savings and other benefits of broad scale dissemination of the Vattanak stove. The identified benefits with regard to the palm sugar industry are:

- Approximately 20,000 palm sugar producers being able to improve their economic viability;
- Wood saving of 40% by the industry or approximately 40,000 tons per year;
- Estimated CO2 emission reductions of 60,000 tons per year and significant reductions of smoke and air pollution in the work place due to the chimney and controlled combustion;
- Possibilities of producing high quality granulated palm sugar through the use of the ELIC technology. This should allow the producers to significantly increase their incomes, and in association with financial schemes, should also make the Vattanak Stove affordable, even for very small producers.
- Possibilities for regional sales of the technology.

The project demonstrated that palm sugar producers were interested in the benefits of the improved palm sugar stove. The total cost of the stove including manufacturing of ceramic parts, transportation and installation by masons was \$70, which was found to be too expensive in relation to the income of producers. Through a payment scheme of installments (part in currency spread over three installments and part palm sugar production), GERES sold 35 efficient palm sugar stoves.

The pilot dissemination project was successful in demonstrating the feasibility of introducing efficient palm sugar stove technology. GERES-Cambodia developed the granulated palm sugar, undertook the pilot trials and created a new social venture company to market the granulated palm sugar. The market potential is very high as previously only paste was available which deteriorated quickly. In contrast the granulated sugar which has a high aromatic caramel like flavor can be used broadly in cooking, food processing and as sugar in coffee and tea. The stove also has been found to have potential for other Small Scale Industries (SSI), such as noodle makers, rice wine, soybean processing.

---

<sup>13</sup> GERES-Cambodia designed the very efficient new palm sugar stove, “Vattanak”, based on Efficient Lateral Inverted Combustion Technology (ELIC) developed by the French organization Planète Bois.

## **ELECTRICITY SMEs**

### **Improving Efficiency and Effectiveness of Rural Electricity Enterprise SMEs**

REEs are the main providers of local grid electricity in urban areas. However, an initial market diagnosis revealed that REEs were going out of business because of the high costs of electricity production resulting in prices of about \$1 per kWh, which is too high for rural users. While there were about 600 REEs operating mini grids driven by diesel engines in 2002, this number had declined to around 300 by 2006 due to the increased fuel costs, which accounts to 84% of their total costs. At present 150 licensed REEs provide the bulk of rural electricity with local grids powered by diesel generators. To reverse the decline in REEs the project's strategy focused on improving the efficiency of the operations of remaining REEs and encouraging new REEs to be formed.

The Program provided support to Centre Krom Ngoy (CKN) and EDC-Training Center to provide technical, safety, and business management training to REEs. CKN provided a *mobile training program* that traveled to the northern areas of Cambodia to bring the training to remote REEs. EDC Training Center, located in Phnom Penh, provided training to REEs located in Southern areas of Cambodia. All 150 licensed REEs were invited to the trainings and 122 of them attended, represented by both owners and technicians, a total of 240 individuals were trained. As a result of the trainings, many REEs improved their system efficiency and safety with a few reporting a 20% reduction in diesel consumption. Subsequently REE managers requested the World Bank to support more advanced training and on-the-job training to improve their performance. *The Rural Electrification Fund (REF) supported by IDA and GEF will continue similar training courses* to new licensed REEs and those REEs that were unable to attend the previous training and also provide an advanced training course to those REEs that attended the first training.

### **Retail SMEs' Sales of Improved Household Lighting Product**

Prior to the ESMAP supported project, several NGOs had tried to develop alternatives to kerosene lighting. A handful launched dissemination projects resulting in reasonable interest of consumers, but there were many points for improvement concerning quality, manufacturing, cost and dissemination strategy. Consumers considered that most of these lanterns were either technically unsuitable or lacked robustness and/or were too expensive (given their quality) to motivate them to switch away from kerosene. In another attempt to get the market conditions right for this needed product, the Program supported Resource Development International (RDI) in pilot testing their LED lantern model. To ease payment for the lanterns, RDI developed a rental scheme and also a 5 month payment scheme to ease the first cost of the lanterns (plus solar charger) to poor households. Existing retail entrepreneurs (SMEs) such as existing district market retailers, village shop owners and a few battery charging stations were enlisted to sell the lanterns on a payment scheme or to rent them.

