Nepal

Renewable Energy Report

APCTT-UNESCAP

Asian and Pacific Centre for Transfer of Technology
Of the United Nations – Economic and Social
Commission for Asia and the Pacific (ESCAP)

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CHAPTER I

1. Introduction
Background

Energy is an important development indicator, which provides vital inputs for survival and economic development. Energy supply and consumption is still in a traditional state in Nepal. At present, renewable energy generation capability of the country is still significantly very low due to technological and economical barriers. But the average efficiency of the renewable energy technologies is good in performance and also environmentally safe.

Nepal is fully dependent on traditional energy sources such as biomass. For commercial purpose the country is reliant on imported fossil fuels like petrol, diesel, kerosene and LPG for running vehicles, stationary engines, boilers, cooking, lighting etc. Heavy dependence for energy on biomass resources has accelerated the depletion of natural resources and contributed to the degradation of natural environment. The country spends about 40 per cent of it's foreign currency reserve on the import of petroleum products. On the other hand, the country's vast resource of renewable hydropower energy remains virtually unexploited. Nepal needs to harness its vast hydropower potential and reduce its dependence on biomass in order to check the further degradation of the environment and reduce country's dependence on fossil fuel based energy. The power so generated can be used for setting up clean energy based industries which will significantly contribute to the economic development of the country.

1.2 Demographic Setting

Nepal is a sovereign independent country situated in the foot hills of Himalayas in the Central Asia. It has an area of 147,181 sq. km. The landlocked country is located between 26 ^{o} 22'N to 30^{o} 27' N latitude and 80 ^{o} 4' to 88 ^{o} 12' E longitude. The length of the kingdom is 885 km East West and the width varies from 115 km to 240 km North South. The country is wedged between India in the east, south and west and the Tibetan autonomous region of the People's Republic of China in the North. Altitudinal variation ranging from 55meters to almost 9000 meters has contributed to the occurrence of sub-tropical, temperate, alpine and artic climate and vegetation within the country.

Topographically, the country is divided into three distinctive ecological regions namely:

Mountains, with 35% total land area and 7.8 % of the total population.
Hills with 42% of total land area and 45.2 % of the total population and
Plains in the south with 23% of the land area and 47% of total population.

The weather conditions vary from region to region. Summer and winter temperatures range from about 90^{o}F in the southern plains to about 20^{o} F in the northern mountains. The mean and annual precipitation ranges from about 250 mm in the northern parts to more than 6000 mm in the southern parts of the country. There are more than 6000 small and big rivers. The total length of these rivers is about 45,000 km. These rivers are capable of generating more than 83,000 MW of electricity.

For balanced economic growth and proper attention on regional planning the country is divided into five development regions namely, the Eastern Region, the Central Region, the Western Region, the Mid-Western Region and Far Western Region. These regions are further divided into 14 zones with 75 districts consisting of 3995 Village Development Committees and 58 officially recognized municipalities including one metropolitan city Kathmandu and five sub-metropolitan cities. Each VDC are again divided into 9 wards, while the municipalities are divided into wards ranging from 9 to 36 according to its area. The political system of Nepal is Federal Democratic Republic. With the people's movement it was declared a Republic State in June 2008.

1.3. Socio-economic Condition

The population of Nepal is estimated to bone 27.15 million people stemming from at least 15 major racial groups. More than 85 per cent of the total population still lives in rural areas. The total population is growing at the rate of 2.3 % annually (CBS, 2008). Nepal's economy is based on agriculture and 66 % of the total gainfully employed population is engaged in the primary sector including agriculture, forestry and fishery. Nepal's per capita income is about US$ 470 (CBS, 2008). The socio-economic setting of Nepal, including its energy needs is deeply influenced by its physical features, particularly the geographic characteristics. One of the major problems facing the nation today is the situation prevailing in the rural areas of the country- shortage of food grains, excessive human drudgery, poor development of health, housing and transport facilities, etc. and lack of scientific knowledge of tapping appropriate resources for developing useful energy.

Energy needs for agricultural, social and other economic activities are met by manual labor and draft animals. Walking remains the only means of transport and communication in most part of the country. Cooking is invariable done by burning firewood, agricultural residues and animal wastes in traditional stoves.

1.4 Energy and International Cooperation

Nepal has been supported by donor agencies for its economic development since it initiated five years development plan. The major share of energy investment comes from donors and international NGOs. Nepal has been receiving international assistance for a long time in hydro resources development. Also, since early nineties, there has been huge assistance in the alternative energy sector through various donors, namely the SNV, NORAD, DANIDA, GTZ, KfW, and World Bank etc. There has been various technical assistance through UN organizations like UNESCAP, FAO, UNDP and SAARC etc.

1.5 Energy Policy and Plan

The government of Nepal has the sole responsibility for establishing the statutory, legal and policy framework for the energy sector. A number of government departments and agencies are involved in the policy formulation, sub-sectoral planning and project implementation.
The Tenth Plan (2002-2007), Hydropower Development Policy (1992), Renewable Energy Perspective Pan of Nepal (2000-2020), Perspective Energy Plan (1991-2017), Water Resources Act (1992), Electricity Act (1992), Environment Protection Act (1996), Petroleum Rules (1984), Forest Act (1993) and Environment Protection Rules (1997) are the main policy, planning and legislative documents guiding the energy sector in Nepal. These policies aim to attract local and foreign private developers to the hydropower sector. The government

of Nepal has also introduced subsidy policy for the development and promotion of renewable energy technology in the name of Renewable Energy Subsidy and Delivery Mechanism in 2008. Micro-hydro, Solar, Biogas etc. programmes are provided different subsidies through Alternative energy Promotion Centre under the Ministry of Environment. Similarly for the development and promotion of Hydropower through private sector, the Government has established Power Development Fund.

1.6 Rural Energy Policy 2006 and Delivery Mechanism

Government of Nepal has promulgated the Rural Energy Policy, 2006 to promote clean, reliable and appropriate energy sources as a means to reduce rural poverty and protect the environment. The policy aims to raise awareness on improved cook stoves, biogas as well as other biomass energy technologies such as briquettes, biofuel, biomass gasification to reduce indoor air pollution and fuel wood consumption. The policy also seeks to institutionalize the promotion of rural energy at the district level and mentions the provision for providing subsidies for promoting renewable energy technologies such as, micro-hydro, solar, biogas, briquette, biofuel and biomass gasification.

To maximize service delivery efficiency in the application of renewable energy resources and technologies, and effectively utilize grant assistance provided by donors, Government of Nepal is providing subsidies on selected RETs to low income rural households. The subsidy is being disbursed by AEPC through a simple and effective system. In order to encourage financial institutions to invest in renewable energy and ensure access to affordable credit, efforts are being made in creating institutional credit mechanism through credit line and credit guarantee scheme under the Rural Energy Fund.

Recently Nepal has entered the regime for the exchange of carbon credit as per the Kyoto Protocol linking energy with the environment and climate change. The Government of Nepal has given the responsibility to Ministry of Environment to act as the Designated National authority (DNA) for any CDM activities in Nepal. Accordingly, Biogas Support Program has recently registered two projects comprising of 19, 396 biogas plants. The role of the DNA is basically to ensure the CDM projects objective of contributing in sustainable development of the country.

Alternative Energy Promotion Centre (AEPC) has become the pioneer organization in developing carbon project in Nepal. Two biogas projects have already been registered as a first CDM project of Nepal. Micro-hydro CDM project is being developed as third project of the country, which is yet to get registered.

Institutionalization of Carbon financing

AEPC has institutionalized the concept of carbon financing and designated a Focal Person to manage all renewable energy related carbon projects.

Carbon Policy

- All renewable energy technologies promoted by AEPC are clean and contribute in reducing green house gas emission. So the potential carbon projects will be developed. The revenue from carbon project is taken as one of the sustainable

sources of financing in the promotion of renewable energy technologies in the country.

- Fund received from carbon revenue will be utilized for the further promotion of the rural/renewable energy technologies, and enhance the quality of system/plants and the service.

1.7 Energy Scenario

Energy sources have been categorized under three broad types (i) traditional, (ii) commercial and (iii) alternate energy sources (alternate energy is synonymous with new, renewable and non conventional forms of energy). This categorization pertains to the modality of use of the resources in abstracting the inherent energy contents. Traditional source of energy include biomass fuels particularly, agricultural residues and animal dung used in the traditional way- which is direct combustion. Biogas and briquettes are examples of modern interventions wherein traditional energy sources undergo transformations into modern types of fuels. Commercial sources of energy are fossils fuels and electricity. Alternative sources of energy include micro hydro, solar, wind power, biogas and briquettes etc. Biomass, hydropower and Solar are the three major indigenous energy resource bases in the country. Though Nepal has a huge potential for hydropower production, its exploitation has been to a very minimal and therefore it is the biomass sector which dominates the overall energy supply and consumption.

The energy sector of Nepal is characterized by excessive reliance on the traditional sources of energy such as biomass, agricultural residues and animal wastes. Paddy, maize and sugarcane are the major sources of agricultural residues used for energy purpose. Animal wastes of the livestock mainly from cattle and buffalo constitute significant sources of energy especially for cooking and heating purpose in the domestic sector. Nepal relies mainly on biomass fuels due to the lack of development of other energy alternatives. These sources of energy will continue to play a dominant role in the Nepalese energy system for years to come.

The overall energy consumption of Nepal is largely dominated by the use of traditional non commercial forms of energy such as fuel wood, agricultural residues and animal waste. The total energy consumption in 2008 was 6.542 million ton oil equivalent (MoF, 2008) of which traditional fuel accounted for 85.0% and the commercial fuels accounted for 14.4% and renewable 0.60%. The major supplies of energy are fuel wood (75.0%), agricultural residues (4.0%) animal dung (5.86%), Petroleum fuels (9.8%), coal (2.3%) and electricity (2.6 %). The country does not have proven and significant deposits of fossil fuel and hence relies heavily on the traditional energy sources such as fuel wood, agricultural residues and animal waste. Less than 2 % Nepal's total energy demand is being met by electricity and 9.8 % by petroleum products. This has led grave consequences on ecological and environment degradation as well as difficulties in the balance of payment. The country has to spend about 40% of its total income generated through its overseas exports for importing commercial energy sources. Due to lack of much industry, Nepal has a very low per capita energy consumption of only 15 GJ and is one of the least energy consuming countries in the world. In 2002, Nepal's total energy demand was 8,883 thousand tons of oil equivalent (1toe = 41.868GJ). Energy consumption increased at an average rate of 2.5% per annum between 1993 and 2002.

The energy demand and supply in 2004/05 is shown in Table.1.1. The energy consumption is dominated by traditional sources which accounted for about 87.7 % of the total energy consumption in 2004/05. Of the traditional sources, fuel wood accounted for 78.14 %agricultural residues for 3.8 % and animal dung for 5.77 %. This indicated the pressure on the traditional sources, primarily on the forests. The share of commercial and alternative sources has been increasing, although at a slow pace. From 1993/94 to 2002/03, consumption of commercial energy increased from 7.5% to 12% of the total energy consumed and the contribution of alternative energy increased from about 0.1% to 0.53 %.

Table 1.1 Nepal Energy Supply Demand Balance in 2004/05 in' 000 GJ

Fuel Type	Primary Production	**Import**	**Total Primary supply/sale**	Final Supply	Residential	Industrial	Commercial	Transport	Agricultural	Total
Traditional	322105	0	322105	322105	317798	2245	2049	0	0	322105
Fuelwood	**286960**	**0**	**286960**	**286960**	**284138**	**773**	**2049**	**0**	**0**	**286960**
Agri-residues	**13964**	**0**	**13964**	**13964**	**12478**	**1473**	**0**	**0**	**0**	**13964**
Animal dung	**21181**	**0**	**21181**	**21181**	**21181**	**0**	**0**	**0**	**0**	**21181**
Commercial	8828	36941	45727	43334	11815	10516	3286	13894	3085	43195
Petroleum	0	29846	30202	30202	9061	1331	2893	13873	2905	30063
Coal	233	6227	6459	6459	25	6434	0	0	0	6459
Electricity	8596	869	9066	6673	2729	2750	394	21	180	6673
Renewables	1955	0	1955	1955	1955	**0**	**0**	**0**	**0**	1955
Biogas	**1903**	**0**	**1903**	**1903**	**1903**	**0**	**0**	**0**	**0**	**1903**
Micro-hydro	**50**	**0**	**50**	**50**	**50**	**0**	**0**	**0**	**0**	**50**
Solar	**2**	**0**	**2**	**2**	**2**	**0**	**0**	**0**	**0**	**2**
Others	**0**	**0**	**0**	**0**	**0**	**00**	**0**	**0**	**0**	**0**
Grand Total	332888	36941	369787	367394	331568	12761	5335	13894	3085	367255

The characteristic of energy consumption in Nepal is dominated by the traditional energy sources like fuel-wood, agricultural residue and animal waste. The share of these traditional energy sources to the overall energy consumption is about 86.64% and the rest is met by the commercial and renewable sources. The fuel-wood itself accounts for about 77% of the overall energy consumption. Renewable source accounts for a very nominal amount of about 0.53% only. Fig 1.1 illustrates the pattern of overall energy use by fuel type in 2003/04 (WECS), which is also a general representation of the historical trend. The total overall energy consumption in the year 2003/04 was about 363 PJ.

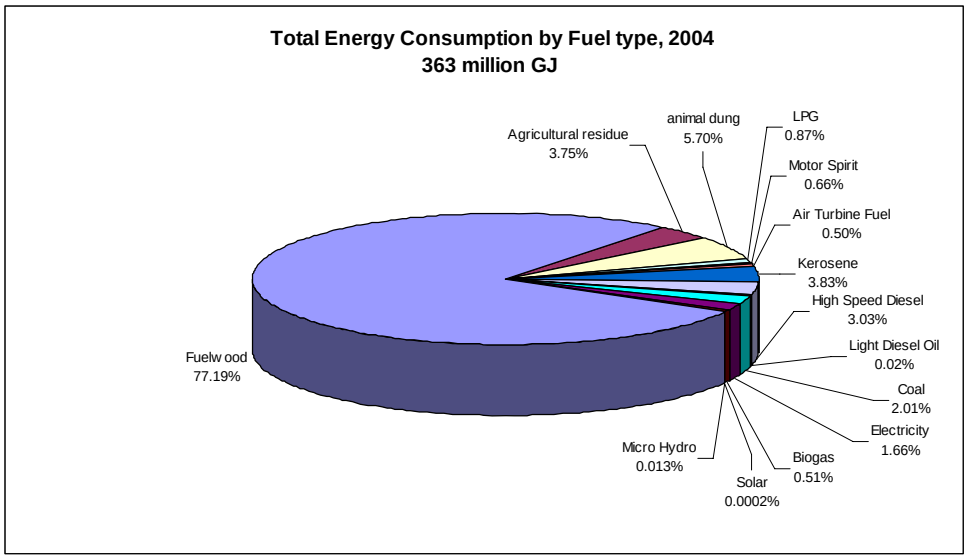

Fig 1.1: Energy Consumption by fuel type of Nepal, 2004

Sector wise, it is the residential sector that takes the mammoth share of overall energy consumption with about 91%, followed by transport, industrial, commercial and agricultural sector (Fig 1.2). The fuel type used in these sectors is also different as the residential consumes mainly the traditional fuels whereas other sector consumes commercial fuels as main source of energy.

