Micro-financing of renewable energy systems

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Abstract
While improved energy services have many quality of life benefits like lighting or television, the productive use of electricity can also help to reduce poverty, leading to increased profitability and productivity for micro, small and medium enterprises, and small industries. The remoteness of rural locations usually makes it difficult to expand electricity supply through a centralised grid system. Therefore people living in off-grid regions often rely on expensive fossil fuels like diesel and kerosene. People in remote areas often do not have the financial background to afford the initial costs for renewable energy applications. Micro-financing of renewable energy systems is a possible answer to provide financial services and support productive activities in a sustainable manner for low-income people. There are various types of microfinance institutions (MFIs), ranging from local cooperatives, NGOs, credit unions, private commercial banks and non-bank financial institutions as well as parts of state-owned banks.

To underline the benefits of micro financing renewable energy systems, good practice projects of local microfinance activities are presented. These projects have been identified in the course of WISIONS, an initiative of the Wuppertal Institute for Climate, Environment and Energy with support of ProEvolution, a Swiss-based foundation.

The two different approaches of the project support on one side the realisation of new project ideas (SEPS – Sustainable Energy Project Support) and on the other spread successful examples (PREP – Promotion of Resource Efficiency Projects). Through the PREP field of action, good practices in energy and resource efficiency are spread worldwide through the Internet and brochures. In the 5th PREP-brochure of WISIONS on "Microfinance and Renewable Energy" five good-practice examples are shown that link this promising financing system with modern and sustainable renewable energy technologies.

Introduction
Internationally it has been recognised that energy is vital for achieving the Millennium Development Goals (MDG's) like poverty reduction, better education, health improvement, gender equity, etc. But still access to safe and reliable energy is not given for millions of people in developing countries (UNDP 2005), where the time to extend public grid may be very long and expensive, fuel transport and cost create difficulties for decentralised fossil-fuel-based electrification. Likewise - since scientific reports on an upcoming global warming have been approved - it has been internationally accepted that emission abatement should be mandatory and is possible through improving energy efficiency, efficient and sustainable utilisation of existing resources and shifting over to the application of renewable energy fuels and technologies. Increasing attention is being paid on 'renewable energy' by the international political arena for restructuring the global energy systems. The first International Conference for Renewable Energies in Bonn 2004 led to expediting the process of increasing the share of renewable energies in total primary energy consumption. The International Action Plan that was presented in Bonn showed numerous options and activities in several countries that are currently implemented (GTZ 2004).

In addition to these highlighted activities, it is necessary to foster more sustainable energy projects not only on a large scale, but specifically the smaller ones, leading to an improvement of the livelihood in emerging and developing countries on a wider and countable scale. Especially in the developing world, adequate financing for renewable energy systems is lacking, particularly for rural electrification based on renewable energy sources, which might in principle be the best solution in the short and medium term for satisfying the need of power and improve living conditions. Microfinance has the possibility to bridge this gap. Playing a key role in many Millennium Development Goals, microfinance can assist to ensure environmental sustainability by increasing the 'percentage of financial institutions offering microfinance and other financial services that promote environmentally sustainable businesses and alternatives' and by increasing the 'percentage of slum dwellers and other poor and low income people who can access microfinance for home improvements' (UNCDF 2005).

Looking in detail at the current experience of microfinance institutions shows that the recent focus lies solely on financial and most urgent social issues. However, in terms of leap-frogging it would be necessary to think ahead, considering environmental and sustainability issues and effects. WISIONS aims to take this into account and therefore promotes existing projects that are linking microfinance with renewable energy technologies in its PREP (Promotion of Resource Efficiency Projects) brochure No 5 'Microfinance and renewable energy – investing in a sustainable future' (Wuppertal Institute 2006).

The paper will start with introducing the WISIONS initiative. After this introduction, the benefits of micro financing of renewable energy will be shown; first by presenting benefits of renewable energy, second by presenting the benefits of microfinance, and finally by establishing the link between both approaches. Then a few case studies, promoted and supported by the WISIONS initiative, are presented. Finally, conclusions are drawn.

WISIONS Initiative – short overview

WISIONS is an initiative of the German Wuppertal Institute for Climate, Environment, Energy, carried out with the support of the Swiss foundation ProEvolution, and has the purpose of fostering practical sustainable energy projects with the main field of activity in developing countries.

The initiative's objective is to identify promising sustainable energy projects and to combine spreading knowledge of existing projects with promoting and furthering new project ideas.

Two fields of action, SEPS and PREP, are the key approaches of the initiative. One part of WISIONS, the Sustainable Energy Project Support (SEPS), aims at supporting strategically important projects still waiting for being implemented in the field of renewable energy and energy efficiency. Projects supported should be innovative, sustainable and suitable for replication in other parts of the world.