Most families found the RDI lantern too expensive; although it sold to some wealthier families, many of which already had batteries and used the lights mainly as flashlights. It was also found that the entrepreneurs were not yet well trained and that local retailers are not in favor of

providing payment schemes unless they know the customer. The rental scheme was recently revised, and the retail price of the lantern reduced just above the import price. Twenty-five additional entrepreneurs were also trained for 3 weeks and at the end of the course they found more than 500 potential customers. The LED-lantern will be sold on a payment scheme and rented for \$2 per month including a solar panel of 2 watts to make it affordable to the poor.

The main conclusion from the project is that neither the RDI lantern nor the other previously tested lanterns are ready for broad scale dissemination and that the market strategies have not yet become fully commercial. Especially when solar charging is included in the cost of the lanterns, they are too expensive and leave a very low profit margin for producers and entrepreneur or the price is too high for the consumer to purchase or rent the solar lantern.

However, the pilot project shows that the lanterns can provide great benefits for the rural poor if the quality/price ratio can be improved. Therefore additional efforts to lower the cost of purchase or manufacturing and dissemination are warranted. Significant efforts to develop affordable lighting alternatives are taking place elsewhere under ESMAP Programs and by other donors.

### **Access to Finance and Co-Financing**

The Program funded a study on “Access to Finance” in Cambodia for SME Energy Service Providers which came up with several recommendations on and options for enhanced access to finance for REEs. One option presented was a risk sharing facility (RSF) with local commercial banks to encourage financial support to the REEs. This model has proven effective in the region for financing renewable energy and energy efficiency projects. The consultant that prepared the study, under funding from AusAID, will continue to develop the Risk Sharing Facility.

During project implementation, funds were secured for 2 additional pilot projects from the Asia Alternative and Sustainable Energy Program (ASTAE): (i) support for the private sector development program for the National Biodigester Program (\$70,000); and (ii) the development of a Model Production Facility for the improved cookstove (Neang Kongrey Model) (\$50,000). The World Bank ESMAP Project also coordinated two research projects, the first was funded by the Japanese Consultant Trust Fund (\$45,000) and generated data on the benefits of the energy technologies at the village level in order to improve dissemination strategies and a second project, funded by the GAPFund (\$45,000), analyzed the gender dimensions of each of the pilot projects and formulated recommendations for gender mainstreaming of sustainable and efficient energy service delivery.

## ***SME (Small and Medium Size Enterprises) Engagement in the Provision of Decentralized Energy Services***

In most developing countries, delivering modern energy services to the poor presents formidable institutional and regulatory barriers. The emerging experience is that small and medium enterprises (SMEs) are better positioned than large-scale energy providers to effectively deliver decentralized and small-scale energy services. ESMAP's Energy SME Program was a global initiative to include SMEs in the energy agenda in a comprehensive and sustained manner.

In developing and carrying out the program ESMAP adopted a broad definition of Energy SME. An ESMAP Energy SME could be one of the following:

- A producer of energy efficient products (either improving affordability or health effects) such as improved charcoal cooking stoves or food production stoves or energy efficient lighting.
- A producer of grid or off-grid electricity in areas formerly without access.
- An energy supplier of alternative fuel substituting for higher cost, dirtier or depleting fuel: such as bio-gasifiers and charcoal kilns.

### **What is an Energy SME?**

- An Energy SME could be one of the following:
  - Producer of energy efficient (EE) products (improving affordability and health benefits) such as cook stoves, EE lighting, production stoves.
  - Producer of grid or off-grid electricity in areas formerly without access.
  - Energy supplier of alternative fuel substituting for higher cost, dirtier or depleting fuel: such as biogasifiers and charcoal kilns.
- The energy source could be either renewable or conventional fuels.
- Technologies chosen are based on local needs and conditions.

The energy source could be either renewable or conventional fuels but should have significant advantages for the user over the traditional energy source such as quality or health benefits or cost advantages. The program was technology neutral but those chosen should be based on local needs and conditions.

ESMAP's approach to introducing Energy SMEs in energy markets for service provision to the poor in rural, small towns, and peri-urban areas was systematic:

- Identifying promising market segments (where modern energy needs were the greatest)
- Identifying existing Energy SMEs and determining the barriers to market entry by them and helping new Energy SMEs to get started,
- Devising solutions that would unblock their participation, and
- Identifying partners, both local and international, that could work with the program to implement the solutions to build a sustainable market involving Energy SMEs.