There has been a negligible shift in the residential sector in pattern of energy uses especially in the urban areas where as in the rural areas fuel-wood is still the main sources of energy accounting for about 98% of the overall energy consumption. In the urban areas, kerosene, LPG or electricity in a slow pace substitutes fuel-wood. In others sectors like Industrial and Commercial, electricity and other fuels also substitute fuel-wood as modern forms of Industrial or Commercial sectors come into operation. In the Transport and Agriculture sector the uses of fuel-wood is almost nil and mainly depend on the commercial fuel such as petroleum or electricity.

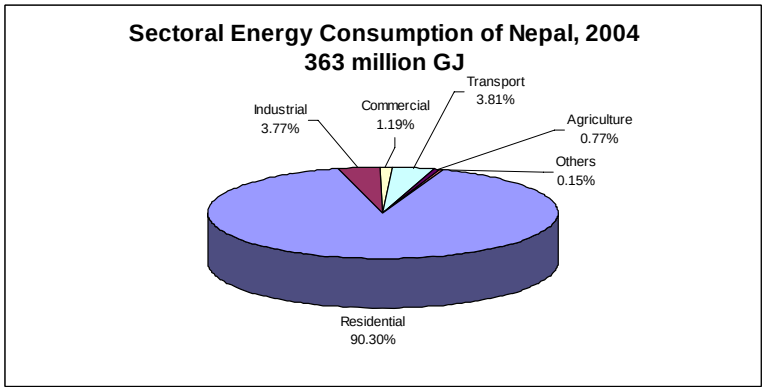

Fig 1.2: Sectoral Energy Consumption in Nepal, 2004

The residential sector mainly consumes traditional fuels, whereas the other sector consumes commercial fuels. Residential consumption accounts for around 98% of the traditional fuels

consumed in the country. Nepal's energy supply and consumption patterns are overwhelmingly dominated by traditional biomass sources and residential uses, respectively. The increased demand of fuel wood to serve the nation's energy needs has resulted into the destruction of Nepal's forest leading to massive land slides and serious environmental consequences.

Considering the above fact, it has become essential to reduce the consumption of the fuel wood. Substitution of fuel wood wherever possible by indigenous sources of renewable energy is the only way out for saving the forest. The country however is rich in renewable energy resources. The hydro energy potential of the nation is very high. Similarly, Solar, Biomass and Wind energy potentialities are substantial.

1.8 Alternate Energy Resources

The country's economy does not provide enough economic bases for large scale investment for the exploitation of hydro potentials and laying transmissions and distribution network in the rural areas in the immediate future. Alternative energy resources like solar, biomass and biogas, micro hydro and wind can play a catalyst in rural development by providing modern form of energy.

1.8.1. Hydropower Resources

Nepal is a country with enormous water resources. The theoretical hydropower potential has been estimated to be 83,000 MW of which 42,000 MW is technically feasible. Hydropower utilization is currently about 1.5 % of the proven potential. The total installed electricity generation is about 613.5 MW Of this total generation of electricity , 603 MW are hooked to the national grid and the remaining are in isolated system comprising of 40 small/mini hydro plants, about 2000 micro hydro and about 1200 peltric sets serving the remote areas of the country. At present about 15 companies manufacture and install micro-hydro plants in Nepal. So far about 13.6 MW of power has been generated from about 2046 micro-hydro plants including peltric sets. Most of these turbines are installed solely for agro-processing. Some of the units are also couples with electric generators.
Micro hydro plant consists of civil and electro-mechanical components. Civil structure consists of intake, canal, desilting basin, forebay tank, supports piers, anchor blocks and power house. Similarly electrical components consist of generator, control panel, ballast heater, transmission distribution system, earthing, poles, stay sets, insulators and load limiting devices. Likewise, mechanical components of a micro-hydro scheme consists of penstock pipe, turbine, valve, drive system and expansion joints. The government of Nepal is providing subsidies for the installation of micro hydro plants according to the location and remoteness of the districts of Nepal. The government provides a subsidy of Rs. 55,000/- per kilowatt for the plants with capacity up to 3 kilo Watt and for plants above 3 kilo watts capacity a subsidy of Rs. 70,000/- per kilo watts is provided. Apart from that an additional subsidy of Rs. 21,000/- per kilo watt is provided for the transportation of construction materials according to the remoteness of the district where the plant is to be installed.
subsidy for MHP projects/schemes is as follows:

1. A subsidy amount of NPR 8,000 per household will be provided for new MHP project up to 5 kW capacities. But the subsidy will not be more than NPR 65,000 per installed kW.

2. A subsidy amount of NPR 10,000 per household will be provided for new MHP project from above 5 kW to 500 kW. But the subsidy will not be more than NPR 85,000 per installed kW.
3. A subsidy amount of NPR 4,000 per household will be provided for to the add-on MHP project (Improved Water Mill), if it is for electrifying villages. But the subsidy will not be more than NPR 40,000 per installed kW.
4. In respect of rehabilitation of MHP project of more than 5 kW capacities, a subsidy of NPR 10,000 will be provided per additional households if it is served by MHP as a result of rehabilitation But the subsidy will not be more than NPR 85,000 per incremental kW due to rehabilitation.
5. An additional subsidy will also be provided for the transportation of equipment and materials of the MHP project. The transportation subsidy will be given based on distance from the nearest road head to project site. The MHP projects will be categorized for transport subsidy as shown below:

Rehabilitation projects, as mentioned in 4, will receive 50 per cent of transport subsidy.

1.8.2 Solar Energy

As per an estimate by WECS (1995), 78% of the land area of Nepal lies in high potential solar insolation areas. The average solar radiation varies from 3.6 – 6.2 kWh/m^2/day, and the sun shines for about 300 days in a year. The development of solar energy technology is thus reasonably favorable in many parts of the country. Solar energy is traditionally used for drying crops, clothes, fuel wood crop residues etc. The technological intervention started only in the sixties with the production of domestic solar water heaters. The use of solar water heaters are mainly in the urban centers and in the trekking route. Till 2005, there are around 61,000 solar heaters installed in the country.

Open air drying is a traditional drying method in Nepal for storage of agricultural products such as paddy, wheat, maize, fruits, vegetable and herbal medicines. Besides natural sun drying, cabinet type, rack type and tunnel type solar dryers are also used in some places in Nepal. A few manufacturers and NGOs have attempted to promote a few designs of solar dryers in the country. A modified rack type solar dryer developed by RECAST is also used for drying fruits and vegetables. The government has been trying to encourage the use of solar dryers by providing subsidies. A 50% subsidy on the cost of solar dryer was announced by AEPC in 1998.

Development of solar cookers in Nepal started in 1997 with the parabolic cooker brought in by RECAST. Later on RECAST developed box type solar cookers locally. A number of demonstrations and training sessions were conducted on these devices and some cookers were distributed. The government also provides an amount Rs. 3500/- as subsidy for a parabolic solar cooker which cost Rs. 10,000/- in the present market price.

The use of solar photovoltaic is increasing rapidly in the country after the provision of subsidy by the Government of Nepal. This technology for electricity generation has been widely used for in households, telecommunications, airports etc. There are around 30 registered solar PV companies operating for the dissemination of SHS with hundreds of branch offices in the various district and rural areas of Nepal. Till 2005, 90,172 units of SHS have been installed in the country.

The government has formulated comprehensive Renewable Energy Subsidy Policy and Renewable energy delivery Mechanism in the year 2000. As per the subsidy policy, subsidy for SHS is Rs. 10,000/- and Rs. 12,000/- per household respectively in remote and very remote VDCs as categorized by the Ministry of Local Development. The subsidy in accessible VDCs is Rs. 6,400/- per household for fiscal year 2003/04 which decreased every fiscal year by 10 per cent of the original amount of Rs. 8,000/- .

Subsidy

- Subsidy will be provided to households for installing SHS of 10-18 Wp, and more than 18 Wp from now onward as mentioned in following regions.

GEOGRAPHIC LOCATION	10-18 WP (NPR)	MORE THAN 18 Wp (NPR)
Karnali and adjoining districts* and very remote VDCs# categorized A in other districts	7,000	10,000
Remote VDC# categorized B in other districts	6,000	8,000
Accessible VDCs	5,000	6,000
Humla, Jumla, Kalikot, Dolpa, Mugu, Rolpa, Rukum, Jajarkot, Bajhang, Bajura, Achham, Dailekh, Darchula The very remote and remote VDCs of the remote districts are as per Ministry of Local Development (MOLD)/GON notification in the Nepal Gazette. The category “A” comprises of very remote VDCs, while category “B” represents remote VDCs as specified in Annex-1.		

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- The subsidy for SHS used by public institutions such as the VDC buildings, School, Club, Health post/ Centre etc. will be up to 75% of the cost.
- In order to provide quick relief from kerosene tuki, jharo etc. in the rural areas a small solar home system (SSHS) based on White LED known as solar tuki will be promoted. A solar tuki consisting of 2-5 Wp solar panel along with two sets of solar lamp will be provided a 50% subsidy on the cost but not exceeding Rupees 1,250 per system.

Subsidy Delivery Mechanism

The qualified company will have to submit all required document to AEPC/ESAP with a covering letter and a duly filled up “Summary Form for Submission of Subsidy Applications”. The willing companies can provide an electronic copy of data in subsidy application form using prescribed software. On receiving the applications, SSP will process and appraise applications including data maintenance in the Solar Energy MIS Database (SEMD), verification for fulfillment of criteria and documentations before recommending approval of the subsidy to REF. REF further appraises and processes the applications for subsidy and if everything is found in proper order REF Executive Committee will approve the subsidy. On approval, 90 percent of the subsidy is paid to the company while the balance is retained as after sales service (ASS) guarantee, which will be released the evaluation of the promised ASS after a year. The subsidy will also be available for SSHS of capacity less than 10-Watt peak (Wp), preferably with 2.5 Wp to 5Wp SPV module and 2 sets of White LED lamps. Subsidy to SSHS of size less than 10 Wp and more than 5 Wp will be same as subsidy

to the "solar tuki" as defined in Subsidy for Renewable (Rural) Energy, 2006. The solar companies may also claim the advance payment against Advance Payment Bank Guarantee prior to full appraisal of the subsidy application forms by SSP and REF. The Bank Guarantee must be as per the REF prescribed format.

Subsidy Criteria

In order to be eligible for subsidy, a Solar Home System must meet following conditions.

1. Solar energy subsidy will only be available to Nepalese Citizens for specified SHS and SSHS systems installed in the rural areas not electrified by other means.
2. SHS subsidy will be available when an area or cluster has at least 10 SHS installed from a qualified company or a group of qualified company provided that the ASS arrangements among the companies has been established (they must submit the written agreement for ASS). The area or cluster has been defined in general as a VDC or a group of adjoining VDCs within 3 hours' walking distance and closeness has to be certified by one of the involved VDCs or DDC. However, this condition will not be applicable for SSHS.
3. Installation of SHS or SSHS must be done by qualified companies and its recognized agents/dealers using certified components. In order to ensure NIPQA compliance the systems must use components certified by RETS only.
4. Installation of SHS must be done by a technician certified at least as Solar Electric Technician Level I by the CTEVT.
5. The qualified company must assure that there must be an adequate after sales service (ASS) in the region. In addition, payment due to RETS for certification and inspection of components must have been cleared within 6 months as per the rules of RETS.
6. The subsidy request must be made in the REF prescribed request form.
7. The SHS application form must submit along with a copy of the user's Citizenship Certificate and two photos. The first photo must clearly show the house in full picture with the panel installed, preferably with a proper angle to show the front view of the panel. The second photo should clearly show the user and the installer standing or sitting together with the house as the background.
8. The SSHS application forms may be submitted jointly for up to 10 households buying SSHS and local government representative must duly attest it.
9. Household that has received SSHS subsidy may apply for SHS subsidy after one year.

1.8.3 Biomass and Biogas

As in almost all Asian countries, biomass energy plays a major role in satisfying the rural energy demand of Nepal. According to an estimate of WECS (2004/05), 8616.61ktoe of energy was consumed in which the major source of supply was traditional energy, 7557.29 ktoe after that commercial energy which was 1013 ktoe and renewable 45.86 ktoe. In percentage wise the shares of them were 87.71%, 11.76% and 0.53% respectively. Besides wood fuels, an estimated 333.52 ktoe of agro- residues and 505.89 ktoe of animal dung were also available as fuel in 2005.

The biological conversion of biomass by anaerobic digestion into gas and a liquid effluent has been found to be a very suitable conversion technology that is readily available for large

scale implementation as a decentralized source of energy. While the gas provides clean energy for cooking, heating, lighting and even running engines, the effluent is used as a wet or sun dried fertilizer.

The potentiality of producing biogas is about 1.9 million plants. The Biogas Sector Partnership-Nepal (BSP/N) under the Alternative Energy Promotion Centre (AEPC) and with the cooperation from various donors like SNV and KfW is promoting the installation of biogas plant in various part of the country. There are about 2,000,000 biogas plants installed in various districts of Nepal. According to BSP-Nepal, 72 private biogas companies and 16 biogas appliances manufacturing workshops have been developed in the country for the effective dissemination of this technology in Nepal. BSP-N further states that 96% of the constructed biogas plants are in operation and the biogas programme is developed as the first CDM project in Nepal. As per the subsidy policy of the government, following are the financial subsidy provided by the government for the construction of biogas plant depending upon the remoteness of the district.

Table 1.2. Subsidy Rates in Biogas Plants

S. No.	Plant Capacity	Terai Region	Hill Region	Remote Hills
1	4 Cubic meter	Rs. 6,500/-	Rs. 9,500/-	Rs. 12,500/-
2	6 Cubic meter	Rs. 6.500/-	Rs. 9,500/-	Rs. 12,500/-
3	8 Cubic meter	Rs. 6,000/-	Rs. 9,000/-	Rs. 12,000/-
4	10 Cubic meter	Rs. 6,000/-	Rs. 9,000/-	Rs. 12,000/-

Apart from that an additional amount of Rs. 500/- is provided in 16 remote districts of the country.

