Potential of Solarhomesystems, Biogas-plants and Micro-hydro in Nepal and Opportunities for MFI

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Introduction

Renewable energies have a long track record in Nepal. It is not only waterpower with its huge and well-known potential but also solar energy is a reasonable and efficient source for generating electricity on a small-scale basis. Not to forget biogas - an important energy resource for cooking and lightning especially in areas where firewood is scarce or a good quantity of cow dung is available.

In Nepal the potential of renewable energies is huge. It is estimated that the potential of micro hydro power is more than 50 MW. The potential of solar with average solar radiation varying from 3.6-6.2 kWh/m^2/day and sunshine around 300 days a year offers great opportunities. The potential of biogas plants is estimated to be 1.9 million. More than 300,000 households are electrified by solar-home-systems and micro hydro-power and around 200,000 households are using biogas for cooking and lightning. This so far is already a great success story. To further continue this development, Alternative Energy Promotion Centre (AEPC), apex body for renewable energy technologies (RET) of the government of Nepal, is promoting RET in rural areas of Nepal. Especially in these remote areas where grid connection will take place never or only after many years, mini-grid solutions or individual solutions on household level can be an answer for electrification. RET therefore play a lead role because the energy is free of charge, it is just the technology which has to be purchased and implemented (compared to fuel-based technologies). Providing energy to rural households will raise the living standard and is the basis for education, health, economic growth and overall development. Still there are many un-electrified villages and areas. The electricity access in Nepal is only around 50%.

Drawing the picture of large areas of Nepal still without electricity, enlightening villages and households with RET is a costly undertaking. As the investment costs are high, though the investment itself pays out after time, many users can not afford the initial cost. This is now where MFIs come into play: in lending small amounts to households for installation of solar-home-systems or biogas-plants these technologies become available. Generally, the repayment can be done via savings in Kerosene. Sometimes, the demand for solar-home-systems exceeds the financial capacity of an MFI or for micro-hydro-power a large amount has to be mobilized. In this case, AEPC supports MFIs in creating a partnership with urban banks. Providing trainings and capacity building for MFIs, a sustainable long-term partnership with an urban bank can be established for further fund placement as well as for business development. Generally, every MFI can enter new terrain in lending for RET and use this outstanding opportunity.

Renewable Energy Technologies

Overview

Renewable energy is energy generated from natural resources such as sunlight, wind, rain, tides, biomass and geothermal heat, which are renewable (naturally replenished). With the help of technologies the energy can be turned into electricity, heat or other forms of energy. Renewable energy technologies have already a long track record in Nepal. With around 650 MW (2007/08), hydro power is the major source for electricity generation and provides more than 90% of the required power [1]. Also Biogas, using biomass as input material, is already widely used in Nepal and can be used for cooking and lightning, replacing firewood and kerosene. With the help of sunlight, photovoltaic generates electricity that can be stored in batteries and used for lightning in the evening. This technology is also well-known in Nepal and serves especially in areas with no hydropower potential for lightning purposes. Other technologies as there are windpower generators, geothermal power or others are less important in the context of Nepal.

The overall energy consumption of Nepal is dominated by traditional energy sources like fuel wood, agricultural residues and animal waste. As shown in figure 2 below, in 2007/08 the share of traditional, commercial and RE sources was 87.8%, 11.5% and 0.7% respectively. The commercial energy includes the petroleum products, coal and electricity mainly from hydro power. The RE includes the micro hydro, solar, biogas etc. In the traditional energy consumption, the highest share is from fuel wood around 77% [1].