The types of barriers typically encountered included difficulties with import or local production capability, poor distribution systems or post-sales service capability, unwillingness of consumers to use new product possibly because of unfamiliar or unacceptable product cost or features, and lack of access to credit for product purchase or to investment funds for SME start-up.

Partnering with other entities was a necessary activity to gain buy in from stakeholders and because ESMAP SME funds could only be used to provide technical assistance. So, coordination with other donor programs was essential in addressing all barriers, developing pilot projects that included hardware acquisition, or for the inevitable follow on activities that would be needed to complete the project plan given the short duration of some of the projects from start-up to program completion.

The ESMAP Energy SME program identified and addressed several market segments that were important in the particular participating country and that had applicability in other regions and countries with similar market imperfections. The segments addressed and their locations were the following:

- Cook stoves: **Haiti, Cambodia** (household and production)
- Lighting: **Lighting Africa, Bolivia, Cambodia, and Nicaragua** (also small appliances)
- Motive Power: **Cambodia, Burkina Faso**
- Cooking Fuel Production: **Nicaragua** (charcoal)
- Off or On-grid Electricity Supply: **Peru, Bolivia, Cameroon, Guinea, Tanzania, Zambia, Mongolia**
- Pre-electrification: **Bolivia, Nicaragua**

During its short lifetime, ESMAP SME Program developed 22 separate projects in thirteen countries. The **Table** at the end of the document provides an overview of each ESMAP SME project, its strategy and market segments targeted, the SME potential envisioned, the types of intervention applied in the project, the present stage and major accomplishments of the project and the leverage achieved and linkages made to move from project to sustainable Energy SME market activity. Case studies are provided in the Appendix for **Cambodia, Peru, Bolivia, Haiti, Cameroon Tanzania**, and *Lighting Africa* and serve to illustrate in more detail the way ESMAP SME projects were conceived, developed, and implemented.

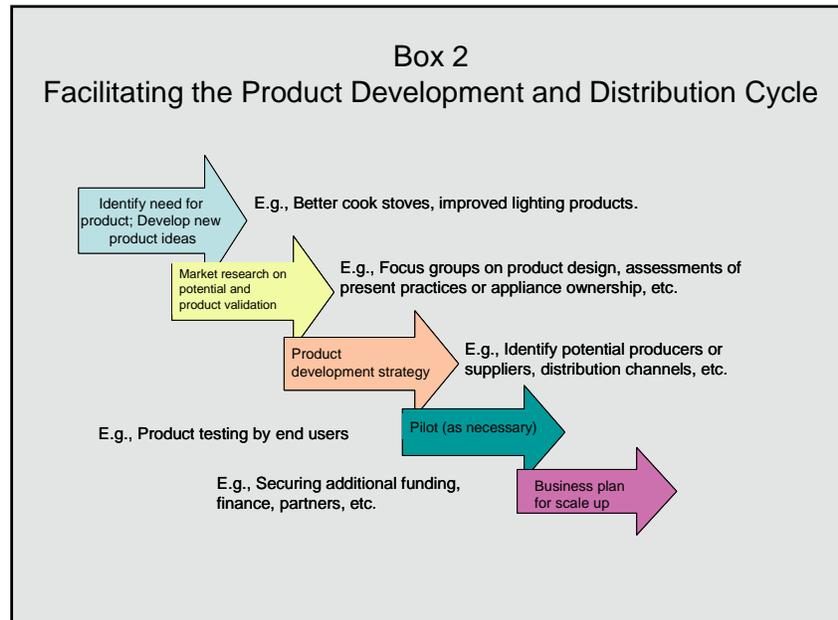
There were two main approaches taken to develop Energy SMEs in the above market segments: a product supply chain approach and a market entry approach. The product supply chain approach was most appropriate for facilitating product development for:

- Such end uses as cook stoves, lighting products such as LED lanterns and solar home systems and
- Motive power substitution and improved fuel production involving new or improved technologies.