The other part of WISIONS, the Promotion of Resource Efficiency Projects (PREP), primarily focuses on fostering means and concepts for improving resource and energy efficiency. People around the world are invited to apply with their good practice examples. The topic and the target groups vary on periodical basis with the objective of addressing a wide range of issues. The most convincing projects are promoted among multipliers, political decision-makers, scientists and activists through brochures and via the Internet. In doing so, the projects get the publicity they deserve and provide ideas to improve the efficiency in using resources to a worldwide audience.

The combined approaches of supporting not yet realized project ideas and already implemented successful projects form an effective and adequate concept of multiplying knowledge and actions in crucial areas of sustainable development, especially in sustainable energy.

SEPS

Since WISIONS has been launched in the beginning of 2004 the interest in the initiative, its concept, the SEPS-support and the promoted PREP-projects has been significant and is still increasing. There have been inquiries from developing as well as industrialized countries and various ambitious and interesting concepts have been presented.

Up to now three SEPS rounds have passed through with more than 200 submitted project applications from all around the world. In total, 25 projects have been selected for financial and additional support, located mostly in developing countries. The topics of the projects range from the implementation of an efficient biogas plant in an Indian plaster of Paris factory to the building up of a worldwide network for solar food processing or implementing efficient lighting systems in Mexican public buildings. Most of the projects are still in the phase of implementation. After being implemented they will serve as positive demonstration projects with a high potential for replication in comparable locations and with similar conditions.

With its activities SEPS seeks to overcome the barriers of a promising project by providing financial and other support. Projects that are innovative, sustainable and can be replicated in other parts of the world are supported. Once a project is selected and depending on the needs of the project, SEPS can provide potential financial support to assist with project implementation, as well as practical expert advice and knowledge transfer for effective implementation or promotion of the project to relevant institutions. In addition, the selected ideas and finally implemented projects are published on the WISIONS website.

PREP – PROMOTION OF RESOURCE EFFICIENCY PROJECTS

PREP has the key objectives of publishing and promoting good practice in energy and resource efficiency. It focuses on one important topic over a selected number of months. All good practice projects are reviewed independently and up to five with the potential to have relevant impact are published in topic-related brochures. The brochures have got a practical case study format, with factual data and are available in a printed version as well as for free download at the WISIONS website. Additional good practice examples not published in the brochure are promoted on the WISIONS website to a wider audience. By doing this, the projects get the publicity they deserve and provide useful ideas for people in other countries to improve the efficient and sufficient use of resources. Thus positive environmental results in combination with effective economics are emphasised.

In the last two years successful good-practice projects have been selected for so far nine PREP issues. These examples are communicated to thematic target groups, multipliers and de-

cision-makers through electronic and printed brochures. The topics vary with the objective of addressing a wide range of subjects, stakeholders and cultures.

The previous and already published issues have been: 'Resource efficient construction'; 'Energy and Water'; 'Sustainable Transport'; 'Sustainable Tourism'; 'Microfinance and Renewable Energy'; 'Energy in Schools'; 'Corporate Energy and Resource Efficiency', 'Sustainable Production and Use of Biofuels' and the upcoming brochure on 'Renewable Energy in the Food Supply Chain'. An interesting mixture of up to five projects in each brochure shows promising and successful examples from all over the world. Interested people like project leaders, investors, NGO's or local governments can herein follow the short and transparent description of already implemented projects that are located in developed, emerging as well as in developing countries.

The selected projects do not represent the only possible and correct way for sustainable project implementation in the different fields of action, but they show promising approaches for different conditions and regions.

CRITERIA

The selection process of both fields of action examines the project potentials in a field of important criteria that are coherent with the ones of important international organisations such as UNEP, the World Bank or the European Union and form the core of sustainable development.

Criteria that have to be fulfilled for being selected and supported in SEPS are:

- technical viability of the project;
- economic feasibility;
- local and global environmental benefits, such as CO_2-reduction;
- marketability and replication possibilities.

Of crucial importance for projects in the pre-implementation phase is the quality and detail of the implementation strategy. Hence, the more advanced and detailed implementation strategy exist, the better SEPS can start assess the needs for project support.

For PREP, the following are the five main criteria for being accepted for publication:

- project success;
- replicability for other related projects and regions;
- economic and technical viability;
- innovation in solving market;
- technological or other challenges;
- durability and sustainability of the project.

As the goal of sustainable development requires an integrated approach of social, economic and environmental objectives, some additional criteria for both approaches SEPS and PREP are also applicable like

- social aspects, such as gender issues and poverty reduction;
- inclusion of local population and structures;
- employment potential for the region and
- cooperation with other stakeholders.

The criteria are inquired in the application forms where central questions enable the applicants to complete them. The selection process is objective, transparent and done by an expert group of the Wuppertal Institute.