1.8.4 Improved Cook Stoves (ICS)

With the support of community Forestry Development Project (CFDP), assisted by FAO in 1981, RECAST carried out research works for the development of designing of improved cook stoves suitable for Nepal. This is the first undertaking in the country with specified commitments for the development and dissemination of improved cook stoves in a large scale. As a result of the project activities, there has been a notable advance in the identification of suitable stove design and also in the dissemination of the improved types to the field in a sizable number. The government of Nepal accorded high priority to increase ICS installation in the country in the 9^{th} plan. The national ICS programme (2002 – 2006) funded by Energy Sector Assistance Programme (ESAP) of DANIDA and executed by AEPC has disseminated about 300,000 ICS till June 2008, in 44 mid-hill districts by more than 2500 trained promoters out of which 50% are women. There are more than 90 local NGOs involved in the program and about 50,000 ICS is being disseminated every year. This has been perceived as a strong platform for the commercialization of ICS in the rural household of Nepal. Within the 10^{th} plan period (2002-2007), the government of Nepal disseminated additional 250,000 numbers of ICS in the rural areas of the country. Government of Nepal is promoting ICS in the mid-hills without direct subsidies. However, in the high mountain districts, 50 per cent subsidy, not exceeding Rs. 2500/- is being provided on metal stoves.

ICS promotion in Nepal is on the cross-roads of prospective future characterized by the following opportunities:

- The use of ICS is estimated to save 25-40% of fuel wood, plays great role to reduced smoke. Create hazards free health and sanitation situations at individual, family, community levels.
- The existence of the Network among ICS promoting organizations has helped in the process of institutionalization of the affiliated NGOs, which is also encouraged by the government.
- The Programme is primarily focused to the rural women with the appropriate strategies to build capacity at local level.

The promoters are paid by the end-user in cash or kind & the promoter acts as self-entrepreneur and therefore can be tuned with poverty reduction activities/Programme with ease.

1.8.5 Biomass Briquetting

Biomass Briquetting is the densification of loose biomass materials (agricultural residues, forestry wastes, etc.) to produce compact solid composites of different sizes called briquettes. Densification is the general process of compressing the raw materials to a certain form using a mould and pressure. In 1982, two different briquetting technologies were introduced in Nepal, namely pyrolysing and extrusion technology. Nearly 20 enterprises registered with the Ministry of Industry for the installation of briquetting plants. However, about 65% of them have not yet started operating due to poor profitability and marketing problems, as well as shortage of rice husk. Only one manufacturer has continued to produce rice husk briquettes in Nepal. Many other plant owners have closed the plants due to technical and marketing problems. This briquette is not used in household cooking. It is mostly used in institutional cooking. It is quite successfully used for space heating in urban areas. High initial investment, increase price of raw material and frequent repair of extruder are problems associated with it.

A technique for producing beehive shaped charcoal briquettes from leaves, twigs and forestry/agricultural residues has been developed in Nepal. It is claimed that the briquettes are easy to ignite, burn quite cleanly and could be appropriate for rural areas of Nepal. This technology has gained wide scale popularity through the Community Forestry Users Group (FECOFUN) and has been disseminated throughout the country.

1.8.6 Wind Energy

Wind is still unharnessed energy resource in Nepal. Due to its diverse topography and the consequent variation in the meteorological conditions, it is difficult to generalize wind conditions in the country. Although there are some indications of some potential of wind energy and geothermal energy, their magnitude as well as feasibility is not yet established. A 30 kW wind power generator was installed by the Nepal Electricity Authority (NEA) in Kagbeni, Mustang, but the unit was heavily damaged by high winds during operation. At present, NEA is implementing a wind power development project and a few private workshops are involved in the fabrication of wind pumps for irrigation purposes.

CHAPTER II

2. Leading R&D institutions and national/ international agencies in the country working in the field of Renewable Energy.

There is no strong institutional mechanism for technology transfer in the renewable energy sector in Nepal. Nevertheless, many organizations are found involved, in some way or the other, in the field of renewable energy in general. Such organizations can be found in the government, non-government and private sectors. Based on the human resources and physical infrastructures available, a few of them (such as the Nepal Academy of Science and Technology, Research Centre for applied Science and Technology) seem to be capable to have significant contribution in this field. But these organizations are reported to be modestly functioning due to financial constraints. It is observed that national priority areas for science and technological research and development (R&D) have not yet been adequately determined. On the other hand, the science and technology related organizations are not in a position to contribute significantly even in areas indicated by the state policies due to lack of adequate budgetary support from the Government. Their yearly budget reveals that the fixed cost is far more than that of programme budget. As a result, even the capable public sector organizations appear to have involved in donor-supported small projects (international non-governmental organizations' aid projects) as and when asked for, rather than working on a long-term basis on the national priority areas. Despite the non-existence of strong technology transfer mechanism within the country, there are many examples of technology transfer and foreign investment in public as well as private sector companies. Technology development and transfer/diffusion in the alternative energy sector in Nepal appears to be remarkable. These technologies particularly include the bio-gas, solar power and micro-hydro power plants, spread to several districts in Nepal. Spread of these technologies has been made possible from various foreign assistance projects. Short description of the activities of some national level technology related institutions/organizations is given in the following.

2.1 Ministry of Science and Technology

The Ministry of Science and Technology is the apex body within the Government in the field of science and technology (S&T) development in Nepal. It is learnt that the Ministry is in the process of formulating S&T policy. There are some foreign assistance projects which are affiliated with this Ministry. However, there is no technological infrastructure established yet within it.

2.2 Nepal Academy of Science and Technology (NAST)

This academy was established in 1982 for contributing to the development of the nation from the S&T sector. However, its contribution to industrial development is not noticeable. Although, the human resources of NAST consist of a number of scientists and technical experts in different scientific disciplines, it is reported that the academy is not able to contribute significantly in the field of technology development and transfer due to budgetary constraints. The academy is occasionally involved in small donor supported projects in the field of alternative energy and other technology development.

Some of NAST's technological projects include:

- Solar photo-voltaic pump and lighting system;
- Biomass brequetting technology from solid fuel;
- River boat (used in Ghatbesi, Trisuli River).

2.3 Research Centre for Applied Science and Technology (RECAST)

RECAST was established in 1976 under Tribhuvan University with an objective of undertaking research and development in the field of S&T. It has human resources as well as fairly developed physical facilities (laboratories) for some specific scientific work. Despite the availability of physical as well as human resources, it is learnt that the Centre could have made significant contribution in technology transfer and development,
particularly in the renewable energy sector.

The Centre has been actively involved in the research and development of renewable energy technologies since its establishment. Design and development of efficient and improved cooking stoves, training materials for their effective dissemination, heat values of fire wood species and their pyrolysis are also being studied. In The area of biomass energy, RECAST has developed a Biomass gasification plant in 1986 based on a Swedish model. The gasifier was tested successfully by operating 3.5 kW engine generators as well as a HONDA water pump. It was a down draft gasifier using charcoal as fuel. The technology was demonstrated successfully by RECAST at different technological exhibitions organized at that time by RONAST as well as Agricultural Development Bank (ADB/N). The technology was further demonstrated by the Rural Energy Development Programme (REDP) of UNDP at Chaubas VDC of Kavre District in 1997/98 for generating electricity. The electricity thus generated from the biomass gasification plant was supplied to the local community for lighting in 26 houses. Research and Development work on Solar dryers, Solar Cookers, Solar distillation units, Solar Pump, Solar street lamps, Solar photovoltaic of different models and sizes has been carried out successfully in RECAST. It also has improved traditional water mills and the diversification of their used. Under the framework of Renewable Energy Technologies in Asia: A Regional Research and Dissemination Programme funded by the Swedish International Development Cooperation Agency (SIDA) and coordinated by Asian Institute of Technology (AIT), RECAST has carried out extensive research and development work on different types of solar dryers suitable for Nepal and a played an active role in the promotion and dissemination of this technology throughout the country. Similarly with the funding support from the University College Northampton, Oxford Brookes university, U.K and the British Council in Nepal, RECAST has undertaken the project entitled “Exploration and Utilization of the Indigenous Renewable Oil Resources in Nepal”. Under this project, RECAST has successfully developed a process of extracting bio-diesel from the plant Jatropha curcus and utilizing this plant oil for operating a diesel engine as a substitute for diesel fuel.
Recently, RECAST has developed and successfully tested Rocket Stove dryer for the drying of large cardamom in Ektin VDC of Phidim, Panchthar District. The project was supported by the Netherlands Development Organization (SNV).

2.4 Water and Energy Commission Secretariat (WECS)

The Water and Energy Commission was established in 1975 with the objective of developing the water and energy resources in an integrated and accelerated manner. Consequently, a permanent secretariat of WEC was established in 1981 and was given the name, Water and Energy Commission Secretariat (WECS). The primary responsibility of WECS is to assist the Government, the Ministry of water resources and other concerned agencies in the formulation of policies relating to rational utilization, control, protection, management and development

of water resources and energy and also in the field of implementation of project. Now, WECS, functions under the Ministry of Energy, Government of Nepal.

The main objectives of WECS are:

- To formulate and assist in developing policies and strategies in the water resources and energy sector.
- To provide suggestions, recommendations and guidance in the development of irrigation, hydropower, and drinking water projects. WECS is also mandated to formulate and develop policies and plans related to industrial use of water, flood management, in-land navigation, fisheries and other sectors related with water resources, along with the protection of the environment relating to the above sectors.
- To provide assistance to the concerned ministries in formulating policies and objectives to be included in the perspective/periodic plan relating to the water resources and energy sector.
- To render opinion, advice and recommendations on bilateral and multilateral issues relating to water resources and energy.
- To act as a documentation center for all regional water resources and energy related issues.

2.5 Alternative Energy Promotion Center (AEPC)

Alternative Energy Promotion Center (AEPC) is an organization devoted to the development and promotion of renewable and alternative energy technologies in Nepal. The Alternative Energy Promotion Centre (AEPC) was established according to a Cabinet Order, Alternative Energy Promotion Development Board Formation Order under the Development Board Act. The institution has an autonomous status under the purview of Ministry of Environment Science and Technology (MoEST). All administrative and functional powers lies with the board of AEPC which comprises of 9 members and is composed of 7 Government representatives and 2 private sector (industry/NGO) representatives. On this background, AEPC was established in November 3, 1996 under the control of Alternative Energy Promotion Development Board (AEPDB). AEPC is now under the Ministry of Environment (MoE). The Minister for Environment is the chairman of the board while Executive Director, AEPC is the Member Secretary.

The overall objective of AEPC is to popularize and promote the use of renewable energy technology to raise the living standard of the rural people, to protect the environment and to develop the commercially viable alternative energy industries in the country.

AEPC was set up to promote the use of renewable energy technologies to meet the energy needs in rural areas of Nepal. Acting as an intermediary institution between the operational level NGOs/ private promoters of renewable energy and the policy decision levels in relevant ministries, AEPC's activities include renewable energy policy formulation, planning and facilitating the implementation of the policies/plans.

The main role and responsibilities of AEPC are:

- Promotion of RET development programmes;
- Standardization, quality assurance and monitoring;
- Technical service and support;

- Subsidy and financial assistance delivery;
- Co-ordination of various government organization, donors, NGOs/INGOs and private sector;
- Monitoring and evaluation; and
- Strengthening of AEPC and other partners.

AEPC is involved in the following alternative/ renewable energy programmes:

1. Biogas
2. Micro-hydro power
3. Solar Energy
4. Improved Cook Stove
5. Improved Water Mill
6. Wind Energy
7. Geothermal and other alternative energy

2.6 Energy Sector Assistance Programme (ESAP)

On the 26th of March 1999 an agreement on an Energy Sector Assistance Programme (ESAP) was signed between Government of Nepal and GKD with a total budget of 154 million DKK. The total ESAP period is expected to be 15-20 years. The Alternative Energy Promotion Centre (AEPC) and Nepal Electricity Authority (NEA) are the national agencies for the programme. Physical outputs of Phase I including successive bridging periods and no-cost extensions has reached more than 1.5 millions people benefited from improved cooking stoves, electric lights (solar home system and micro hydro). In addition, the project has made a substantial investment in capacity building at field, manufacturing, financial sector and at the central policy level which is expected to have a long time bearing in the development of rural energy in Nepal. The activities in the Phase I were executed by private commercial sector operators and by NGOs.

ESAP is launching Phase II for next five years (2007-11) with realigned development objective of:

- Improving the living conditions of the rural population by enhancing their access and affordability to rural energy solutions that are environment-friendly and that address social justice.

The immediate objective is to see that Regulatory and institutional arrangements are in place, technological solutions are available with quality assurance according to income strata, and credit facilities are available to promote investments.

For the next five years phase, the ESAP will have five components:

1. Institutional Support to Rural Energy Sector.
2. Biomass Energy.
3. Mini Grid (Micro Hydro) Development.
4. Solar Energy.
5. Financial Assistance to Rural Energy Investments: Rural Energy Fund.

The Alternative Energy Promotion Centre (AEPC) is the executing agency of the programme and implemented by the ESAP Programme Office. The components are implemented at field level by communities, private commercial sector and by NGOs/INGOs.

2.7 Renewable Energy Project (REP)

The Renewable Energy Project (REP) is a joint effort of the European Union and the Government of Nepal to create renewable energy infrastructure and services for the benefit of rural people in remote districts of Nepal. The REP focuses on provision of solar energy systems for public services (schools, hospitals, safe water provision, communications, etc) of remote districts, as well as for income generating activities.

The energy service is provided to the end-users through community based and owned energy service providers. These Community Energy Service Providers (CESPs) will be one of the key players in decentralized energy service of Nepal. The CESP provides electricity services to the end users and operates and maintains the stand-alone PV systems against service fee. The REP will cover the entire cost required for the installation of the solar energy systems, and the end use appliances and necessary infrastructure will be provided by the communities.

The project embraces highly participatory approach in its implementation, which begins with the identification of COs through the social mobilization. The REP provides extensive capacity strengthening support at central, district and community levels as well as the continuous technical assistance to ensure the sustainability of the schemes. In addition, REP addresses the question of financing of the renewable energy technologies with emphasis on the financing of the CESP, and provides extensive support to the quality assurance of both the large PV systems and solar thermal equipment.

The European Commission and the Government of Nepal signed an addendum to extend the implementation period of the REP till 17 August 2011 due to importance of the REP for development and peace process in Nepal. The project extension open the way for procurement of solar energy equipment to rural communities, and is boosting the confidence of the communities, who ar working together with the PTF for the establishment of community-based energy utilities in rural areas. The total funds available for its implementation are EUR 15 million as contribution from the European Commission and EUR 0.675 million as the contribution from the Government of Nepal.

Rural Energy Fund (REF) has been established as stipulated by the "Renewable (Rural) Energy Subsidy Delivery Mechanism, 2006 of the Government of Nepal as follows:

In order to arrange the Government of Nepal and donor's fund involved in ESAP's for subsidy to the Biomass Energy Technologies, solar energy (SHS and SSHS), micro hydro and other programmes, the existing Interim Rural Energy Fund (IREF) is expanded into Rural Energy Fund (REF).