The product chain approach involves looking at the entire product chain to identify those areas that need reinforcing in order to create a cost-effective, efficient and sustainable supply of targeted products to the users of those products. Typically a product chain starts with identifying the need for a new product and developing product concepts that improve substantially on existing products; conducting market assessments on market size and validating the product within that market (such as product trials with typical users and evaluating their opinions of the product), putting together a product development strategy that includes the potential producers (or importers), distribution channels existing or needed, conducting pilot tests of the supply chain in an area to test distribution as well as product acceptance, and developing a business plan for scale up of the product chain.

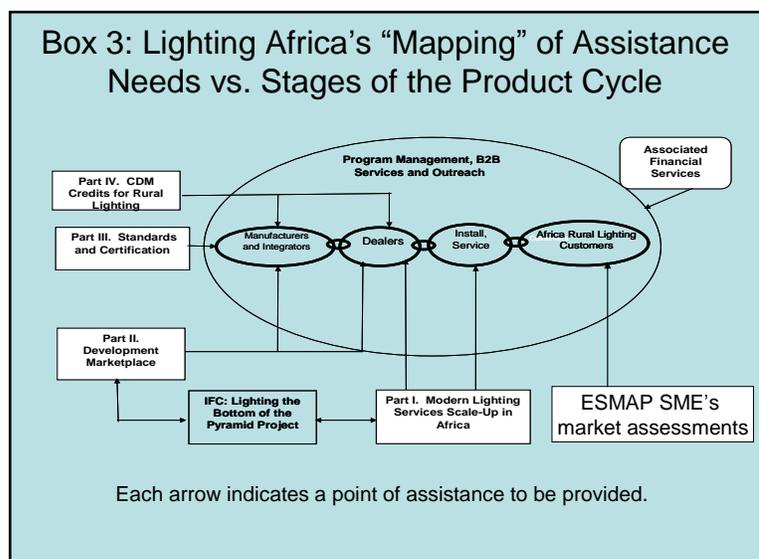
**Box 2** provides examples of the type of facilitation that might be needed to improve the product or its distribution channels. Examples drawn from ESMAP SME for the stages of the chain that were targeted for improvement in specific projects include:

- **Haiti** (cook stoves): improved design, production techniques, demand creation, distribution and materials procurement.



- **Cambodia** (cook stoves for households & production): market surveys, production improvements (e.g., model production facility), credit for purchase, development of GoC Action Plan for 1 million household stoves in 4 years, leveraging of finance for scale up of production resulting in 35 production stoves sold and 40 more on order with major savings (40%) in wood inputs.
- **Bolivia and Nicaragua**: application of techniques developed by “sister” ESMAP SME projects, e.g., focus group and product testing methodologies for a variety of possible lighting products to be introduced.
- **Lighting Africa**: market surveys and product testing formed the basis of entire product strategy.

*Lighting Africa's* strategic assistance is specifically designed to improve linkages and the effectiveness of the product supply chain for lighting products that will replace kerosene, candles, and paraffin lamps as well as expensive batteries. The ESMAP Energy SME program funded the market assessments in three countries (Zambia, Tanzania and Ethiopia) that provided a solid basis for the development of viable lighting services in numerous African countries. *Lighting Africa's* "dissection" of the product chain



into manufacturers and integrators, dealers, installers and service providers, and finally the customers allows it to pinpoint the assistance needed and how it will be applied by different parts of its program. This approach is illustrated in **Box 3**.

As noted, the ESMAP SME projects that are promoting efficient lighting are working together to share market research methodologies and findings on product testing and consumer preferences for different technologies. This has allowed for comparisons among regions and markets. Lighting product replacements for traditional lighting are still fighting an uphill battle for consumer acceptance primarily because of the cost of the product. Efforts in the projects cited have focused on reducing costs, related for example to import tariffs or high distribution costs, improving product robustness and weatherproof characteristics, and developing payment plans that could mitigate the higher cost of the lighting devices. While there have been some successes, this is clearly an area needing more work to get the price/benefit ratio right for the very low incomes found in remote rural areas. With its broader regional base and the attraction of the much larger market that it represents, as well as its methodical attention to all aspects of the product chain, *Lighting Africa* offers a great deal of hope for improving the odds of success for SMEs selling lighting products.