The Renewable Energy Point of View

Present energy systems, which are mostly based on fossil fuels, are not sustainable and have problems to handle current and coming energy-related problems like energy security, gender and social issues, as shown for example in the close connection between lack of energy access and poverty or employment creation (Goldemberg 2004). Furthermore, current patterns of energy generation and consumption threaten the environment on local as well as on global scale.

For example, the burden of environmental degradation falls disproportionately on developing countries. Poor people often live in the most ecologically sensitive environments, which makes them especially vulnerable to environmental degradation and the adverse effects of climate change (UNDP 2005a). Additionally, these people often do not have access to energy: two billion people live without clean, safe cooking fuels and must depend on traditional biomass sources; 1.7 billion are without electricity. Poor people tend to rely on a significantly different set of energy carriers than the rich. The poor use proportionately more wood, dung, and other biomass fuels in traditional ways, and less electricity and liquefied petroleum gas (LPG) (UNDP 2004).

A sustainable energy use can support solving major local and global problems. In many cases, increasing energy efficiency, introducing modern technologies for energy production and use, and introducing renewable energy can directly or indirectly mitigate environmental damage (like deforestation, GHG emissions, pollution due to fossil fuel exploration and transportation or indoor pollution), can support the provision of basic needs (cooking, heating, lighting, and so on) and can support productive activities (manufacture, industry, commerce, and so on). Even though energy is only one determinant of poverty and development, it is a vital one (UNDP 2004).

The Millennium Development Goals (MDGs) constitute a set of quantitative targets for reducing extreme poverty and for improving education, health and gender equality by 2015, and provide the benchmarks for measuring progress (UNDP 2005b). Although energy is not addressed directly in the eight MDGs, it is widely accepted that access to clean and affordable energy is a prerequisite to achieving sustainable development and reducing poverty (UNDP 2004). This was said in the ninth session of the Commission for Sustainable Development in 2001 and it was concluded, "To implement the goal accepted by the international community to halve the proportion of people living on less than US$ 1 per day by 2015, access to affordable energy services is a prerequisite (UN 2001)."

Though constant development reduced the costs for renewable energy technologies substantially and the price for technologies like solar and wind power for example are now about

50 % lower compared to 15 years ago (REN21 2005), initial costs for these technologies are often not affordable for poor or low-income people. However, investments in some areas of developing countries have made power from renewable energy more competitive with power from conventional energy sources (Mohiuddin 2006).

Though most of the renewable energy growth has been in grid-connected power systems so far, renewable energy technologies are well suited for off-grid regions to provide modern energy services (like cooking, illumination, communication, mechanical power, heating, transportation, water pumping or cooling) for low-income people (UNDP 2005a). Especially small technical solutions for remote areas are possible through the use of existing resources on location. Regarding the broad portfolio of the technologies, solutions for different conditions from a geographical, climate and society view can be found. Some technologies are well tested and due to a decrease of costs, they are also ready for a large-scale introduction in remote areas of developing countries, like biogas use for decentralised cooking and electricity; small and micro hydro systems for electricity, PV for local electricity or solar collectors for water and space heating (REN21 2005a).

The Microfinance Point of View

Studies carried out by the United Nations (UN 2005) show that of the 4 billion people who live on less than 1,400 USD a year, only a fraction has access to basic financial services. The most important basic financial service is the access to a bank account. It is the entry point for allowing customers to make a loan, to save money outside the household, and to transfer money within the country or abroad. In the Western world, most people have bank accounts (about 80 percent), while in low-income countries there are less than 20 percent. In some developing countries like Bangladesh or Sudan the number is even lower, the majority of residents does not have bank accounts (CGAP 2006).

Microfinance is one promising way to bridge this gap and since the 1990s an opening up of the world of microfinance can be discovered. The development community began to realise that microfinance providers could recover loans to poor and low-income people and cover their costs, thus reaching large numbers of people. Originally, microfinance focused on the provision of very small loans to very poor families to help them undertake productive activities or grow their small business. Mainly specialised microfinance institutions (MFIs), most of them being nongovernmental organisations (NGOs), offered such micro credits. Nowadays, with the realisation that the poor, lacking access to traditional formal financial institutions, require a variety of financial products, microfinance has come to include a broader range of services (credits, savings, insurance, etc.). Many existing microfinance methodologies are based on village or group lending but also a growing number of banks offer microfinance products or are specialised on microfinance. Experience of the recent years show, that poor and low-income people are able to use and pay for a number of financial services and that microfinance can be solid and even profitable. A 38-country analysis found that MFIs with publicly available performance information were more profitable on average than the commercial banks in the same countries (CGAP 2006).