The REF will remain under the supervision of the Alternative Energy Promotion Development Board. The REF may consist of one or more funding mechanism as required by various ongoing and future programmes. If the Government of Nepal allocates the fund for Renewable (Rural) Energy particularly for Electrification (MHP, SHS etc.) other than matching fund, this fund will be put in REF and disbursed as per procedure of REF.

2.8 Rural Energy Development Programme(REDP)

The REDP was initiated on 16th August 1996 as a joint programme between Government of Nepal (GoN) and the United Nations Development Programme (UNDP) and the World Bank. It complements the rural electrification objective of the Tenth Five Year Plan Government of Nepal by promoting micro hydro schemes, solar, wind energy and biogas technologies. It adopts holistic approach by linking rural electrification with rural economic activities and ultimately impact positively on livelihood of the rural people. Decentralized and participatory planning, decision making, implementation, monitoring and evaluation activities are basic pillars for the success of the program. It was recognized with many internationally prestigious awards viz. ENERGY GLOBE AWARD 2000, AUSTRIA; PEARL OF KNOWLEDGE AWARD 2005, THAILAND; GLOBAL 100 ECO-TECH AWARD 2005, JAPAN. It is targeted to cover 150 VDCs in the 25 programme districts.

REDP-I

REDP-I is a joint initiative of His Majesty's Government of Nepal (HMGN) and the UNDP. It was initiated in 1996 as a pilot project in five hill districts. It was implemented in 15 hill districts of Nepal namely, Dadeldhura, Baitadi, Achham, Bajura, Dailekh, Pyuthan, Baglung, Myagdi, Parbat, Tanahu, Kavre, Sindhupalchok, Dolakha, Okhadhunga and Tehrathum. By December 2003, REDP-I had supported the communities of 100 VDCs of 15 districts to install 120 micro hydro schemes, 1524 solar home systems, 2953 toilet attached biogas plants and 7200 improved cooking stoves, resulting in more than 10,000 new rural households having access to electricity. It has successfully demonstrated that rural energy is an effective entry point for sustainable development for poverty reduction and need of holistic development approach. REDP-I was recognized as one of the most effective delivery model in the rural hills of Nepal.

REDP-II

REDP-II is built on the successes and achievements of REDP-I and envisages to replicate the successes in more districts with an additional support of the World Bank. In addition to 15 districts of REDP –I, the programme is implemented in 10 new hills districts namely, Darchula, Bajhang, Doti, Humla, Mugu, Dhading, Solukhumbu, Sankhuwasabha, Panchthar and Taplejung. Altogether, REDP is functional in 25 districts all over Nepal. The targeted beneficiaries of the programme are foremost men and women of several VDCs of selected hills districts. Government agencies, the local elected bodies (DDCs and VDCs), local NGOs and private sectors all are benefited. Decentralized and participatory decision making process and holistic development approach are two basic pillars of the programme.

Alternative Energy Promotion Center (AEPC), under Ministry of Environment, Science and Technology (MoEST) is the executing agency for the programme. Programme Management Committeee (PMC) is formulated that comprise of the representatives from National Planning Commission (NPC), Ministry of Local Development (MoLD), District Energy Network (DENET), ADDCN (Association of District Development Committee of Nepal) and National Association of VDCs in Nepal (NAVIN).

Rural Energy Development Programme (REDP) has entered into the Phase Three effective from 1 September 2007 upon the successful completion of its Second Phase. Initiated as a pilot programme with the financial and technical assistance of the United Nations Development Programme (UNDP) in five districts on 16 August 1996, the REDP was expanded to 10 districts in 1998 and to 15 districts in 2000. The main objective was to enhance the rural livelihoods through the promotion of rural energy technologies; primarily the community managed micro hydro system as the entry point for the holistic development and poverty reduction. Based on the impressive achievements and impacts, when the REDP was extended as the Second Phase, the World Bank has joined as a partner organization to provide the financial assistance for expanding REDP activities to additional 10 districts making a total of 25 districts in 2003.

In this third phase, among others, the REDP is supporting the Government of Nepal (GoN) to implement the Rural Energy Policy 2006 in all 75 districts. The Alternative Energy Promotion Center (AEPC) of Ministry of Environment, Science and Technology (MoEST) is the government executing agency.

The main objective of the REDP-III is to contribute to "the peace process by building local capacity for sustainable, community-managed, and equitable rural energy service delivery for poverty alleviation, livelihood promotion and environmental protection". This objective supports the goals and targets of the GoN and the UNDP in line with the existing United Nations Development Assistance Framework (UNDAF, 2002-2007) as well as the new UNDAF (2008-2010). The intended outputs are: i) lessons and best practices of REDP and other experiences are used for design of new model and continuous learning in rural energy and poverty alleviation in Nepal; ii) local level has capacity built to increase energy access through community management model in 40 districts iii) local level has capacity built to link energy services to poverty alleviation through productive and other end uses, including for women and socially excluded, in 40 districts; iv) Support to AEPC for energy planning in line with the key elements of an operational/functional Rural Energy Policy and local level environment mainstreaming started in 75 districts and national levels; and v) innovative approaches for long-term micro-/mini hydro and RETs sustainability are piloted, including developing micro-hydro projects as a Clean Development Mechanism project.

2.9 The Netherlands Development Organization (SNV) Nepal

SNV began its operations in Nepal in 1980. Over the years, SNV Nepal has been able to expand its reach, acquire in-depth technical knowledge, and deepen our understanding of Nepal's cultural and social underpinnings.

SNV Nepal works to realise sustainable, locally owned and relevant impacts in two areas:

- Improving the access, coverage and quality of basic services
- Increasing the production, income and employment opportunities for the poor

In order to achieve the above mentioned impacts, SNV Nepal works in five sectors:

- Renewable energy
- Water Sanitation and Hygiene
- Smallholder Cash crops
- Pro-Poor Sustainable Tourism

With 85% of Nepal's population living in rural areas of which 90% still use fuel wood to generate energy, it is increasingly important to pursue off-grid energy solutions for the future. SNV has been working in the renewable energy sector in Nepal since 1992, promoting market-orientated initiatives among government, private and NGO stakeholders. With over 20 years of experience in the renewable energy sector in Nepal, SNV has been able to develop a deep understanding of the benefits to local populations from renewable energy technologies (RETs) and the importance of maintaining performance of these technologies on the ground by engaging the private sector at the local level.

Objectives of SNV Nepal are as follows:

- Improve access to energy services
- Improve income generation and employement
- Bring reliability and stability to energy supply

Across all Renewable Energy applications, SNV's practical approach emphasises the delivery of essential benefits at the local level, including improved health and sanitation, environmental protection, good governance and social inclusion, and poverty reduction through income generation and employment opportunities.

Programmes:

- **Next Generation Biogas:** One of the defining features of our work - developing Nepal's domestic biogas scheme into a viable and vital part of the economy - is a model throughout Asia and Africa. Up till now, 200,000 families in Nepal have gained access to domestic biogas schemes and there is the potential for a further 100,000 to be installed in the coming five years.
- **Improved Water Mills (IWM):** In order to accomodate the new surge in demand for IWMs, SNV will continue to support the Centre for Rural Technology Nepal upscale its programme to 40 districts (from its current 16). Till date, SNV has helped install 5,000 IWMs across Nepal
- **Inclusive Biofuels:** SNV is exploring possibilities to promote Jatropa (a non-edible oil bearing plant) sourced Biofuel as an alternative to petroleum. The programme will demonstrate the full value chain of Jatropha, from planting, cultivation to processing a final user-product that will include biodiesel.

Innovative Microfinance: In order to enhance the access of Nepal's rural population - particularly the poor and marginalised - to energy solutions, it is essential that credit support be made available. Accordingly, SNV is working to pilot microfinance mechanisms by (1) building the capacity of promising microfinance institutions and (2) will explore possibilities for Carbon Bundling and Microfinance whereby income from Nepal's emergent carbon trading market will be used as collateral for new Renewable Energy lending my microfinance institutions.

Biogas Support Programme (BSP)

The Biogas Support Programme was initiated in July 1992 to develop and promote the use of biogas in Nepal.

For the first two phases of the programme, BSP I and II, programme support was provided by Government of Nepal, the Netherlands Development Cooperation in Nepal (SNV/N) and the Netherlands Development Agency (NEDA). With the start of the third phase of the programme (BSP III: 1997 - 2002), the German Government, through KFW, enforced the programme's support with financial assistance to the subsidy and credit component.

Implementation of BSP III is done jointly with three banks (Agricultural Development Bank of Nepal, Rastriya Banijya Bank, and Nepal Bank Limited), and 50 recognized private biogas companies.It has completed first and second phases and has been operating in the third phase since March 1997. The third phase is scheduled to end in December 2002.

Goals of the Third Phase
To promote and develop biogas as a sustainable source of energy throughout rural areas of Nepal.
Objectives:

1. To develop a market oriented and commercially viable biogas industry in the country.
2. To construct 100,000 biogas plants.
3. To ensure the continued operation of all biogas plants constructed under the program.
4. To research biogas related topics and to develop improved methods and techniques.
5. To assure that the slurry, a by-product of biogas plants, is brought to proper use.

To develop the biogas sector and give it an institutional outlook.

Program Facilities:

1. Government Subsidy.
2. Easily available loans from banks.
3. Operation and maintenance training.
4. Guarantees accompanying the plant and maintenance services.

Program Activities:
Promotion of biogas technologies
The programme aims to disseminate information on biogas technologies and its advantages through the use of radio, television, posters, newspapers and magazines, video shows, and promotional campaigns.

Quality Control
In order to assure the construction of good biogas plants by companies providing services to farmers, the programme regularly inspects the service provided to farmers and encourages companies to construct durable and efficient plants by giving them technical know-how and training.

Provision of subsides
Subsides are available to those who wish to install biogas plants that meet the criteria set by the programme and its quality standards. The amount is determined by the remoteness of the area that the plant is to be built and the size of the plant.

Training courses
Staff of biogas plant construction companies, bank employees, biogas users, non-government agency workers, etc. receive technique, management, and skill-based training courses.

Monitoring and evaluation
Activities of the programme are reviewed and evaluated on a regular basis and changes and improvements are made on the basis of reported findings.

Setting of standards and research
Research on biogas related topics is initiated and supported and appliances used on biogas plants are standardized and approved.

Slurry utilization
In order to assure the proper use of the slurry resulting from biogas production, activities are underway in cooperation with Alternative Energy Promotion Centre, comp. branch organizations and Department of Agriculture.

Institutional support
Organizations that are involved in the biogas pro-grammes are assisted in their institutional stren-gthening.

Achievements:
From the inception of the programme in July 1992 to December 2005, the programme has achieved the following:

BSP has successfully achieved the following results by the end of Dec 2005:

- Installed 156,575 biogas plants.
- 60 private biogas companies have been strengthened.
- 15 biogas appliances manufacturing workshops are developed.
- Comprehensive quality standards and quality control system is developed.
- 96% of constructed plants are in operation.
- 93,251 toilets are constructed (motivated for construction) and connected with biogas plants.
- 80% of bio-slurry is utilized as an organic compost fertilizer.
- Biogas programme is being developed as a first CDM project in Nepal.
- BSP is an ISO 9001-2000 certification holder for its strong quality management system and subsidy administration.
- 118 micro finance institutes are mobilized on biogas lending.
- 980,000 persons are directly benefited.
- 11,000 persons got employment.

Receipt of International Awards to Nepal's Biogas Program

Biogas program of Nepal has become a most successful program as it has been recognized

not only at the national level but also has been success to win the internationally recognized awards. The program has won the two international awards: **Ashden Award - 2005** amounted 30,000 Starling Pound and **Global 100 Eco-Tech Award – 2005 amounted 100,000 Japanese Yen,** for its outstanding contribution on improving health and welfare for rural Nepalese communities

Implementation Process:

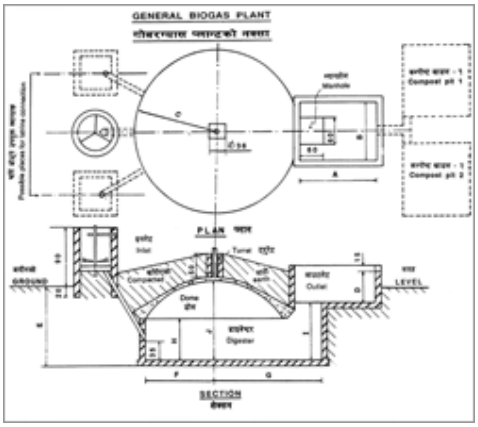

Figure 2.1. Schematic Diagram of a Biogas Plant

Contact a biogas company in close vicinity.

- Contact a local bank if loan is necessary.
- Select material required to build a biogas plant.
- Place dung and water in proper ration on a regular basis after the plant is installed.

Farmers who want to install biogas plants have to have adequate number of cattle in their farm. Since dung needs to be mixed in plentiful of water for proper processing, regular water supply has to be maintained and the water needs to be near the biogas plant. Further information can be obtained from a bank, biogas company, or BSP.