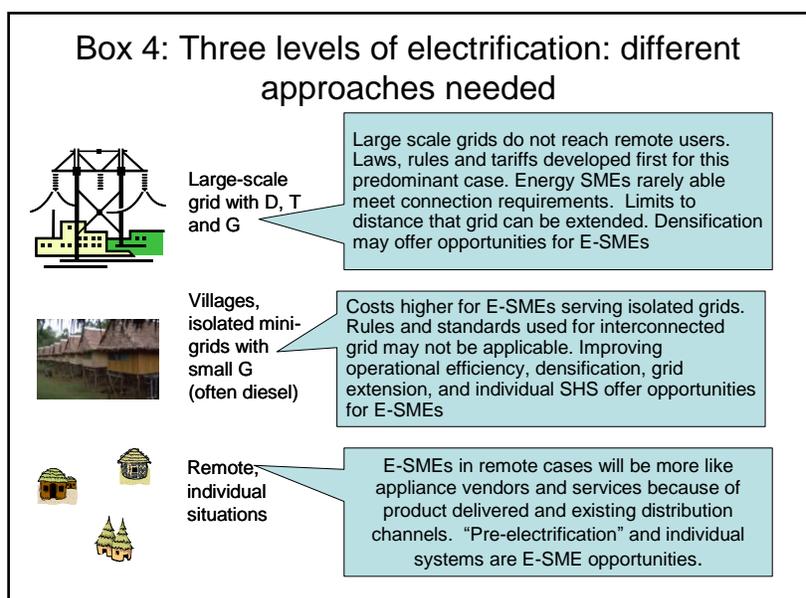
ESMAP SME projects trying to promote grid densification, grid extension, and development or expansion of isolated grids found that a "market entry approach" was more suited to their proposed projects. In virtually all developing countries an electricity grid serves at least a portion of the population, mostly urban, and in most of them, the industry structure was reformed during the past couple of decades possibly by breaking up the single government owned vertically integrated company, almost always by restructuring the industry, and inviting private participation in some or all of the resulting entities (distribution, transmission, and/or generation). In these cases, rules, regulations, and new entities such as an independent regulator have most likely been created to cover market operations.

However, often, the bulk of the population, usually rural, would not be covered by the new market structure because they are located physically outside of it. Underfunded rural

electrification initiatives generally had little impact. Until recently, many governments have taken a “let them come” approach, i.e., letting donors and aid organizations develop projects to serve small segments of the population with renewable resource based solutions or a private operator (possibly a local cooperative or a large resource extraction industry) with a diesel-fueled mini-grid to serve an area. Now, particularly with their Millennium Development Goals in place but lacking viable means to meet those goals, governments are becoming more open to establishing markets with rules and regulations that better fit the situation and needs of remote populations. So, additional structures, rules and regulations are needed to begin to “universalize” the coverage of comparable service to those connected to the central grid as shown in **Box 4**.

The ESMAP SME program, drawing from World Bank research on rural electrification, has made a significant contribution in developing market entry approaches for rural electrification tailored to the country situation. A range of electrification needs were identified in 10 separate projects: pre-electrification, off-grid development, grid densification, and developing and improving efficiency of operation of isolated grids. A range of technologies were applied as appropriate to the location and the energy needs of those served: PV Solar Home Systems and Pico-PV, Micro and Pico-hydro, biomass gasification to replace diesel in isolated grids, and improved efficiency of diesel fuel usage by existing mini- or isolated grid operators. The assistance that was provided varied according to the starting conditions encountered. For example,

- Assistance was provided to existing rural electricity isolated mini-grid operators to improve operations and profitability (e.g., through training) in **Cambodia and Bolivia**
- Development of legal and regulatory bases and competencies, appropriate tariffs and pre-feasibility studies for high cost remote on- and off-grid operations (in **Peru, Bolivia, Cameroon, Guinea, Tanzania, and Lao PDR**) to unblock access to existing subsidies and development funds and establish a path for development to come.



The importance of this latter assistance cannot be underestimated. Often the regulatory approach is “one-size-fits-all” which means that small isolated systems and remote individual situations are required to meet standards that are far too stringent for the actual situation on the ground. In Tanzania, the principle of light-handed regulation was successfully introduced to reduce this tendency.