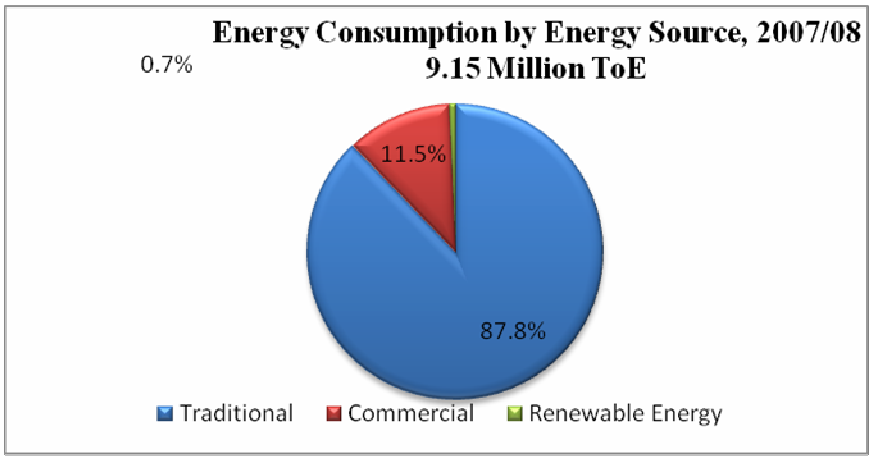

Figure 1: Energy Consumption by energy Source [9]

In this figure only micro hydro power is considered as a renewable energy technology whereas in other countries also big hydro plants fall under this category. For clarification, also the hydro power plants worth more than 1 MW are considered as renewable, but for the following this

paper only concentrates on micro hydro. In Nepal micro hydro power is defined as isolated or grid connected hydro power that generates up to 100 kW.

Potential

Micro-hydro Power

To identify the potential of hydro power, especially in the rural areas a carpet study has been conducted by the Alternative Energy Promotion Centre (AEPC). According to this study 659 projects have been identified as technically possible and financially viable. This is in total around 17 MW [2]. In this survey not all districts have been covered and districts already being grid connected have been excluded. The following map shows the districts with the most promising potential:

>> INSERT MAP of Carpet Study

Solar Power

Nepal as being located in favorable latitude receives solar radiation. The average solar radiation varies from 3.6- 6.2 kWh/m^2/day and sun shines 300 days a year. This shows the high potential for solar power in many parts of the country. There are two types of solar energy technologies available in Nepal, solar thermal and photovoltaic. Solar thermal includes the solar heaters, solar cookers and dryers. According to a study carried out by AEPC under SWERA/UNEP, 2008 [3], the commercial potential for solar power for grid connection is 2,100MW if only 2% of the land area of Nepal is considered as suitable land. This shows the exploitable area for grid integrated PV potential is significantly high in the country.

Biomass

Regarding energy from biomass, biogas technology is one of the energy resources with huge potential in Nepal. Biogas in Nepal is produced from anaerobic digestion of animal waste mainly from cattle dung and recently with human excreta. The gas is mainly used for cooking and also lighting in some places. There are different data for the potential of biogas in Nepal. Based on the number of cattle in the country or specifically on the quantity of dung that could be available for biogas, it is estimated that the technical potential of biogas plants is 1.9 million [4].

Achievements

Some studies have reported that the traditional water wheel less than 1 kW has been in use in rural Nepal for centuries for agro processing. However, the data shows the development of micro

hydro since 1962. Till 2008, the total numbers of MH was more than 2000 with total installed 13.12 MW in more than 57 of the 75 districts in Nepal.

Although solar PV started since 1963, it has been popular and promoted significantly since 2000. Till 2008, the total installed numbers of solar PV have reached to 163,907 with total capacity of 4.7MW. Solar PV is emerging as an important RE sources for household lighting in rural areas where there is no feasibility of hydropower and other options. Government is providing the subsidy for installation of solar PV, solar dryers and cookers in Nepal.

Since 1992, the development of biogas took the momentum with establishment of Biogas Support Program (BSP). Till 2008, the total installed number of HH biogas plants in Nepal was 186,273. This is almost 10% of the total potential (1.9 million) of the biogas plants in the country. The biogas is mainly used as cooking fuel and also lighting with very small percentage of HHs.