Biogas related Organizations:

NAME OF THE ORGANIZATION	CONTACT PERSON	CONTACT DETAILS
All Nepal Biogas Company Pvt. Ltd.		Banepa-9, Kavre Tel: 011-63677 Mob: 9851055209 info@allnepalbiogas.com
Biogas Bistar Company Pvt. Ltd.		Bharatpur-10, Hakimchowk, Chitwan Tel: 056-523878/523515 Mob: 9845023743
Butwal Gobar Gas Company Pvt. Ltd.		Butwal-12, Basecamp, Rupandehi Tel: 071-541973 /545848
Bageshori Gobar Gas Pvt. Ltd. (Previous Baral Gobar Gas)		Pokhara Nagarpalika-8, Newroad Mob: 9846023112
Bhairabi Gobar Gas Udhyog Pvt. Ltd.		Chaughada Bazar-7, Nuwakot

		Tel: 010-69257 PCO
Baikalpik Urja Bikash Company Pvt. Ltd.		Bharatpur-12, Chitwan Tel: 056-525331
Gobar Gas Tatha Krishi Yantra Bikash Pvt. Ltd.		New Baneswor, Kathmandu Tel: 01-4462582
Gramin Gobar Gas Tatha Urja Bikash Pvt. Ltd.		Dumre, Tanahun Tel: 065- 80016
Gorakhkali Gobar Gas Tatha Urja Bikash		Prithivi Narayan-3, Shaktichowk, Gorkha Tel: 064-420618
Himalayan Gobar Gas Tatha Gramin Sewa Pvt. Ltd.		Bharatpur-10, Chitwan Tel: 056-530667
Integrated Energy Development Company Pvt. Ltd.		Kumroj, Chitawan Tel: 056-20224
Jansewa Gobar Gas Company Pvt. Ltd.		Chaubiskoti, Bharatpur, Chitwan Tel: 056-28471
Janta Gobar Gas Nirman Tatha Baikalpik Urja Bikash Anusandhan Kendra		Bharatpur-10, Chitwan Tel: 056-524987
Janabhavana Gobar Gas Udyog Pvt. Ltd.		Bidur-1, Dhunge, Nuwakot Tel: 010-560123
Janapriya Gobar GasCompany Pvt. Ltd.		Barakalpur-2, Imiliya, Kapilvastu
Kamana Gobar Gas Company Pvt. Ltd.		Bhoteodar, Lamjung Tel: 066-29444 / 29304
Khanal Gobar Gas Sewa Kendra Pvt. Ltd.		Damauli, Vyas Nagarpalika, Chapaghat, Tanahun Tel: 065-60421
Kishan Gobar Gas Udyog Pvt. Ltd.		Dhunge, Bidur, Nuwakot Tel: 010-60435, 4360130 (KTM)
Kamala Gobar Gas Company Pvt. Ltd.		Anarmuni-4, Birtamod, Jhapa Tel: 023-541094, 542461 (shop), 42308 (Res)
Krishi Bikash Gobar gas Company Pvt. Ltd.		Biratnagar, Morang Tel: 021- 528799
Laligurans Gobar Gas Company Pvt. Ltd.		Makar-4, Bardaghat, Nawalparasi Tel: 078-580181
Lamjung Gobar Gas Nirman Tatha Gramin Batabaran Samrachhyan Pvt. Ltd.		Besisahar-2, Lamjung Tel: 061-539550 Mob: 9841206315
Lokpriya Gobar Gas Tatha Saurya Shakti Bikash Pvt. Ltd.		Mainroad, Itahari-1, Sunsari Tel: 025-581876/26-520060
Manaslu Gobar Gas Company Pvt. Ltd.		Damak, Jhapa Tel: 023-80397
Maheshmati Gobar Gas Uddhyog Pvt. Ltd.		Dharke Bazar, Dhading Tel: 010-529119, 4284609

Mankamana Gobar Gas Sewa Kendra Pvt. Ltd.		Pokhara-8, Kaski Tel: 061-535432
Mechi Gobar Gas Company Pvt. Ltd.		Biratchowk, Indrapur-3, Morang Tel: 021- 545007 Mob: 9842024372
Nepal Biogas Company Pvt. Ltd.		New Baneswor, Kathmandu Tel: 01-4470062
Nepal Gobar Gas Bistar Tatha Bikash Company Pvt. Ltd.		Dumre, Tanahun Tel: 065- 80016
Nil Kamal Gobar Gas Company Pvt. Ltd.		Bharatpur-10, Chitwan Tel: 056- 523688/520786
Panchthar Gobar Gas Company Pvt. Ltd.		Phidim-1, Panchthar Tel: 024- 20212
Paschimanchal DhaulagiriGobar Gas Tatha Sewa Pvt. Ltd.		Aanandaban-3, Manigram, Rupandehi Tel: 071-560691
Public Gobar Gas & Rural Development Company Pvt. Ltd.		Sukranagar-10, Butwal, Rupandehi Tel: 071-43122 Mob: 987021237
Pragati Gobar Gas Sewa Kendra Pvt. Ltd.		Main Road, Vayas-11, Tanahun Tel: 065-560573/560873
Rapti Gobar Gas Company Pvt. Ltd.		Hetauda-4, Makawanpur Tel: 057-521825
Rastriya Gobar Gas Nirman Tatha Sewa Pvt. Ltd.		Bharatpur-10, Chitwan Tel: 056-521563, 524275 rggbha@mos.com.np
Shiva Shakti Gobar Gas Pvt. Ltd.		Fikkal Bazar, Ilam Tel: 027-540250
Sital Gobar Gas Company Pvt. Ltd.		Tam Nagar, Butwal-14, Rupandehi Tel: 071-545766
Sana Krishak Samudaik Gobar Gas Company Pvt. Ltd.		Indrapur, Morang Tel: 021-545359
Tribeni Gobar Gas Company Pvt. Ltd.		Kawasoti-5, Nawalparasi Tel: 078- 540313
Bhrikuti Gobar Gas Company Pvt. Ltd.		Jeetpur-4, Kapilvastu Tel: 071-562238 (R), 071-549478
Biogas Construction & Energy Development Pvt. Ltd.		DDC Road, Guleriya, Bardiya, Banke Tel: 084-420524
Dipshikha Urja Bikash Company Pvt. Ltd.		LNP-7, Talchowk, Kaski District Tel: 061-560406
Gandaki Gobar Gas Sewa Kendra Pvt. Ltd.		Prithvichowk, Pokhara-8, Kaski District Tel: 061-523145
Gharelu Gobar Gas Tatha Prabidhi		Mahendra Rajmarga, Chauraha, Butwal-10, Rupandehi

		Tel: 071-540827
Bikash Company Pvt. Ltd.		Achham Tel: 987020852
Gorakha Urja Bikash Company Pvt. Ltd.		Prithivi Narayan-3, Harmatari, Gorkha Tel: 064-420552 Mob: 9841319627
Hamro Gobar Gas Company Pvt. Ltd.	9841278899	Pourahi-5, Rutahat
Hetauda Gobar Gas Company Pvt. Ltd.		Hetauda-4, Makwanpur Tel: 057-522824 Mob: 985067246
Himal Energy Development Company Pvt. Ltd.		Kumroj-1, Harnari, Chitwan Tel: 056-560659/5554616
Kantipur Gobar Gas Company Pvt. Ltd.		Kamalamai Nagarpalika-6, Sindhuli Tel: 047-520405
Kamadhenu Baikalpik Urja Company Pvt. Ltd.		Shurunga-5, Jhapa Tel: 023-550046
Lekbeshi Saurya Urja Tatha Gobargas Sewa Company Pvt. Ltd.		Tamghas-1, Naya Bazar, Gulmi Tel: 079-520207/520166
Makalu Gobar Gas Company Pvt. Ltd.		Tamthok-8, Sankhuwasabha Tel: 026-520513
Mahila Samuhik Bikash Company Pvt. Ltd.		Rautahat-1, Chandranigahapur, Chitwan Tel: 046-570058/055-540393
Motherland Energy Group Pvt. Ltd.		Gangabu, Kathmandu Mob: 9841271677
Machapuchre Bio Biogas Tatha Gramin Bikash Company Pvt. Ltd.		Vyas-2, Damuli, Tanahun Urja, Tanahu Mob: 9846021700
Munal Gobar Gas Company Pvt. Ltd.		Damak-11, Jhapa Tel: 023-582170/540042
Nipurn Gobar Gas Company		Bhoteodar, Lamjung Tel: 064-520754/061-561144
New Deep Public Gobar Gas and Urja Company Pvt. Ltd.		Ghorahi, Dang
Pathibhara Gobar Gas Company Pvt. Ltd.		Ilam-3, Ilam (ILA) Tel: 027-521107 Mob: 9852680057
Public Urja Bikash Company Pvt. Ltd.		Itahari-4, Sunsari Tel: 025-581639/582250
Ramechhap Gobar Gas Company Pvt. Ltd.		Manthali-6, Ramechhap Tel: 2111117
Ratna Joti Gobar Gas Tatha Urja Bikash company Pvt. Ltd.		Bandipur-1, Tanahun Tel: 065-580011
Rastriya Baikalpik Urja Prabardhan Tatha Bistar		Dhumbharahi, Kathmandu-4

Company Pvt. Ltd.		Tel: 4481166/2071124
Sulav Biogas and Alternative Energy Development Service Centre		Vyas-7, Chapaghat, Tanahun Tel: 065-60421 (R)
Sudurpaschimanchal Gobar Gas tatha Urja Bikas Company Pvt. Ltd.		Mahendranager-18, Kanchanpur Tel: 099-525096/524064
Sarbodaya Urja Tatha Gobargas Company Pvt. Ltd.		Besisahar-2, Lamjung Tel: 61-539167
Suryodaya Gobar Gas Company Pvt. Ltd.		Ramilo, Morang Mob: 9842021937
Bikash Company Pvt. Ltd.		Kamalamai NP-11, Biman, Sindhuli
Taplejung Gobar Gas Company Pvt. Ltd.		Phuling-4, Taplejung Tel: 024-460031
Gorakha Urja Bikash Company Pvt. Ltd.		Prithivi Narayan-3, Harmatari, Gorkha Tel: 064-420552 Mob: 9841319627

2.10. Biogas Sector Partnership Nepal (BSP-Nepal)

Biogas Sector Partnership Nepal (BSP-Nepal) is the implementing agency of Biogas Support Programme (BSP) Phase-IV. BSP-Nepal was established as an NGO in 2003 to take over the implementation responsibility of BSP, which formerly was managed directly by the Netherlands Development Organisation (SNV). The Executive Committee (Board) of BSP-Nepal has 6 Nepalese professionals directly involved in the promotion of biogas or other reputed professionals willing to contribute to further the development and promotion of biogas.

Since, BSP-Nepal took over the responsibilty of implementing BSP Phase-IV, it very much considers itself responsible for development of the biogas sector, further strengthening and expanding the sector while at the sametime interlinking it with the issues of other development sectors. Further, since last few years it has also embarked on promotion of rain waterharvesting systems and linking it with biogas promotion in areas where water is scarce.In that background, BSP-Nepal is broadening its vision and scope and has recently established a New Project Wing to handle project activitiesother than those under BSP. Thus, BSP-Nepal has also articulated its vision, mission objectives and strategy as given below.

Vision

An organisation that is capable and successful in improving livelihood of communities through promotion of different environment-friendly solutions.

Mission

To promote environment- friendly and sustainable solutions to people in partnership with other players in the sector(s) for improved livelihood and environment protection.

Objectives

1. To further develop and disseminate biogas plants as a mainstream renewable energy solution in rural Nepal, while better addressing poverty, social inclusion and regional

balance issues and at the same time ensuring enhanced commercialisation and sustainability of the sector (Objective of BSP Phase-IV).

2. To develop and strengthen innovative fund raising measures such as CDM for continued service delivery.
3. To initiate and implement projects in biogas plants for institutional and community uses.
4. To facilitate the process of developing new solutions that complement the promotion of biogas and integrate it with solutions on water, sanitation, etc.

Strategy

1. Partnership with relevant organisations.
2. Promotion and marketing of environment-friendly solutions.
3. Maintaining and replicating best practices.
4. Institutional strengthening and capacity building for sustainedservice delivery.
5. Institutional good governance.

Major projects under the New Project Wing

1.Rainwater Harvesting Capacity building Centre with funding from RAIN Foundation, the Netherlands. This also includes construction of institutional size rainwater harvesting tanks.
2.Construction of household size rainwater harvesting tanks for biogas plants with use of the cash prize from the Ashden Award 2005
3.Construction of Institutional Biogas plants with funding from UN-Habitat and ICRC.
4.Implementation of Gold Standard CDM Biogas Projects with funding from WWF.

Background:

The Biogas Support Programme (BSP) started in July 1992 with funding from the Directorate General for International Cooperation of the Netherlands (DGIS) of the Netherlands government through the Netherlands Development Organization in Nepal (SNV/N). Government of Nepal (GoN) through Alternative Energy Promotion Centre (AEPC) and Government of Germany through the Kreditanstalt fur Wiederaufbau of Germany (KfW) also started funding the BSP from the Phase-lll, which started in March 1997 and lasted till June 2003. Until the Phase-III, BSP was directly implemented by SNV/N.

The BSP, Phase-IV (July 2003-June 2009) is being implemented after successful completion of the first 3 phases. Biogas Sector Partnership Nepal (BSP-Nepal) is the implementing agency.

The Programme had originally aimed to install 200, 000 biogas plants during the Phase IV period. This is also a target envisaged in the tenth plan (mid July 2002 to mid July 2007) of the GoN.The programme has reached 67 districts till December 2007, out of 75 Districts in Nepal. The total number of plants constructed under the programme till December 2007 was 1,72,858.

2.11 Practical Action Nepal Office

Practical Action Nepal Office works to improve the livelihoods of the poor and disadvantaged by implementing sustainable development. We aim to achieve this by building

technical skills and undertaking the research, application and dissemination of appropriate technologies.

Practical Action Nepal Office currently undertakes work through its government, non-government and private sector partners under four main areas:

- Reducing vulnerability
- Making markets work
- Promoting infrastructure for the poor
- Responding to new technologies

Contact:

Practical Action Nepal Office
PO Box 15135, Pandol Marg, Lazimpat
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Fax: +00 977 1 444 5995

e-mail: nepal@practicalaction.org.np

2.12 Winrock International

Winrock International is a nonprofit organization that works with people in the United States and around the world to empower the disadvantaged, increase economic opportunity, and sustain natural resources.

Winrock matches innovative approaches in agriculture, natural resources management, clean energy, and leadership development with the unique needs of its partners.

By linking local individuals and communities with new ideas and technology, Winrock is increasing long-term productivity, equity, and responsible resource management to benefit the poor and disadvantaged of the world.
Winrock International is committed to: building human capacity, creating long-term relationships, managing effectively, communicating openly, and promoting teamwork.

Winrock supports establishment and growth of small and medium-sized enterprises to create jobs, promote private sector growth and increase incomes in rural areas.

Market development

- Value chain analysis
- Marketing and trade initiatives
- Policy reform
- Public - private partnerships

Capacity building

- Entrepreneurial, management and business planning training
- Leadership development
- Development and strengthening of SMEs and the organizations that support them

Supporting mechanisms

- Technical assistance in production and value-added processing
- Investment and financing strategies
- Information and communication technologies
- Information dissemination

2.13 Centre for Rural Technology Nepal

Centre for Rural Technology, Nepal (CRT/N) is a professional non-government organization engaged in developing and promoting appropriate/rural technologies effective in meeting the basic needs of the rural communities and improving their life support system. Initially it was established in 1989 under the Company Act, CRT/N is now registered with His Majesty's Government of Nepal under the Social Registration Act since 1998. Since its establishment, the organization has been dedicated and actively engaged in upgrading traditional technologies and developing new technologies and effectively promoting and disseminating these technologies to technologies that strengthen the capability of rural poor communities to respond to their needs and creating better options and opportunities for sustaining the rural livelihood.

Objectives:

- Promote and disseminate appropriate technologies to respond to basic needs of the people and create opportunities to improve quality of life and upgrade the economic condition of the people
- Conduct adoptive and action-oriented research on indigenous and improved technologies;
- Train and transfer technical information and know-how on the production, installation and management of appropriate technologies;
- Assist in development of technical and institutional capabilities for application of science and technology for sustainable development; and
- Provide technical support and consulting services in the field of energy and environment conservation.

Areas of Operation:

Renewable Energy Technology Development
Environment and Natural Resource Management
Small Scale Irrigation Management
Technology for Women and Micro-enterprise Development
Local Water Harvesting Systems and Rural Transport System

The Operational Mechanism
Assistance/Partnership in Action Programs

CRT/N works in partnership with technology manufacturers, promoters and users to implement and evaluate action programs effectively. It provides support services and motivates local community members to participate in technology need assessment, development and its utilization.