Like energy, also the availability of microfinance for poor households contributes significantly to the achievement of the MDGs. Experience with microfinance customers world-wide shows, that access to financial services enables the poor to increase their income, to build assets, and to reduce their vulnerability to daily-live crises. This includes for example better nutrition and improved health, as well as the ability to make plans for the future and to enable education for the children. Female customers became more self-confident and are better able to confront gender inequities. Microfinance customers manage their cash flows and can decide what their own priorities or most important issues are to spend the money for. All these benefits show that microfinance is a very participatory and non-paternalistic instrument for sustainable development. Access to flexible, convenient and affordable financial services empowers and provides the poor to make their own choices and build their way out of poverty in a sustained and self-determined way (CGAP 2003, UNCDF 2005). To summarise, the availability of microfinance has a great impact on the MDGs targeting poverty eradication, children's education, health issues, and the empowering of women.

Bringing together Renewable Energy & Microfinance

The previous two chapters show, that both renewable energy and microfinance play significant roles for achieving the MDGs and can support social, environmental and economic development in developing countries. The next step would be to establish a link between renewable energy and microfinance in order to combine the benefits that can be reached with both approaches.

Access to affordable consumer loans is a key barrier in increasing access to energy services as a means for poverty reduction. Currently, the majority of financial support for rural energy applications is government or donor-based. Although such programmes are beneficial, by adopting renewable energy through microfinance, developing countries support environmental protection as well as the growth of businesses (GVEP 2004, Mohiuddin 2006). The provision of microfinance for productive energy use in small businesses can show quantifiable long-term effects. The effects of renewable energy systems for domestic use may not be as quantifiable as in the business case; however, they have positive financial implications for the customers. For example an MFI-run housing programme protects the family from rain and cold and therefore reduces the number of illnesses and medical costs. The space in the house can be used for storing grains that can be sold later at a higher price. These effects constitute long-term economic benefits for the customer (NREL 2000).

The same applies for lighting systems that provide light for reading and studying, which thereby has long-term effects on the employment potential of the young generation. Additionally, it allows extending working hours, as well as extending selling and shopping hours and therefore leads to increasing income. Moreover, electric lights are safer than for example kerosene lanterns that produce harmful smoke.

Combining the provision of access to energy services for the poor and the generation of economic growth does not only have great influence on the local population, but could also in-

fluence the regional or national energy strategy. Micro financing of renewable energy technologies could provide strong impetus for governments of developing countries to increasingly promote the successful and benefiting use of such technologies and therefore pave the way of a more sustainable future (Mohiuddin 2006).

The initial costs of renewable energy technologies are significant. By introducing microfinance programmes, governments of developing countries can reduce these initial costs as well as offset the costs for the distribution of renewable energy technologies. By making the energy systems more affordable, microfinance can support the dissemination of these technologies. MFIs play an important role in this regard, as they are able to offer flexible loans and structure their services in accordance with the needs of the poor, e.g. by adjusting repayment schemes to seasonal conditions (Mohiuddin 2006).

Linking renewable energy systems with microfinance can benefit both the client and the supplier: the client can use electricity to increase its productivity and improve its quality of life, while microfinance institutions find in renewable energy a new loan item that will strengthen their client's economic activity and diversify their own lending portfolios (NREL 2000). Microfinance practitioners agreed that energy services can provide a profitable product line for MFIs and some of them already offer financial products specialising on energy (GVEP 2004).

There are some provisions for guaranteeing the success of energy-related microfinance products (GVEP 2004):

- Energy services should match consumers' income flows, be demand driven and be affordable
- Productive uses of energy services are a vital component of loans
- An improved financial capacity among lenders should be included
- Best practices should be considered
- The energy service providers should be solid and include operation and maintenance of equipment
- Deviation from existing bank policies and procedures should be minimal
- Awareness of energy products among key MFI personnel should be increased
- There is a need to match loan amounts to funding sources. Certain energy loans might be too large for MFIs.
- The existing knowledge gap between MFIs, consumers and energy service providers could be addressed through capacity building, knowledge sharing, and piloting of new approaches for energy and consumer lending.

Microfinance and Renewable Energy Projects Promoted by WISIONS

WISIONS presents in its PREP brochure No 5 'Microfinance and Renewable Energy' projects from Peru, South Africa, China and Nepal that have been successfully implemented, with the intention of further promoting the particular approaches used by these projects. Using a key number of internationally accepted criteria, the main consideration for the selection of the microfinance projects was the inclusion of renewable energy technologies like solar and photovoltaic systems, wind energy, hydropower and biogas used for cooking, lighting, power telecommunications equipment, radio, television, household electrification, health clinics, water pumping, milling and grinding, water disinfection, fencing, computer education, machinery operation, and so on in households or businesses.