Policies

The policies in the RE sector are scattered in various documents and executive orders. They include the policy statement of the government made in the periodic plan mainly five year development plans, government orders (policies during the annual budget announcement and policies approved by cabinet, laws enacted by Parliament) and notices. Although there is no RE Act in Nepal, there are Water Resource Act 1992, Electricity Act 1992, and Hydropower Policy 2001 which are mostly related to hydropower including micro hydro, Renewable Energy Policy 2006 and RE Subsidy Policy 2008.

Rural Energy Policy 2006

The Government of Nepal promulgated the Rural Energy Policy in 2006. This is a first national policy on RE sector with focus on decentralization to some extent. The overall goal of this policy is to contribute to rural poverty reduction and environmental conservation by ensuring access to clean, reliable and appropriate energy in the rural areas. Some of the major aspects of this policy are capacity of the local bodies for planning, implementation, M& E, increase involvement of private sector, community management, diversification of productive end-uses, R & D etc.

Subsidy Policy for Renewable Energy 2009

The government revised the subsidy policy for RE in 2009 with objective of increasing development impact in terms of service delivery efficiency and increased access to rural poor and disadvantaged people. The policy has provision of providing subsidy to hydropower up to 500 kW, solar energy, biomass (biogas, Metallic ICS), improved water mill and wind energy.

This subsidy policy is more inclusive as it focuses on remoteness, poor and disadvantaged people and low caste.

Geographical Location	10-18 Wp (NPR)	More than 18 Wp (NPR)
Karnali and adjoining districts* and very remote VDCs	7,000	10,000
Remote VDC	6,000	8,000
Accessible VDCs	5,000	6,000

Table 1: Subsidy rates for SolarHomeSystems

The Subsidy for Solarhomesystems (SHS) differs in size and remoteness. The average size of the System sold is around 20 kWp. Due to transport costs the subsidy is higher in more remote areas. The subsidy for SHS contributes in average around 40% to the total investment costs.

Category	**Ceiling /kW**
Project Appraisal	The net present value of the MH should be positive at 6% discount rate after the recovery of loans and its corresponding interests.
Subsidy delivery	NRs.85000/kW or NRs.10000/ household whichever is less

Table 2: Subsidy Rates for Microhydro

The subsidy for Microhydro is calculated has to ceilings – one ceiling is per kW and the other ceiling is per household. The lower ceiling is applied for the subsidy approval. There is also a transportation subsidy that is approved in dependence of the remoteness – the distance in km to the next road head. Sometimes the nearest road can only be reached within a few days walk. This is increasing the investment costs significantly – as all the construction materials have to be carried by porters to the site. For microhydro the subsidy contributes up to 50% to the total investment.

Region	**4 m3 and 6 m3**	**8 m3**
Terai Districts	Rs. 6,500	Rs. 6,000
Hill Districts	Rs. 9,500	Rs. 9,000
Remote Districts	Rs. 12,500	Rs. 12,000

Table 3: Subsidy for Biogas

The subsidy for biogas also distinguishes between remoteness and size – equally to the mechanism for Solarhomesystems. The subsidy is around 30% of the total investment costs.

The subsidy is given by the Rural Energy Fund (REF), a Cash Fund that is supported by different donor agencies (Danida, Norad, KfW) and administered by AEPC and one of its programs Energy Sector Assistance Program (ESAP). The subsidy is given by a transparent and clear mechanism that is soon qualified by the ISO-Certification. To ensure quality of the Technologies, AEPC has its own test station. The qualified technologies and manufacturers are shortlisted. This ensures that only proven quality is supported and installed on household level.

Summarizing, renewable energies have a huge market potential in Nepal. As the technology is already proven and its quality monitored there is hardly any technical risk. Additional manufacturers offer a guarantee mechanism up to 2 years. To make the technology affordable to everyone, subsidy is contributing significantly to the total investment costs – between 30% - 50% depending on the technology. On the household level the technologies are easy to operate. Many technologies offer multiple appliances for lightning, cooking or others.