Trainings and Workshops

CRT/N provides assistance in conducting trainings and workshops for project staffs and grass-root community leaders and promoters to develop and enhance their technical capability especially on the application of rural technologies suited to the village and community development.

Technical Support Services

CRT/N provides technical services to governmental organizations (GOs), non-governmental organizations (NGOs), international non-governmental organizations (INGOs), community-based organizations (CBOs) as well as the users for promotion and dissemination of appropriate technologies.

Dissemination of Rural/Appropriate Technologies

CRT/N disseminates rural technologies on an independent basis and in collaboration with other NGOs, INGOs, CBOs, GOs and other technology related organizations.

Study Visits and Demonstration

CRT/N organizes study visits to familiarize with specific technologies that are being used successfully in various parts of the country. It provides a forum for the exchange of ideas and experiences to planners, researchers, promoters and community members engaged in the development, promotion and use of appropriate technologies.

Collaboration and Networking

CRT/N has established collaboration and networking with various stakeholders in national, regional and international level involving technology researchers, developers, promoters, users and agencies and professional involved in this field in order to facilitate information exchange and experience sharing.

Technology Information and Documentation Unit

CRT/N collects, processes and disseminates information on rural technologies in conjunction with its documentation unit. As a part of Documentation unit, various collections are also available in our resource center. Any individuals, organizations or institutions can benefit from our resource centre as and when required.

2.14 Centre for Renewable Energy

Establishes in 1992, the Center for Renewable Energy (CRE) is a non-governmental and non-profit making organization (NGO) which brings together professionals and people who believe in the generation and optimum utilization of renewable energy and appropriate

technology. The Centre believes that harnessing renewable energy and utilizing appropriate technology hold promise for achieving sustainable development and economic prosperity of the common people. Clean energy is the future of mankind and CRE is the forum setup to exchange the ideas, debate, research and analyze the possibilities of harnessing this clean energy. CRE studies, plans, designs and promotes efficient generation and utilization of renewable energy and appropriate technology as well as innovative means for conserving energy. In doing so, the Centre encourages the use of existing resources (expertise and materials) and liaises with regional and international agencies/organization to share information on available appropriate RETs and on the possibilities of adaptation and transfer to specific local conditions. The long term goal of CRE is to assist the nation to maximize the use of sustainable appropriate renewable energy technology and environmentally friendly energies such as solar PV, solar thermal, wind, pico-hydro, bio-mass, bio-gas etc.

Objectives:

To become National Information Bank on Renewable Energy and Appropriate Technology.

..:: Conduct awareness programs, for utilization and conservation of renewable energy.

..:: Undertake adaptive research, impact study and development of existing or new and innovative technologies in the field of renewable energy.

..:: Form a "clearing house" to collect and disseminate information on the status of renewable energy and appropriate technology.

..:: Initiate and/or participate in discussions among government, industry and NGOs on legislations and economic interventions to promote renewable energy.

CHAPTER III

This chapter deals with the case studies on selected renewable energy technologies taken up by different organizations.

3.1 Success Stories

3.2 Model Energy VDC: A Dream Comes True

The Bhoksing VDC has been declared as the Model Energy VDC by the Eight District Council of the Parbat District Development Committee. One of the 55 VDCs of the Parbat district, the Bhoking has become the first VDC that has electricity access to its all 234 households. This has become possible due to the installation of two micro hydro plants, two plethoric sets and 17 solar home systems. Besides, all the households have constructed the improved cook stoves, which have helped reduced the fuelwood consumption by about 30 percent.

The process got rolled with the implementation of the REDP activities in the VDC in 1997. Following the REDP community mobilization process, the people have organized into 22 community organizations (COs), of which 11 are female COs. Under the weekly saving scheme, the CO members have saved a total of Rs. 188, 965 and made the cumulative investment of Rs. 437,880 to the members for carrying out various income generating activities. Among others, the popular enterprises include the poultry farming, battery charging, potato chip production, agro-processing mill, photo studio and video theatre. People do no have to travel 37 km to the district headquarter and spend lots of money for taking photos now. Similarly, they have easy access to information and entertainment through radio, TV and video.

The credit goes to the people, both men and women, who have demonstrated the strong social capital, dedication and determination for these impressive achievements and results. The DDC: REDS has been successful in supporting the villagers through the provision of guidance, technical backstopping and financial assistance.

The concept of developing an energy village has been discussed for a long time at the national and international arenas. Many approaches and modalities and technology mix have been devised and implemented but without producing successes. The Energy Village is still a dream concept for many intellectuals and planners and is thus a matter of discussion and debate. Thanks to the people of Bhoksing VDC, who made Nepal proud to be able to present a model Energy Village that is functional as well as sustainable. Days are not far to have more energy villages, as people of adjoining VDCs and nearby districts have shown similar commitment and efforts to provide electricity to all households in their respective VDCs. The

REDP has been supporting them through DDC: REDSs of the respective districts. Along with other stakeholders, the REDP is happy to support this initiative which has helped to make the long cherished dream come true in Nepal.

3.3 Bringing the World Closer: Micro Hydro Operated Cable TV Network

It might sound quite astounding, but the community people of a remote village called Dudilabhati are finding themselves very close to the rest of the world through connection of their TVs with the cable network of the disc antenna. This has become possible due to the micro hydro system, which is installed for generating electricity for household lighting and end-use applications. The Dudilabhati village is situated at 30 Km from the nearest motorable road at Baglung Bazar. It takes one day to walk from Baglung to the village.

Mr. Moha Dutta Subedi, an enterprising CO member had conceived the idea of establishing and providing the services of cable network to the TV possessing households when all villagers were discussing and making plan for the installation of a micro hydro plant in the village through the assistance of the REDP supported DDC: REDS Baglung. So he was quick to establish the cable TV network enterprise, once the micro hydro plant started distributing electricity in the village. He made the total investment of Rs. 250,000 of which the Rs. 80,000 was obtained as loan from the MHFG managed Community Energy Fund (CEF) at annual interest rate of 12 percent. Mr. Subedi pays the monthly tariff of Rs 500 to the MHFG for the supply of electricity to operate the cable network. At present, there are 18 households connected to the cable TV network. He charges Rs 50 per month from each household for services provided. The cable TV network is operational from 6 PM to 11 PM. The timing will be increased at the later stage.

The VDC was selected for the programme implementation in the very beginning of 1999. The villagers have completed the Gaundi Khola Micro Hydro Demonstration Scheme in 2002, which generates 20 kW of electric power benefiting 231 households. The programme facilitated the CO members to carry out various IG activities for which different training were conducted and the credit linkage facilitated. As the results, majority of the households has engaged in one or the other initiatives that have started to generate additional income. The increases in the income and the exposure to the markets have fascinated the villagers to possess TVs. At present some 50 households in the VDC have TVs and more are in the process to buy TVs in the near future because of the varieties of national and international entertainment serials and news aired from the cable network.

The impact of the cable network has been unbelievable. Among others, the men and women of the village feel themselves no less developed or privileged than the people of the most of the nearby bazaars which are yet to be electrified either through the national grid extension or though the installation of decentralized micro hydro. Because of the visible impact observed in the lives of the people of the Dudhilabhati village, the people of the adjoining villages of the VDC have started the installation of micro hydro systems in their respective communities.

As of now, there are five peltric-sets operational in the VDC, which were established through the support of the DDC: REDS, Baglung. These peltric-sets with the cumulative power outputs of 17 kW are benefiting 195 households. Besides, a 20 kW Lower Gaundi Khola MHDS is under implementation through the technical and financial support of REDP, which would benefit additional 220 households in the near future. With these development, it is not far way when all of households in the VDCs will have electricity access from the decentralized micro hydro systems. Then the VDC will have the privilege of becoming the first URJA GAON (Energy Village) of the Baglung district.

3.4 Making of an Urja Arc

The development of various types of decentralized rural energy systems is taking place in various nooks and corners of the country. However, the way the development is taking place varies from one place to another and from one promoter to another. Among these developments, the pragmatic and innovative approach of the REDP is being discussed as the 'talk of the time' in the recent years. The REDP supports to develop rural energy systems to electrify a VDC completely but in a phased manner. This is incorporated in the decentralized rural energy planning and management practice followed by the DDC in order to fulfill the demands of the people through the capitalization of their aspirations and commitment for the development of rural energy systems. Experiences have shown that people are sensitized and familiarized more through the successful demonstration in of the programme activities in the neighboring VDCs thereby generating multiplying effects of the initiatives undertaken for the forwarding looking socio-economic transformation of the community people of the entire area.

The Taman VDC in Baglung district was selected for programme implementation in the late 1997 with a view to provide access to electricity to its two main settlements, viz. Taman and Lamela. The implementation of the 20 kW Taman MHDS was completed in 1999 which is benefiting 230 households of six wards of the VDC. The Thul Khola MHDS (18 kW) is under implementation. Once completed, it will benefit nearly 300 households in Lamela (Ward # 7,8,9). The people from the adjoining VDCs were very much impressed with the excellent results in Taman VDC. They have put strong demand to DDC: REDS for programme expansion as they meet REDP criteria of VDC selection. Accordingly, the Gwalichaur and Bhimgithe VDCs were selected in the second phase of programme expansion. The installation of the Labdi Khola MHDS of 56 kW in Gwalichaur VDC, and the Bhimghat Khola MHDS of 42 kW in Bhimgithe VDC have been carried out successfully. Works are underway for the Labdi Khola II MHDS of 30 kW in Gwalichaur and the Upper Bhimghat Khola of 18 kW in Bhimgithe VDC. The successful implementation of these schemes has encouraged in selecting two more VDCs in the locality viz. Dagatundanda and Khunga for the further expansion. Now, it is quite interesting to observe that all these VDCs which stretch from Dagatundanda to Taman form the shape of an arc in the map of the district. The formation of this arc has been admired not only by the community people and

local authorities, but also by the national level stakeholders. The beauty of the arc does not lie only on its geographical positioning; it is more relevant as the people residing in these VDCs share common way of life and maintains similar social relations. The development of the rural energy systems through the arc will foster the strong social capital and asset bases leading to higher level of development of the entire areas.

It is encouraging to note that these VDCs are being linked through the Kharbang –Burtibang district road. This road is considered as the backbone of the western part of the district and the development of series of micro hydro systems along the roads have been compared to the 'blood veins' of these entire locations. The demonstrative effective would not be limited to the Baglung district alone; it would get spread over to the neighboring districts viz., Gulmi, Rukum and Myagdi.

3.5 MAKING ECONOMIC SENSE

SUNSARI—Farmer Jit Narayan Chaudhary and his wife Jagita relax in their kitchen and start calculating their household expenses. They managed to save more this month. They are jubilant with the news.

“We’re glad that we took the initiative for installing the biogas plant in our village,” says Chaudhary, who was the first villager in his Dumartoka village of Khanar Village Development Committee (VDC) in Sunsari district to invest in the biogas technology when representatives from biogas companies were visiting each household to educate and promote the villagers about the biogas technology and how it could change their lives.

For poor farmers in his village, the initial cost of Rs 30,000 to install a biogas plant system, including a cooking stove is quite a huge amount. However, the Biogas Support Programme (BSP), a national programme implemented by Biogas Sector Partnership –Nepal (BSP-Nepal) gave him such a good financial plan that he decided to try it out.

BSP is currently funded by Directorate General for International cooperation of the Netherlands (DGIS) of Netherlands government through Netherlands Development Organisation in Nepal (SNV/Nepal), government of Nepal through Alternative Energy Promotion Centre (AEPC) and government of Germany through the Kreditanstalt fur Wiederaufbau (KfW) of Germany. The programme, which provides technical as well as subsidy for families to build biogas plants in rural areas, has helped a large number of low-income rural households to make biogas technology affordable and accessible to a great extent.

A poor farmer himself, Chaudhary managed to build his own plant with subsidy of Rs 6,500 provided by BSP. All he needed was an additional Rs 12,000, which he managed to get a low-interest loan from a Grameen Bank to whom he would repay in 50 weeks.

In addition, he also received an additional subsidy of Rs 1,500 from BSP. In 2006, ‘additional subsidy programme’ was initiated in collaboration between BSP and relevant development organizations especially with Grameen Banks to provide extra subsidy to help the poor who had at least one cattle and small plot of land. Those living in the remote hill districts would receive the highest subsidy of Rs 3,500, and the families in the Terai would receive Rs 1,500 and those in the hills would get Rs 2,500. Over 400 households have already received the support.

Today, many farmers like Chaudhary are glad they made the decision of building their own plants, as they are able to reap more benefits than they had imagined.

Saving from biogas

“The biogas technology has made so much difference to us. Surely, all families who own biogas plants will feel the same way,” says Chaudhary. Over the past one year, Chaudhary has been able to reduce his household expenditure by switching from wood to biogas for fuel ever since he installed his own biogas plant in his house at his Dumartoka village of Sunsari district.

Chaudhary used to spend over Rs 60 everyday to buy firewood. Now, due to biogas, his family does not have to spend anymore money to buy any firewood as fuel from biogas suffices to cook food for the family. Within few months of installing his biogas plant, he was not only able to save enough money but he also sparked interest among other villagers who saw that the investment on the biogas plant was really worthwhile.

“The neighbors often come to us and ask for advice as they have seen how easy it is to save money with the help of biogas plant,” explains Chaudhary’s wife smiling with pride. They were the same people who had cautioned her not to risk their savings by investing in a biogas technology about which they were sceptical. They believed that biogas would not benefit the farmers.

Today, more houses in the village and other areas in the district are fast building biogas plants with help of biogas companies who help them in the construction. Now even these companies are competing with each other to market their technical services to the poor households.

Old stories but never stale

Such stories about biogas are already old in the country but its consistent success among the users continues to inspire more people to build their own plants everyday from the terai to the hills and the mountain areas.

Until this year, the number of biogas plant users has reached 172,505, according to BSP-Nepal. With over 98 percent of plants operating, BSP has been a world model for successful biogas programmes.

“All we did was to provide guidance and boost the motivation of the villagers so that they could decide how best to use their cattle dung to clean gas and improved manure,” says Saroj Rai, executive director of BSP-Nepal.

In this district alone, around 9,000 families have already built gobar gas plants under BSP with technical help from biogas companies like Public Energy Development Company and Gobar Gas Tatha Krisi Yantra Bikas.

“Demand is even increasing as people have started to realise the immediate positive impact the biogas has made in the lives of many farming villagers,” explains Dilip Kumar Bhandari, a biogas expert involved in the sector for over three decades (Are you sure …. for so long?).

Pro-poor programmes

Despite the success of the biogas programme, there are many challenges to make this technology accessible for especially those who need it the most, namely the poor, who are the ones using most of the forest resources as they have no alternative.

The cost for complete plant construction and cooker costs over Rs 30,000 but the farmers have to pay only half of it due to the government subsidy through additional financial aid of German and Dutch

governments through KFW and DGIS/SNV respectively.