There is also an equity aspect underlying the barriers encountered in creating the conditions for accessing low income tariffs (or tariffs more appropriate to the type of service provided) and subsidies for operation that would be available for mainstream operators. Gaining access means lower costs for the operators and “double benefits” for the consumer (in lower tariffs or costs for the comparable service prior to intervention and in lower costs passed on by the operators). Several ESMAP SME projects successfully gained access to rural electrification subsidies as a direct result of assistance to assist alternative technologies and business models to qualify. For example, in **Burkina Faso**, the Action Plan developed by ESMAP accessed more than \$38M from Power Sector Development project for energy access. In the **Peru** project, access to FONER finance will open up development of up to 20,000 renewable energy based connections. The establishment of structures and rules that work for rural electrification situations described above promises tremendous payback for the initial investment of ESMAP SME funds because, if properly structured, the new rules of the market will unleash private investment and consumer purchases of better products such as “pico-PV” or LED lanterns. In **Bolivia**, ESMAP SME program helped GoB to develop a new service contract called a Medium Term Service Contract (MSC) for solar home systems, gaining access to subsidies for Energy SMEs and more appropriate service requirements for the size and nature of the SMEs’ operations. **Box 5** describes the MSC in greater detail. This work should be useful in similar situations in many countries.

In the case of **Peru** a further step has been accomplished. Not stopping at rewriting the rules and regulations, pilot projects were funded that were then used to do “test drives” on the new pathways developed to make sure that the interpretation of the rules did not cause new road blocks to project implementation. Indeed, technical assistance had to be applied to remove those blockages and create a clear road map for the projects already in the pipeline in the country. Other ESMAP SME projects such as those in **Tanzania** and **Lao PDR** need to take this next step in ensuring that the pipeline of projects getting ready to take advantage of the improved regulatory environment and access to rural electrification funds flows smoothly and if not, that remaining barriers are also addressed to ensure longer term sustainability.

### Medium Term Service Contract for SHS

Medium Term Service Contract is a new SHS business model that can be used when governments wish to subsidize rural off-grid electrification. It combines the strengths of the fee-for-service and dealer models.

- Companies must bid on a proposed number of connections (the bidding variable) for a fixed total level of subsidies per area. Subsidies are provided in return for five- to seven-year obligations to develop and serve small local markets.
- The winners of the MSCs will have the obligation to install a minimum number of systems over a period of less than three years, to service systems during an additional four years (starting from the date of installation), to develop the local SHS markets on the demand and supply side by educating users about SHSs and training future local spare parts suppliers, to report on their own performance, and to conduct user interviews for project evaluation.
- Since the operators are free to choose between cash sales, microcredit, finance or lease, they have considerable freedom to find the best business plan for their geographic areas.

A few opportunities to improve the fuels available for motive power were identified. The resulting projects provided leverage for Energy SME “implantation” in those countries. For example, in **Cambodia** the project identified an opportunity to introduce biomass gasification of rice hulls as a substitute for increasingly expensive diesel fuel for use by rice producers in their production processes as well as by other productive uses with access to excess rice hulls,

including existing rural electricity SMEs. After successful demonstrations of the technology and development of a financing scheme, 30 gasifiers were sold and a joint venture created to implement the Action Plan for scale up had received orders for 40 more. In **Burkina Faso**, interest in the multi-function platform motive power demonstration led to a proposal by the Ministry of Finance for funding scale up. Rural electrification fund created (SMEs eligible to access it).

## **Conclusions on the Results of the ESMAP Energy SME Program**

### **Key outcomes of the ESMAP SME Program include:**

- Increase in number and size of commercially viable, sustainable energy SMEs with access to markets.
- Increase in the number of households and or businesses receiving the services of these SMEs.
- Commercially viable pilots and successful business models ready for scaling-up, including increased domestic financial services / resources.
- Substantial learning and knowledge exchange opportunities among projects with like objectives, products, or technology applications.
- Substantial leverage of initial ESMAP/DfID funds to continue market development.

### **Considerations for future efforts include:**

- Energy SME market development projects require sustained multi-year efforts to bear fruit.
- Integration into parallel bank operations such as GPOBA, PPIAF et al. (operational leveraging) can substantially increase effectiveness.
- Enlisting the private sector in development efforts and linking to governmental priorities can vastly improve effectiveness.
- Early identification of barriers that cannot be overcome is important (to avoid waste of resources).
- Some projects may falter not from bad design or execution but from forces outside of normal control such as civil wars or change in government. These risks cannot be foreseen but are very real.