Opportunities for MicroFinanceInstitutions

This chapter combines the aspects of Renewable Energies and Finance. Though there exist microfinance institutions in the rural areas and renewable energies have been promoted for some years – besides for biogas plants, availing loan for these technologies is still not very often happening. The following issues explain why:

Problems in Financing Rural Renewable Energy Technology

Lack of awareness and knowledge

In general microfinance institutions do not have any knowledge about renewable energies in terms of technical risks, required repayment period etc. In general they have only short-term loans that do not suit to the requirements of RET investments. Local financial institutions as well as the user itself have only limited knowledge about the subsidy programs and other possibilities to get support.

Lack of Funds

The loan amount that is often required for micro hydro-projects is beyond the capacity of the local financial institutions. Therefore they need additional funding from outside, which is in most of the cases not available. Though there are some institutions like Rural Microfinance Development Centre (RMDC) the procedures are often connected to administrative efforts and organizational improvements that again are a barrier for many microfinance institutions.

Commercial Banks are one potential partner for placing funds at local financial institutions for investment into rural renewable energy technologies. According to existing rules and directives by the Nepal Rastra Bank they are obliged to lend a certain amount of their portfolio (2%???) to the deprived sector. But there existing practices offer loop-holes so that hardly any money reaches the rural areas. Being asked about investments in rural areas, banks have been very reluctant. They raised a number of concerns:

General concerns of commercial banks

In general banks have expressed several concerns about rural renewable energy investments:

- Securities:
  A major concern is the lack of securities. Until and so far banks are used to a bundle of securities like personal guarantee, landowner certificates and others. In the case of rural finance the banks fear that these kinds of securities are in the case of default not enforceable.

- Administration Costs:
  Going to rural areas implies high administration costs. To monitor a micro hydro-project needs several visits per year. Located in Kathmandu this implies huge travel cost. Additionally compared to the other businesses the loan amount is comparatively small so that from the banks perspective the profit out of rural energy lending is not competitive.

- Financial viability of renewable energy projects:
  For banks renewable energy investments in rural areas are financially not viable. In their opinion there is not enough cash-flow to repay the interest and the principle.

- Lack of knowledge:
  Most of the banks are not familiar with the renewable energy technologies. As a consequence they can not consider the risks and the deposits that are required. The concept of project lending – the repayment is based on the cash-flow that is generated by the project – is not common practice.

From AEPCs perspective, further promotion of renewable energies needs the involvement of the financial sector. For a solid financial structure investments on household level as well as on project level need access to credit. Only then the outreach and widespread of renewable energies in the whole country can continue. Therefore high efforts have been undertaken to solve the current situation and motivate banks taking their role in the rural renewable energy finance.

Solutions in Financing Rural Renewable Energy Technology

The general model concentrates on financing Solarhomesystems and micro hydro plants. These two technologies offer access to electricity – which is considered to be the motor for further development and is also part of the millennium development goals to which Nepal committed itself. The major challenge lies in creating linkages between the urban banks and the rural areas. The general idea behind these linkages is to channel funds from commercial banks to microfinance institutions. These institutions act as a local financial partner for the banks. The local partner will be responsible for the further lending to each household, collecting the repayment, monitoring etc. The following figure shows the model that is currently promoted:

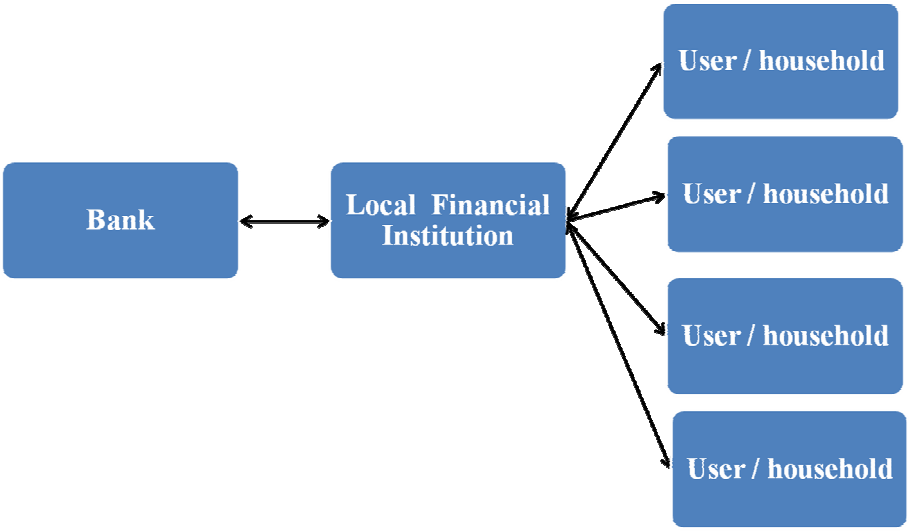

Figure 2: Financing Model [own source]

This model has several advantages. Banks can reduce their administration costs as they will only do the wholesale lending to the local partner. This is efficient and causes and only small administration costs. The local partner will do all the lending and documentation as it is required for proper bank practices. For each individual household there can be taken different sorts of securities. This will satisfy the requirements of the banks and ensure the commitment of the household to repay its loan. The collaterals can be in form of cattle, landowner certificate, personal guarantee or others. The repayment rate can be arranged as per the need of each household. In general the repayment rate is close to the amount of money that has so far been spent on kerosene. The local partner is responsible for the collection, monitoring and controlling of each loan agreement.

For the biogas-program, there is a credit module in place that provides funds for microfinance institutions. The money – funded by KfW – is administered by the biogas credit unit of AEPC. Microfinance institutions can apply for a bulk loan for biogas plants that are going to be constructed within their area of activity. So far more than 200 microfinance institutions availed loan from the biogas-credit-unit.

Role of AEPC/ESAP

AEPC/ESAP is undertaking great efforts to promote and realize partnerships between urban banks and rural financial partners.

As a facilitator also funds have been earmarked to cover the costs for technical insurance and debt insurance. Including Nepal's existing debt insurance company DCGC is part of the strategy to involve all relevant partners. Instead of setting up a guarantee fund, DCGC is the matching

partner for reducing the investment risks. Compared to a credit guarantee fund this approach is more challenging, but on the other hand has more potential as the total loan amount is not depending on the limited amount that could be covered by a guarantee fund.

Additionally AEPC/ESAP is responsible for the capacity building of the local partner as well as for the urban banks. Regarding the local partner the capacity, procedures and management processes have to be improved up to the needs of the commercial banks. Only then banks are willing to enter into partnership. AEPC/ESAP will keep up the support for the local partner until all loans of the households are repaid. Urban banks are receiving capacity building in renewable energy technology, project finance and risk analysis. This will make them more comfortable with the concept of project lending and helps them to consider and reduce the inherent risks.

To reduce the administration costs, AEPC/ESAP is also willing to share the costs of the required field trips up to a certain level.

Overall AEPC/ESAP is using its broad network to bring banks, local financial partners and user committees of micro hydro projects together. Concrete, AEPC/ESAP is providing the relevant information for banks which micro hydro projects require loan. These documents cover cash flow analysis, technical analysis, feasibility study and more. At the same time AEPC is looking for a suitable local partner institution. Bringing all partners together on one table is already the first success and the basis for entering into loan agreement.

Opportunities for Microfinance Institutions

In financing rural renewable energies, MFI are playing a lead role. As figure number 3 points out, MFIs are the partner to bridge the gap between the users and the urban banks. They are becoming the key player for promoting and financing renewable energies in the rural areas. This of course opens a broad range of advantages and opportunities:

<u>Increase of business volume and organizational growth</u>

Financing renewable energies is opening a new sector for MFI's general field of activities. This means by offering loans for RET MFIs can offer new products and services to its clients. This will of course also attract new clients and increase thereby the lending volume and the number of clients.