“The provision of subsidy has helped many families to own their own plants,” says Tilak Shrestha, manager of Kantipur Gobar Gas in Mohattari district, where his company has built over 500 plants in the last three years.

The poor families still have to find a huge amount of cash and most of them get low-interest loans from a Grameen Bank at the rate of 12 percent but they still need to show enough property to guarantee the timely payback in 50 weeks. If the client was poor, the loan from a Grameen bank would be provided with a group collateral and asset would not be required. He or she would also be provided with an additional subsidy.

But not all hope is lost, say biogas managers who believe that there are a lot of good options. One, the biogas users have formed their own groups and are already helping their poor neighbors to guarantee Grameen Bank for their sake. In addition, the Community Forest Users Groups (CFUGs) are also helping to build toilets to be attached to biogas plants. For instance, Parsahi Arne Bhulke CFUG in Parsahi village of Mohattari has already helped to build plants for nearly 60 families.

The poorest families in the context of biogas include those who have insufficient land to farm and do not own any cattle. This means that they would not even have the most important and basic raw material, namely cattle dung. In addition, they lack access to water and most of all enough land to build the plant.

Our ultimate objective is to ensure that our programme reaches the poor but it is quite difficult to reach the poorest now,” says Rai. Besides direct approaches like providing additional subsidy for the poor, in cooperation with the Grameen Banks, BSP-Nepal is also linking up its programme with other rural development and poverty-related initiatives for better pro-poor orientation.

3.6 Less Hardship for Women

SUNSARI—Manita Chaudhary sits comfortably in her house waiting for her children to return from school as she has already finished all her work before noon.
Her life was quite different a few months ago. She had to wake up very early to reach the forest on time to fetch wood for house fuel, sit five hours in the kitchen cooking and then spend additional four hours to clean up huge heap of cow dung in her house compound.
“There is no more hardship like before,” says Chaudhary, explaining how her life has changed ever since she installed her own biogas plant.

Although she had a small land, it was quite enough to build a tank to fill up with 50 kg of cow dung. It took barely a few weeks to build up her biogas plant and a new kitchen with guidance from Biogas Sector Partnership-Nepal (BSP-Nepal).

BSP-Nepal helped to provide a subsidy of Rs 6,500 from Biogas Support Programme (BSP), currently funded by Dutch, German and Nepal governments through Dutch development organization SNV, German Development Bank KfW and Nepal government organization Alternative Energy Promotion Centre (AEPC).

“This technology has helped to change the lives of women. I have personally reaped so many benefits as a woman,” explains Chaudhary, who has been encouraging her female neighbors in Khanar Village Development Committee (VDC) to build their plants so that they can also benefit in many ways, especially in reducing their drudgery.

Chaudhary’s change in her lifestyle has been inspiring other female villagers, who also want to have their own plants and are now requesting the local biogas companies for help.
She no longer has to worry about fetching wood and spends less than an hour in her kitchen cooking food, as it is quicker on her biogas stove. There is also no need to clean the cow dung since all of it is used completely to fill the tank. Most importantly, she and her children do not have to inhale any smoke from the fuel wood filling up in her kitchen.
“Biogas has really helped to raise more awareness about the drudgery that we women went through. Now, we often talk about how to improve its use,” explains Chaudhary. Over the last several months, she has learnt so much about biogas technology and its benefits. She also leads her local gobar gas users group, consisting of mostly women, and teaches them on how to get loans, fund assistance and making best use of biogas to improve their own lives.

“Now we don’t have to worry about waking early in the morning or walking for hours to find wood to store for months,” explains her neighbour Sharmila Chaudhary. She explained that many women were the ones enduring the most hardship, as they had to make dry dung for fuel when they ran out of wood.

Reducing hours of drudgery

Studies have shown that biogas technology has played a significant role in making a difference in gender sector. In a country where 95 percent of the rural population burns traditional biomass fuels indoors for cooking, heating and light, it is the female populace who spend most of their time in the smoke-filled kitchen for hours. The current trend of cooking through the use of fuel wood could have a direct chronic impact on the health of the women and children.

To a larger extent, biogas programme has helped to reduce the health risk especially in relation to reducing indoor pollution with tens and thousands of household shifting to biogas from biomass.

“Our long term goal has always been to also improve hygiene and health of the rural population, especially the women,” says Saroj Rai, executive director of BSP-Nepal.
There are of course criticisms also that the biogas technology has not altogether reduced the work burden of the women, since they continue to do more work than their male counterparts in maintaining the biogas plants. Women are the ones who carry the cow dung to fill in the tanks. In addition, they still have to carry water, which is needed to process the gobar gas. In places where water is scarce, the women and girls still have to walk a long way and could consume a lot of their time.

“We are aware of these issues and this is the reason why we are spreading gender equality issues through our biogas user groups,” said Manita. She explained that in her village, the local men and women share their work equally to ensure that neither the male or female members are burdened with work. The local biogas users groups have already increased huge membership with an equal number of men and women.

According to BSP, every plant reduces the workload of women by nearly three hours everyday in each household. Over the last 15 years, BSP has reached 172,505 households in 2,675 VDCs of 67 districts. Although there is no accurate data on the number of female populace benefiting from the programme, it can be easily gauged how it has directly affected a large number of them.

“Surely, my wife already works less than before but now I am also getting more involved in household work,” explains Kesablal Chaudhary, who carries the cow dung in his wooden basket. The best part is that he does not see his wife coughing so much and rubbing her eyes like she did when they didn’t own a biogas plant.

Definitely, the gender aspect of the biogas programme has turned out to be one of its best achievements. The noticeable difference can be gauged even now if one goes to the villagers who own the biogas plants.

With BSP aiming to reach more households in Nepal’s rural areas, biogas technology would certainly prove to be one of the most effective gender development programmes by helping to reduce the household burden on women. “We could have the chance to use our saved time for education, income generation and leisure activities,” says Chaudhary.

CHAPTER IV

4.1 Renewable Energy Market and Industries Scenario

In Nepal, though the economic structure is a free market economy, the market of the commercial energy sector is monopolistic in nature. The market and prices of the energy fuels have a unique characteristic in Nepal. The he energy consumed comes from the biomass sources and majority of it is non-monetized. The electricity, fossil fuels and some alternative sources of energy pass through the monetized market. With the 14 per cent of commercial energy and 0.6 per cent of the alternative energy, in the total energy consumption share, it is about 40 per cent of the total energy that is monetized.

This chapter deals with the types of RETs which later developed into SMEs or cottage industries in Nepal. For example, the "Solar Tuki" or the Solar PV powered light developed by Centre for Renewable Energy (CRE). Solar Tuki consists of two units of WLED based lamp set 94 units of WLED each 100 mW) with rechargeable Nickel Metal Hydride batteries (3.6 bolt/1300 mAh), Solar PV Panel (2.5 to 3 Watts peak) with mounting clamp set, a 3 volt power supply connector- accessory for powering a small FM/AM radio (2x AA batteries powered), and a guarantee and warrantee card with warrantee information. The whole system retails at Rs. 3,500/-. Solar PV Panel is the most expensive component in the solar Tuki but when installed with appropriate orientation, solar Panel operates without constraints for numerous years at least five years guaranteed).

For Solar Tuki, Service Centres are an alternative to agents and dealers. Entrepreneurs/ manufacturers are able to provide their warrantee and guarantee services in any area where their product is in use through local partnership without incurring high investment or operating cost. A typical rural household spends Rs. 135/- to Rs. 160/- on kerosene per month. A comparison of lifetime costs shows that the WLED lamp breaks-even against kerosene in around two years when monthly kerosene expenditure is NRs. 150/- and the remaining years are savings for the consumer.

The Centre for Renewable energy (CRE) promoted Solar Tuki as "Light for All" campaign with the objective of eradicating the use of kerosene based tuki (oil-wick lamp) from Nepal in shortest period possible. CRE is promoting the solar Tuki in its bid to develop decentralized and cost effective renewable energy systems to provide ustainable light and energy sources to the rural people. More than a decade earlier CRE had piloted Nepal's first Solar Village in Pulimarang VDC in Tanahun District using the stand alone solar Home System (SHS). Although the SHS costs RS 20,000/- to 35,000/-, the government started offering subsidy in 1997. Since then more than 100,000 such Solar Home systems have been installed in Villages around the country. Considering its reliability, affordability, portability, easy maintenance and non-polluting qualities, the solar tuki system is on the threshold of eliminating the kerosene tuki from Nepal. The list of qualified Companies for SHS installation is given below:

4.2 List of qualified Solar PV Companies:

S. N.	NAME OF THE COMPANY	CONTACT PERSON	E-MAIL ADDRESS	FULL ADDRESS	P. O. BOX.	PHONE NO.
1	Alternative Energy Resources Nepal Pvt. Ltd.	Raj Kumar Pandey (9851020873)	areolex@wlink.com.np	Gairidhara Chowk, Kathmandu	19404	4416701, 4418893
2	Bio Energy pvt. Ltd.	Deepak Bd. Shahi (9858021150)	bioenergy@ntc.net.np	Balaju Chowk, Kathmandu	9802	01-6225310, 081-26837, 081-550580 (Nepaljung)
3	Bionic Energy Pvt. Ltd.	Bhuminanda Baral (98510 85606)	aedc@ecomail.com.np	Goushala, Kathmandu	9813	01-2003356
4	Dhaulagiri Solar and Electronics Company	Kiran Gautam (9851089480)	dhaulagirisolar@ntc.net.np	Balaju, Kathmandu	1815	01-4365376, 012093109
5	Energy and Construction Company Pvt. Ltd.	Bhuwan Karki (9851018063)	eccnepal@ntc.net.np	Kalanki, Kathmandu		16220189
6	Energy International Pvt. Ltd.	Nabin Prakash Dhar (9851027061)	–	Jawal, Lalitpur		5543482
7	Everest Solar Energy pvt. Ltd.	Sing Raj Ghale (9851013280)	ese@ntc.net.np	Gogabu, Tokha Road, Kathmandu	8974	4360086
8	Kathmandu Power Company Pvt. Ltd.	Shailesh K.C (9851076627)	info@kpc.com.np	Shanti Nagar, Baneshowar, kathmandu	21533	4373572, 01-2111162
9	Krishna Grill and Engineering Works Pvt. Ltd.	L.M Rajbhandari	kgktc_brt@wlink.com.np	Bhumiparsasan Chowk, Biratnagar	150	021-525492, 021-535904
10	Lasersun Energy Pvt. Ltd.	Pushkar Nath Bhattarai (9851007786)	lasersun@wlink.com.np	Pulchowk Lalitpur	9952	5536171, 5549607
11	Lek Bensi Sourya Urja Tatha Gobar	Dhurba Bhandari (9841835388)	–	Rupandhei, Butwal		071-540074, 4384725

	Gas Sewa Company					
12	Lotus Energy Pvt. Ltd.	Puran Rai (9851036736)	info@lotusenergy.com	Bhatbhateni, Kathmandu	9219	4418203
13	Nabajyoti Urja Pvt. Ltd.	Deepak Humagai (9851047869)	info@nabajyotiurja.com	Maharajung, Chakrapath, Kathmandu	19655	4721741
14	Nepal Energy Development Company Pvt. Ltd.	Praksh Chandra Shrestha	nedco@techminds.com.np	Bharatpur-10, Chitawan	26 Chitwan	56521563
15	Perennial Energy Nepal Pvt. Ltd.	Anup Bajracharya (9851059600)	info@pen.com.np	Thribam sadak, Naxal, Kathmandu	4395	4414363
16	Rural and Alternative Energy Pvt. Ltd.	Prakesh Chandra Subedi (9851045892)	resurja@ntc.net.np	Tanahu, Vyas Municipalaty-11		065-560573, 5010516
17	Scientific Technology Pvt. Ltd.	Gyanu Mahoto (9851035809)	scientific@wlink.com.np	Tangal, Kathmandu	8975	4423638, 4419179
18	Solar Electricity Company Pvt. Ltd.	Yug Ratna Tamrakar (9851022649)	ises@healthnet.org.np	Bagbazar, Kathmandu	12515	4225253
19	Sprint International Pvt. Ltd.	Prachanda Man Shrestha (9851075736)	sprint@wlink.com.np	Baluwatar, Kathmandu	23163	4430417
20	Sun Power Pvt. Ltd.	Chandreswar Chaudhary (9851047107)	info@sunpower.com.np	Baluwatar, Kathmandu	8975	4440354, 4426658
21	Sunshine Energy Pvt. Ltd.	Uttam Sitaula (9851047868)	info@sunshine.com.np	Samakhushi, Kathmandu	23238	4353538
22	Suryodaya Urja Pvt. Ltd.	Nabin Bhujel (9851040404)	info@suryodaya.wlink.com.np	Bhapasi VDC-2, Lilanagar	10233	4379000
23	Suryojyoti Company Pvt. Ltd.	Kalpana Acharya (9841241862)	suryajyoti@hons.com.np	Newroad, Guccha tole, Kathmandu	13779	01-4249255, 4249719
24	Swabhiman Urja Bikash	Hira Bahadur K.C.	kchira2000@yahoo.com	Mahandra path Baglung		068-520818,

	Company Pvt. Ltd.	(9851087947)				068-520718
25	Swogun Energy pvt. Ltd.	Gokul Khadka (9841390797)	swogun@vianet.com.np	Samakhushi, kathmandu	10167	4362505
26	Urja Ghar Pvt. Ltd.	Indra Khanal (9851093223)	sanramjan@yahoo.com	Balaju, Devakota Margh, Kathmandu	6761	4384725

4.3 List of qualified manufacturing, supply & Installation companies for MHP

MH Consultancy Firms - 100 KW

Organization Name	Contact Person	Contact Details
Appropriate Engineering	Mr. Prem Bahadur Tamrakar	Prakashan Marga, Ward No. 11, Butwal, Rupandeh
Balaju Yantra Shala Pvt. Ltd.	Mr. Rajesh Mani Ghimire	P.O. Box 209 Balaju Industrial District, Ward No. 16, Kathmandu
Dhaulagiri Civil Electrical & Mechanical Engineering Pvt. Ltd.	Mr. Bal Bahadur K.C.	Baglung Municipality-3, Shreenagar Tole, Baglung
Gautam Energy Engineering	Mr. Hari Bhakta Gautam	Butwal Industrial Area, Ward No. 12, Butwal, Rupandehi
Himalayan Power Industry	Mr. Tirtha Man Nakarmi	P.O. Box No. 4889 Bhaktapur Industrial Estate, Byasi Ward No. 3, Factory No. 30
Housing Services Company Pvt. Ltd.	Dr. Hari Sharan Chakhun	P.O. Box 176 Gabahal, Ward No. 21, Lalitpur
Kathmandu Metal Industries & Hydro Power Pvt. Ltd.	Mr. Akkal Man Nakarmi	P.O. Box No. 4889 83/19 Naghal, Ward No. 17, Kathmandu
Krishna Grill & Engineering Works Pvt. Ltd.	Mr. Laba Mani Rajbhandari	P.O. Box 150 Main Road South, Bhumiprasasan Chowk, 321, Ward No. 13, Biratnagar, Morang
Machhapuchhre Metal & Machinery Works Pvt. Ltd.	Mr. C.D. Joshi	Pokhara Industrial Estate, Ward No. 10,
Nepal Hydro & Electric Limited	Mr. Nawa Raj Shrestha	Kumaripati, Lalitpur
Nepal Machine & Steel Structure	Mr. Bharat Pathak	
Nepal Yantra Shala Energy	Mr. Shyam Raj Pradhan	
Power Tech Nepal Pvt. Ltd.	Mr. Surendra Mathema	P.O. Box No. 3418 Patan Industrial Estate. Block No.