In the following, the five good-practice projects of the PREP brochure No 5 will be presented:

REVOLVING FUND FOR THE IMPLEMENTATION OF SMALL HYDRO SCHEMES

The objective of this project carried out by Practical Action is to improve the living standards of rural population in Peru by implementing Small Hydro Schemes (SHS), forming sustainable energy services and promoting productive use of energy. Its purpose was to promote a financial model that combined subsidised credits with technical assistance and an appropriate management model. The project is aimed at meeting small energy requirements in isolated rural areas that are impossible to serve with conventional electricity grids.

The project is based on two agreements with the Inter-American Development Bank. Under the first agreement for the period between 1992 and 1998, ITDG (Intermediate Technology Development Group), now called Practical Action, received a reimbursable contribution of USD 400,000 to establish the "Revolving Fund". A second agreement was signed in 2000, increasing the revolving fund by USD 200,000 and recommending the establishment of new management models and the promotion of productive and business activities capable of generating employment and income.

The financial model with the "Revolving Fund" combines a soft loan that includes technical assistance with joint financing by different institutions. The beneficiaries are farmers, small rural businessmen, communities, a producers' association, etc. A loan of up to USD 50,000 can be obtained for the construction of a small hydro scheme at a 10 per cent interest rate, repayable over a period of up to five years.

The management model is based on the efficient management of the service and active participation of the local population. The model consists of the owner of the small hydro scheme (the community and/or the municipality) handing it over to a private local enterprise under a detailed medium or long-term contract with clear and specific terms of reference that respect the current legal framework. The model therefore requires three main agents: the owner, the users and the local enterprise.

In general, the implementation of the hydro schemes has both replaced and prevented the installation of diesel systems, which is a more affordable technology for rural populations. The CO_2 emissions from burning fossil fuels have, therefore, been reduced. In addition, the use of electricity has replaced the traditional use of candles and kerosene burners that not only contaminated people's homes but were also health hazards.

21 towns now receive electricity from small hydro schemes that are usually in the category between 10 and 200 KW; this project also covers some plants below 10 KW, but over 1 KW. The electricity service management was created and reinforced

and the technology for manufacturing hydro scheme equipment was developed and transferred to small local manufacturers. All turbines were manufactured in Peru and generators and electronic load regulators are a combination of domestic manufacture and import. As a result, local technical skills were also improved. More than 200 new small businesses were created, which increased the population's income by one third. There is a positive impact on the social capital, defined as the capacity to act in an organised and co-operative manner, particularly in cases where the management model has been put into practice.

Out of 28 hydro schemes, 23 are operating and the rest have temporarily stopped for maintenance purposes or to complete their construction. No technical problems have been reported; the oldest scheme has been operating for over 10 years. Training the local enterprise in operation and maintenance starts at the beginning of the work. Operators and administrators of hydro plants have an active participation during the whole construction phase of the plant, in order to learn about the characteristics and technical requirements of the plant for its optimal operation in the future. After the plant is built, the same staff receives specific training on operation and maintenance on site, plus a booster course after a short period of about 30 to 45 days.

Monthly operating costs are fixed costs of about USD 300 over the whole range of micro hydropower sizes in the sample. Maintenance costs, both routine, preventative and periodic overhauls, are calculated as a percentage of fixed costs. The adoption of socially acceptable rates in line with the people's willingness to pay makes it possible to cover the plants' operation and routine maintenance costs, thus ensuring the sustainability of these small hydro schemes.

Organisation and training are important aspects of the management model. In fact, they are just as important as the implementation of the system, if not more so, as the future of the system largely depends on good organisation and training. Four successful schemes, the oldest of which has been operating since 1998, cover their operating and maintenance costs and keep a reserve fund for equipment replacement purposes.

A value of approximately 2,621 USD/kW was established, including pre-investment costs and working capital. The investment per family is estimated at USD 1,352. A study of a sample of projects implemented by the government reveals an investment of more than 5,000 USD/kW. The average pre-investment cost per scheme is estimated at USD 14,885, which is a significant percentage of the total cost of the hydro scheme. Currently, the revolving fund consists of about USD 600,000; 31 loans worth USD 880,000 have been granted for 28 small hydro schemes and 50 single-family photovoltaic schemes, and more than 2,000 rural families have benefited from the project.

Loan recovery is an important and complex task; requiring careful follow up with the clients, review of accounts regarding bank deposits, notification of payment due dates, and so on. In the event of any delay or even of non-payment, the loan agreements contain rules of conduct that allow for legal action to recover the loan. In a few cases, it actually has been necessary to start lawsuits to execute loan collateral.

In the case of community owned hydro plants, residents are charged with electricity bills. Under a former financing model (the Direct Municipal Management Model), tariffs were quite arbitrary with usually two or three different prices according to the kind of client, and with no relationship to actual energy consumption. During the project a new tariff system was designed, according to which three decreasing tariffs are set for an equal number of increasing consumption blocks. This new tariff model has served as an incentive for the installation of new productive activites.