<u>Increase outreach and competitiveness</u>

Offering products in the field of renewable energy technologies, MFIs are more competitive. By this they can again attract new clients also from areas where this service is not yet available. Consequently RET are available for everyone. Though many MFI mainly focus on higher income groups, RET lending offers the opportunity also to offer financial services to everyone.

Adjusting the repayment to the level of the current expenses for lightning (Kerosene, Batteries, etc.) every household can repay a loan by using the savings of the former expenses. Even for poor households Small Solarhomesystems for lightning can easily be afforded.

Increase of Sustainability and Profit

Entering a new market and by that having all the advantages that have been already mentioned, MFIs become more sustainable. By financing RET the quality of the products is taken care of by AEPC. The repayment can be based on the former expenses for lightning, so the risk of default is low. These aspects in general strengthen the financial capacity of an MFI and make it less susceptible for crisis. This in consequence also increases the profit.

Increase of professionalism and capacity building

By lending in RET, MFI will gain a huge profit out of the capacity building offered by AEPC. Provided with trainings in management, business plan, accounting and bookkeeping, MFIs become more professional in their organizational structure and general procedures. This again will improve their competitiveness and business volume, as already discussed.

Example of Successful Partnerships

In the case of Solarhomesystems a pilot project has successfully been carried out. In three districts an assessment of the demand for Solarhomesystems has been undertaken. On basis of the demand 20 microfinance institutions have been trained on technical and financial issues. To strengthen the institutions also accounting, bookkeeping, management, business plan training etc. has been conducted. Finally these institutions have been introduced to urban banks as a potential partner for renewable energy finance with sufficient potential for Solarhomesystems – as the pre-assessment showed. So far two commercial banks entered into agreement with a local partner and transferred already the first part of the agreed sum. This successful model will now also continue in three other districts. For the future it will be expanded for other technologies as well.

For micro hydro projects currently seven commercial banks are interested in financing. Suitable and financial viable sites have already been selected. It is expected that within a few weeks the first micro hydro project will be financed by a commercial bank.

Conclusion and future prospects

In financing renewable energy technology within a rural framework everyone is entering new ground. AEPC as the apex body of the GoN for promoting renewable energies is taking the lead role also in improving the access to these technologies for everyone. Facing high initial investment costs – this goal can only be achieved when financial services (loans) are available in rural areas. This is necessary because especially in rural and remote areas people cannot make high cash contributions to cover the initial cost. Therefore to further continue its successful role as a promoter, AEPC wants to work together with financial institutions to create linkages between the urban and rural financial sector. This implies to provide trainings and build the capacity of these partners in order to increase motivation and commitment and at the same time reduce the hindrances that exists for financing renewable energies.

Recently AEPC has been successful in creating partnerships in the field of solar technology. Capacity training of local financial institutions that face a high demand of Solarhomesystems has been fruitful. A few banks finally lend money to those institutions that act now as their local partner. This successful program will now continue and be replicated in other districts.

This offers a great chance to MFI in becoming a key player in rural renewable energy finance. Obtaining support in different fields, MFI can develop their organization and thereby improve their sustainability, profit and outreach to the benefit of everyone.

In the future financing rural renewable energy technology will be a standardized procedure. All relevant partners, the financial sector, the insurance companies and the users will be comfortable and familiar with the technological and financial aspects. AEPC with its organizational structure is already present in nearly all the districts and therefore plays a leading role for distributing information and offering support. Therefore AEPC is part of the bridge between the rural and urban regions and has also in the future the major responsibility to keep this bridge a living construction. This mechanism then will ensure the access to finance which is the base for access to energy in rural areas.

Literature

[1] Government of Nepal, Ministry of Finance, 2009: Economic Survey, 2008/09\

[2] Alternative Energy Promotion Centre, 2008, “Carpet Verification Survey for microhydro”,

[3] Alternative Energy Promotion Centre, 2008, SWEA Report

[4] Biogas-Support-Program, 2009, “Yearbook 2009”,