The main barriers encountered by the project were the limited payment capacity, loan guarantee restrictions, changing political aspects and the lack of an adequate legal framework. In order to overcome these barriers, co-ordinated work was carried out with local and regional governments, government social aid programmes, co-operation institutions and the population in general, with a view to joining efforts to raise co-financing funds. Furthermore, rural dwellers have no legal title deeds to their properties (the main source of loan guarantee); therefore efforts were made to formally register their properties so that they could become credit subjects with access to the credit of the Revolving Fund or to any other commercial credits.

SWITCH ON – DEMONSTRATION OF RURAL HOUSING 'ENERGISATION'

This project supported by US Aid and the South African Department of Environmental Affairs and Tourism, carried out by Parallax began in April 2002 with the aim of demonstrating how non-grid energy sources can be used as a means of providing sustainable energy to rural communities, thereby making a significant contribution to climate change mitigation. It involved establishing a rural business in order to make an energy package available to residents of a remote valley in KwaZulu Natal, South Africa. Four members of the targeted local community were carefully selected and trained in the skills necessary to operate a rural energy business. The brand name given to this business was "Switch On" and it is now registered as a Section 21 company (non-profit organisation). The project finished at the end of February 2004, but the Switch On business continues to serve the local community with ongoing support from Parallax.

The overall goal of the project was to show the extent to which energisation of rural communities can limit the negative contribution of energy use to climate change whilst offering a means for sustainable development. It aimed to determine whether a user-owner model of energy supply was effective in the rural South African context, and whether it could be implemented on a commercial basis. The current focus for financing renewable energy in South Africa is based on a fee-for-service model. This project demonstrates that an ownership approach may be more effective, providing that appropriate financing terms (and suitable provision for cash-collection) are in place for customers. Using a local business has provided these conditions and creates jobs within the community.

Each energy package offered consisted of a 55 W solar home system, four lights, an alarm for the solar system, a 2-plate gas stove, a 6 kg LPG cylinder, and 36 monthly LPG refills. Residents who accepted the offer effectively became the owners of these energy packages by means of a special finance agreement,

which involved the repayment of an agreed monthly sum over a three-year period.

Switch On installs and maintains the system. The solar component of the energy system will be maintained for the resident and a monthly refill of gas will be supplied. As owner of the system, the resident concerned is responsible for the security of the solar panel supplied. No insurance is available for the energy package and therefore the resident is responsible for full payment in the event of any loss or damage.

While some community members have asked to purchase the energy systems outright, for the majority the 3-year payment plan approach seems best. The difficulty is that more rural community members are still obliged to transact in cash as banks are either too far away for them to use, or the cost of having a bank account is too great. This presents both a security risk and a convenience problem. Affordability is therefore not merely a function of what monthly amount must be paid. This aspect needs more work, and discussions have been held with the Banking Council and those responsible for the establishment of the National Bank Account, aimed at the same target market as Switch On customers. The current banking constraints are one of the reasons for needing to allow flexibility in repayment. In the future, a range of loan repayment options for customers would be useful and is likely to expand the market. However, payments are preferably made directly into the project bank account, reducing the cash collection burden on the local team. Payments rates have reached 90% and continue to improve. However, the bank account must be constantly monitored and payment records communicated to the team. As customers pay for the energy packages in 36 instalments, payment rates are regularly monitored, and action is taken where no clear reason for non-payment is established.

The project shows that the provision of appropriate energy sources can be achieved for remote rural communities based on a commercial, private sector model. However, a key problem for the switch on business is its risk profile when trying to attract funds to purchase the initial capital (in this case solar home systems and gas stoves). No commercial bank was willing to offer such a rural business, seen as high-risk, any reasonable finance source. Hence the switch on project used donor funds (from USAID/Dept. Env. Affairs & Tourism, Parallax & Partners, Local Municipality, Local Community) to meet this initial requirement with the aim to demonstrate that such a 'loan' could be paid back in the future. This will then demonstrate to finance providers that the Switch On model will provide a reasonable return (though a public-private-partnership, with some form of government subsidy, may be more appropriate).

The establishment of the Switch On business in this rural community has provided immediate direct and indirect benefits such as improved access to credit and banking facilities. Prior to the project intervention, the largest fuel source used in the community was wood, most of which was collected from the surrounding environment. The introduction of LP Gas for cooking, as well as the solar home systems, has significantly improved the environment of individual households.

The total cost of the project was about USD 170,000 over 2 years. This paid for the set-up costs of the business and for the management time of the project partners to establish the demonstration model. 90 customers were supplied during the project, repaying approximately USD 800 per system. These repayments provide capital for investment into additional systems.

Switch On Energy Services has continued to operate since the end of the project in March 2004. However, without expanding the customer base and/or product and service offering, the business will not have sufficient income once the existing customers have completed their repayments in 2007. A further one-off investment is necessary to ensure the long-term sustainability of Switch On. As the majority of financial background is needed for the initial costs of buying solar home systems, Switch On is currently thinking about switching the focus to the sale of small accessories and appliances to the community, and to the development of the LPG business. This continues to be a challenge though, as local gas suppliers have not proved trustworthy, and national suppliers do not have any other rural distribution channels.

GREENVILLAGE CREDIT - A PROJECT OF THE CHINA RURAL ENERGY ENTERPRISE DEVELOPMENT INITIATIVE

The Project aims to create a clean energy path in China's Yunnan province and surrounding areas. It is designed to help local communities generate income that can then be used to purchase better energy services by their own means. GreenVillage Credit provides local villagers with two types of credits: a household credit to purchase higher quality sustainable energy systems (energy-efficient and renewable energy systems) and a loan for activities that can generate income using the new and improved energy services, such as vegetable and cash crop plantations, animal husbandry, tourism services and other activities with sufficient financial return.

GreenVillage Credit is designed to help local communities generate income that can then be used to purchase better energy services by their own means, instead of simply waiting for grants and subsidies. GreenVillage Credit explores a new approach to finance in order to promote economic development and environmental protection in the remote mountain communities.

The project entrusts loan capital to local rural credit co-operatives (RCCs) that serve as a platform for financial operations. The project also provides financial and technical support to member households of the local village associations that install new energy systems and conduct income generation activities.

GreenVillage Credit is a part of UNEP's China Rural Energy Enterprises Development (CREED) project. Supported by the United Nations Foundation (UNF), CREED offers enterprise development services for local sustainable energy entrepreneurs and support for household credit and income-generation loans. The Nature Conservancy (TNC) China Program is responsible for the consumer credit and income generation component through GreenVillage Credit in the northwestern part of Yunnan Province. The total project budget (February 2004 — June 2007) is USD 668,550, consisting of a revolving fund of USD 400,000 (CREED GreenVillage Credit) and the rest as operational costs for project personnel, sub-contractors and local training to establish efficient and effective project operation.

Average fuel wood consumption by local household in the project area is around 6 cubic meters per year. By targeting

500–600 households in the area, the project expects to reduce consumption by 15,000 to 20,000 cubic meters over the 15 to 20 year lifespan of the installed sustainable energy system. The sustainable energy installations supported by this project can significantly reduce firewood consumption, with some households reporting a 30-60 per cent reduction, which in turn helps to protect forest resources, better manage watersheds and reduce greenhouse gas emissions.

In addition to the environmental benefit, the GreenVillage Credit provides other social benefits, such as the development of the capacity for income generation on a local level, the improvement of local livelihoods and the provision of cleaner indoor air for better health, particularly among women and children.

As a means of securing loan repayments to the revolving fund, the consumer credit to buy sustainable energy systems (like solar water heaters, commercial fuel-efficient stoves, biogas digesters, micro hydropower generators, improved cook stoves, improved fireplaces for room heating, energy-efficient houses, house retrofitting) is combined with loans for income generation activities (like vegetable and cash-crop plantations, animal husbandry, agricultural product processing and trading, tourism services).

Convinced by the early results of the GreenVillage Credit, the local RCCs have preliminary agreed to provide their capital to the project to scale up the project approach in other villages. One of the aims of the CREED project is to influence existing local financial institutions, such as RCCs, to eventually offer renewable energy finance products as one of their own services. Given the poverty stricken circumstances of the project areas, one may not expect it to be fully 'commercial' in short term, but the approach represents much more efficient use of the currently available finance in the area.

Most loans are under CNY 10,000 although some borrow up to CNY 15,000. The average is about CNY 6,000. The amount depends on the cost of the renewable energy device. Interest is charged at a flat rate of 4.8 % per year, and borrowers also need to pay a loan guarantee fee of 5 %, which is returned to them if and when everyone in their group has fully repaid.

Mainly loans are made on the basis of mutual guarantee and personal credit rating as assessed by the small group of borrowers and the association's management committee. In some cases the association has made agreements with the borrowers to take their house and households' assets as collateral; this is done to pressure villagers to repay and it is unlikely that the association would seize houses.

As of October 2005, with the support of this project, more than 280 households in Northwest Yunnan have completed installation of some alternative energy devices, including biogas digesters, solar water heaters and improved cooking stoves.

CAPACITY BUILDING FOR MICRO FINANCING OF RENEWABLE ENERGY TECHNOLOGIES

This project carried out by Winrock Int. is designed to expand the installation and use of biogas plants in Nepal by increasing access to microfinance for lower-income purchasers. This includes training and motivating rural development banks, NGOs and cooperatives engaged in microfinance to lend for biogas and other renewable energy technologies.

Only 150,000 of Nepal's potential 1.9 million biogas plants have been installed and most of these installations are in relatively affluent areas. High transportation costs to remote scattered villages increase system costs. This, together with a decreasing level of government subsidy, means that rural communities must contribute greater amounts of money to biogas installations. However, these subsistence-based rural communities lack the necessary disposable income to pay the upfront costs of plant construction. Therefore, there is immense demand for an affordable means of credit from such communities. Access to credit plays a vital role in making biogas economically viable for these communities.

The project is supported by USAID, implemented by Winrock International in collaboration with the governmental Alternative Energy Promotion Center (AEPC) and the Biogas Sector Partnership, Nepal (BSP). The partners have designated roles: AEPC promotes various renewable energy technologies (RETs), provides subsidies, and manages a revolving fund of 2.5 million Euros in wholesale loans to MFIs in order that they can then provide credit to farmers for biogas installation. BSP manages the biogas programme, is responsible for research, promotion and quality control. Winrock works to strengthen both the demand and the supply aspects of financing biogas.

As a result of this project, 56 masonry jobs were created through the increased demand for biogas plants among MFI clients. Interested MFIs, including dairy cooperatives and forest user groups, are now actively promoting biogas plants among their constituents due to the direct link between cattle raising (with the associated income generation) and availability of raw materials for biogas generation and the link between biogas plants and forest conservation.

The project emphasises mobilisation of commercial sources of finance and supports capacity building and awareness creation. Once the project can provide this support to a critical mass of MFIs (around 300), biogas micro financing is expected to take off by itself. Already many MFIs have adopted biogas as a suitable loan product. With declining government subsidy, demand for credit will increase.

The 2005 project target was to facilitate 1,500 biogas loans amounting to USD 200,000, leveraging USD 500,000 in total investment. Biogas digesters are purchased directly from the manufacturer and are sold at a cost of USD 240-285 (size of 4-6 cubic meters). The manufacturer receives a subsidy from the government for the balance of the system cost, which ranges from USD 87-163, depending on the size of the plant and the geographic area in which it is installed. The project has exceeded this target by facilitating the construction of 1,572 biogas plants through micro credit.

The major problems identified were a lack of awareness about RET micro financing among MFIs, limited sources of wholesale financing and inadequate functional linkage between MFIs and the energy companies. The project is designed to address these problems and has a three-pronged approach i.e. capacity building of MFIs, linkage facilitation between various stakeholders and lobbying to create a favourable policy environment.

Conclusions

This paper shows, that access to renewable energy as well as the availability of microfinance supports poverty reduction and the path to sustainable development. Both approaches play a significant role in reaching the MDGs. Renewable energy can mitigate environmental damages, can support the provision of basic needs and can support productive activities. The attractiveness of microfinance lies in the support of human dignity, as it provides poor people with own money and leaves the choices of disposal to them. As experience shows, the link between both approaches has to improve. Major hurdles for micro-financing renewable energy include

- Lacking awareness about the possibilities of micro-financing renewable energy among MFIs;
- Limited sources of wholesale financing and inadequate functional linkage between MFIs and the energy companies;
- Subsistence-based rural communities lack the necessary disposable income to pay the upfront costs for renewable energy systems;
- Limited payment capacity;
- Loan guarantee restrictions;
- Changing political aspects;
- The lack of an adequate legal framework.

Microfinance probably might not be the perfect solution for everyone. For the poorest of the poor microfinance may not be sufficient enough for increasing the living standard and for providing access to clean and sustainable energy services. Additionally, micro-financing of renewable energy is not the only possible and reasonable way. Donor- and government-based financing in a certain amount will continue to be necessary for setting up the infrastructure for renewable energy, as well as for the dissemination of the technology. However, there is a number of promising and successful examples showing that it can work.

Experience demonstrated by many good-practice examples shows, that by micro-financing renewable energy the advantages and benefits of both can be brought together and can support the empowerment of the local population as well as the dissemination of renewable energy technologies. Identifying necessary links for a broader implementation of sustainable energy – like the linking of renewable energy with microfinance – is essential. With its brochures, WISIONS shows that ambitious, innovative and implemented projects like the ones that are presented in the brochure "Microfinance and Renewable Energy – Investing in a Sustainable Future" are possible. They reflect that creative open minds do exist and should be supported on a broader scale.

Finally, with the combination of supporting not yet realised project ideas in SEPS and already implemented successful projects in PREP, WISIONS enhances chances of knowledge transfer from practical experience to action. Still, the activities that can be done and pushed via the WISIONS initiative are only a drop in the ocean and the ideas of a more sustainable use of resources, especially use of energy, need more helping hands for furthering the concepts in the future and disseminating the ideas – especially from South to South. Regarding more than 200 good applications – submitted by ambitious and well-informed people - for SEPS support in the last 3 years whereof only 25 can partly be supported, show that one of the bottlenecks is still the financing of these mostly well-planned and useful projects.

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