		12, Kathmandu
Radha Structure & Engineering Works Pvt. Ltd.	Mr. Ghanashyam Paudyal	P.O. Box 20989 Subidhanagar, Tinkune, Kathmandu
Structo Nepal Pvt. Ltd.	Mr. Urgen Sherpa	Patan Industrial Estate, Ward No. 15, Lalitpur
Thapa Engineering Industries Pvt. Ltd.	Mr. Dewan Singh Thapa	P.O. Box 29 Kalikanagar, Ward No. 12, Butwal, Rupandehi

MH Consultancy Firms - 60 KW

Organization Name	Contact Person	Contact Details
Alternative Energy Consultancy Service Centre Pvt. Ltd.	Mr. Bhumi Nanda Baral	P.O. Box 9813 Kathmandu, Opposite of NTV, Singha Durbar
BDA Nepal Pvt. Ltd. and Scientific Centre for Environment Consulting Pvt. Ltd and C-WID Nepal	Mr. R.K. Sharma	P.O. Box 1353 Chakupat, Patan Dhoka, Lalitpur
Bojini Company Pvt. Ltd.	Mr. Shailendra Guragain	P.O. Box 14165 Bansbari, Kathmandu
Butwal Hydro Power and Engineering Consultant Pvt. Ltd.	Mr. Arjun Marasini	Milan Chowk, Butwal-11, Rupandehi, Nepal
Centre for Appropriate Technology Nepal Pvt. Ltd. (CATN)	Mr. Bhawany S. Upadhaya	P.O. Box 2883 Ward No. 14, Kuleshwor Awash Chetra, Kathmandu
D.A.T. Engineering Consultancy Pvt. Ltd.	Mr. Baburam Paudel	P.O. Box 5794 Ja-2/165, Samakhusi, kathmandu
DE Consultancy Pvt. Ltd. and Epson Engineering Consultancy Pvt. Ltd.	Mr. Dinesh N. Chalise	P.O. Box 6553 Lazimpat, Kathmandu
DETA Consult	Mr. Hari Prasad Pandit	P.O. Box 6914 Balkhu, Ring Road #1, House #58/584, KMC-14, Kathmandu
Development Network Pvt. Ltd. (D-Net) and GREAT Nepal	Mr. Guna Raj Shrestha	P.O. Box 1062 New Baneshwor, Kathmandu
DIP Consultancy Pvt. Ltd.	Mr. Kamal Gurung	P.O. Box 4903 Kalikasthan, Dillibazaar, Kathmandu
Energy and Environment Solutions Pvt. Ltd.	Mr. Kumar Pandey	P.O. Box 724 Ward No 29, Tahachal, Kathmandu
Energy Systems	My Bhola Shrestha	P.O. Box 8975 EPC 4069, Sallaghari, Bansbari, Kathmandu
Group of Water Engineers	Mr. Pradeep Gangol	P.O. Box 3040 Sankhamul, Naya Baneshwor, Kathmandu
HEET Consult Pvt. Ltd. and Swet Bhairab Power Supply Pvt. Ltd.	Mr. Kumud Raj Kafle	BP.O. Box 9669 Baluwatar, Kathmandu

Himalaya Energy Development Company Pvt. Ltd. (Himal Energy)	Mr. Purushottam Shrestha	P.O. Box 10429 Danfe Galli, Koteshwor-35, Kathmandu
Housing Services Company Pvt. Ltd. (HOSECO)	Dr Hari Sharan Chakhun	P.O. Box 176 Lalitpur, Gabahal, Lalitpur-21
INtegrated Rural Development Service Pvt. Ltd. (IRDS)	Mr. Khesab K.C.	P.O. Box 1346 Balkhu, Kathmandu
Masina Continental Associates Pvt. Ltd.	Mr. C.K. Acharya	P.O. Box 2995 Baneshwor, Kathmandu
MEC Consultancy Pvt. Ltd.	Ms Shovita Parajuli	P.O. Box 21480 Gongabu, 4-Kha, Kathmandu
Neha Consultancy Pvt. Ltd.	Mr. Rana Pratap Singh	P.O. Box 475, NI.A.Ka-138, Kupondole, Lalitpur
Nepal Engineering Consultancy Services Centre Ltd.	Mr. Dhana Raj Sapkota	P.O. Box 4672 Buddhanagar, Pabitrachowk, Kathmandu
North Engineering Consult Pvt. Ltd.	Er Tanka Kandel	P.O. Box 54 Butwal-11, Garbuja Colony, Prakashan Marga, Kalikanagar, Nepal
Oshin Power Services	Mr. Thankur Prsd. Adhikari	P.O. Box 30 Barbarline, Butwal Municipality-5, Jyoti Naga Nepal
Perennial Energy Nepal Pvt. Ltd.	Mr. Rajesh Chaudhary	P.O. Box 4395 Laxmi Niwas, Naxal, Kathmandu
Pioneer Architects & Consulting Engineers Pvt. Ltd.	Mr. Bishnu Dev Yadav	P.O. Box 20263 Kathmandu, Kupondole, lalitpur
Universal Consultancy Services Pvt. Ltd.	Mr. Govinda P. Devkota	P.O. Box 20506 Banasthali, Balaju, Kathmandu

Micro-Hydro Support Organizations

Organization Name	Contact Person	Contact Details
Annapurna Conservation Area Project (ACAP)		P.O. Box 183 Pokhara
Canadian Cooperation Office		P.O. Box 4574 Kathmandu
Centre for Renewable Energy (CRE)		P.O. Box 589 Kathmandu
Centre for Rural Technology (CRT)		P.O. Box 3628 Kathmandu
Centre for Self-help Development (CSD)		P.O. Box 8852 Kathmandu
Community Awareness Development Centre (CADEC)		P.O. Box 11241 Kathmandu

Community Based Economic Development Project (CBED)/CECI-Nepal		Baluwatar
Dhaulagiri Community Resource Development Centre (DCRDC)		P.O. Box 5733 Baglung
Energy Development Centre (EDC)		Birendra Nagar – 3Surkhet, Nepal
Himalayan Light Foundation		P.O. Box 12191 Kathmandu
Intermediate Technology Development Group (ITDG)		P.O. Box 15135 Kathmandu
International Centre for Integrated Mountain Development (ICIMOD)		P.O. Box 3226 Kathmandu
Jumla Service Centre (JSC)		Jumla, Nepal
National Trust for Nature Conservation (NTNC)		P.O. Box 3712 Kathmandu
Namsaling Community Development Centre (NCDC)		Ilam, Nepal
Nepal Micro-Hydropower Development Association (NMHDA) Association of Manufacturers		P.O. Box No. 8975 EPC 5155 Kathmandu
Nepal Trust		P.O. Box 8975 Kathmandu EPC 4131
Participatory District Development Programme (PDDP)		P.O. Box 107 Kathmandu
Rural Energy Development Programme (REDP)		P.O. Box 107 Kathmandu
Rural Reconstruction Nepal		P.O. Box 8130 Kathmandu
USC Canada – Nepal		P.O. Box 2223 Kathmandu
World Wildlife Fund (WWF) International Conservation Agency		P.O. Box 7660 Kathmandu
Youth Campaign for Social Progress (YOUCASP)		P.O. Box 12030 Kathmandu

4.4 List of Organisations involved in the development of Wind Energy in Nepal

S. No.	NAME/TYPE OF ORGANIZATION	SERVICE PROVIDED
1	**Alternative Energy Promotion Centre (AEPC)**	**Renewable Energy Technologies** Biomass (ICS/Biogas/Briquette/Biomass/Gasification)

	Khumaltar, Lalitpur Tel: 5539391 Fax 5542497 Email: aepc@aepc.gov.np Government	Solar PV Solar Thermal (Dryer/Cooker/Water Heater/Passive) Hydropower/Micro Hydro/Improved Water mill Wind Power Geo thermal **Scope of work** Inputs to policy Formulation/Planning Programme/Project execution/Implementation Financing (Loan) CDM Support to community (Financial/material/technical) Social Mobilization Communication/Awareness Capacity building/Training
2	**APETEC Consultancy Pvt. Ltd. (APETEC)** Jawalakhel, Lalitpur Tel: 5548096 Fax: 5548096 Email: aptec.vianet.com Consultancy	**Renewable Energy Technologies** Biomass (ICS/Biogas/Bio-Fuel Briquette/Biomass/Gasification) Solar PV Solar Thermal (Dryer/Cooker/Water Heater/Passive) Hydropower/Micro Hydro/Improved Water mill Wind Power Geo thermal **Scope of work** Inputs to policy Formulation/Planning Programmed/Project execution/Implementation technical backup support Social Mobilizing Communication/Awareness Capacity building/Training
3	**Association of District Development Committees of Nepal (ADDCN)** Sanepa, Lalitpur Tel: 5529202, 5554081 Fax: 5548469 Email: shambhu@addcn.org.np Web: www.addcn.org.np	**Renewable Energy Technologies** Biomass (ICS/Biogas/Bio-Fuel Briquette/Biomass/Gasification) Solar PV Solar Thermal (Dryer/Cooker/Water Heater/Passive) Hydropower/Micro Hydro/Improved Water mill Wind Power Geothermal **Scope of work** Inputs to policy Formulation/Planning Technical backup support Communication/Awareness Capacity building/Training
4	**Centre for Energy Studies** Pulchowk, Lalitpur Tel: 5532235 Fax 5532234 Email: ces@ioe.edu.np Web: www.ioe.edu.np/bodies/ces	**Renewable Energy Technologies** Biomass (ICS/Biogas/Briquette/Biomass/Gasification) Solar PV Solar Thermal (Dryer/Cooker/Water Heater/Passive) Hydropower/Micro Hydro/Improved Water mill Wind Power Geo thermal

	Research Institute	**Scope of work** Inputs to policy Formulation/Planning Programmed/Project execution/Implementation Technical backup support Communication/Awareness Capacity building/Training
5	**Centre for Renewable Energy (CRE)** Jwagal, Lalitpur Tel: 5011010 Fax 5550452 Email: cre@wiseuse.org.np Web: www.crenepal.org.np Non-Government Organization	**Renewable Energy Technologies** Biomass (ICS/Biogas/Briquette/Biomass/Gasification) Solar PV Solar Thermal (Dryer/Cooker/Water Heater/Passive) Hydropower/Micro Hydro/Improved Water mill Wind Power Geo thermal **Scope of work** Inputs to policy Formulation/Planning CDM Communication/Awareness Capacity Building/Training Academic Course R&D
6	**Community Awareness Development Centre (CADEC)** Naya Baneswor, Kathmandu Tel: 4472264 cadec@enet.com.np Non-Government Organization	**Renewable Energy Technologies** Biomass (ICS/Biogas/Briquette/Biomass/Gasification) Solar PV Solar Thermal (Dryer/Cooker/Water Heater/Passive) Hydropower/Micro Hydro/Improved Water mill Wind Power **Scope of work** Programmed/Project execution/Implementation Support to Community (Financial/Material/Technical) Social mobilizing Communication/Awareness Capacity building/Training Energy data management Networking
7	**Energy Systems/EC** Bansbari, Kathmandu Tel: 4372171 Email: systems@info.com.np Consultancy	**Renewable Energy Technologies** Biomass (Biogas) Solar PV Solar Thermal (Dryer/Cooker/Water Heater) Hydropower/Micro Hydro Wind Power **Scope of work** Inputs to policy Formulation/Planning CDM Survey design Technical backup support Communication/Awareness Capacity building/Training
8	**Environment Camps for Conservation**	**Renewable Energy Technologies**

	Awareness Jwagal, Kopundol Tel: 5553870 Fax: 5011006 Email: ecca@mos.com.np Web: www.ecca.org.np Non-Government Organization	Biomass (ICS/Biogas/Briquette/Biomass/Gasification) Solar PV Solar Thermal (Dryer/Cooker/Water Heater) Wind Power **Scope of work** Programmed/Project execution/Implementation Financing (Loan) Support to community (financial/material/Technical) Social mobilizing Communication/Awareness Capacity building/Training
9	**Flensberg Association for Energy Management (FAEM-NEPAL)** Pulchowk, Lalitpur Tel: 5009154 Email: faemnepal@info.com.np Web: www.faem.org.np Consultancy	**Renewable Energy Technologies** Biomass (ICS/Biogas/Briquette/Biomass/Gasification) Solar PV Solar Thermal (Dryer/Cooker/Water Heater/Passive) Micro Hydro/Improved Water mill Wind Power **Scope of work** Programmed/Project execution/Implementation CDM Technical backup support Communication/Awareness Capacity building/Training
10	**Group of Engineers & Architects for Kathmandu** Tel: 5011006 Email: great@greatnepal.com Appropriate Technology Nepal, GREAT Nepal Consultancy	**Renewable Energy Technologies** Biomass (ICS/Biogas/Briquette) Solar PV Hydropower/Micro Hydro/Improved Water mill Wind Power **Scope of work** Survey/design Installation/construction Technical backup support
11	**Institute of Engineering (TU, IoE)** Pulchowk, Lalitpur Tel: 552111531 Email: ioe@ioepc.healthnet.org.np Research Institute	**Renewable Energy Technologies** Biomass (ICS/Biogas/Briquette/Biomass/Gasification) Solar PV Solar Thermal (Dryer/Cooker/Water Heater/Passive) Hydropower/Micro Hydro/Improved Water mill Wind Power Geo thermal **Scope of work** Inputs to policy Formulation/Planning Programmed/Project execution/Implementation CDM Academic course
12	**Integrated Technology Department Nepal (P) Ltd, ITD** Kathmandu, Nepal Tel: 5553870	**Renewable Energy Technologies** Biomass (ICS/Biogas/Briquette) Solar PV Hydropower/Micro Hydro/Improved Water mill

	Fax: 5011006 Email: itd@itdnepal.com Private Company	Wind Power **Scope of work** Manufacturing Survey/Design Installation/Construction
13	**National Planning Commission (NPC)** Singh Durbar, Kathmandu Tel: 4226873 Government	**Renewable Energy Technologies** Biomass (ICS/Biogas/Briquette/Biomass/Gasification) Solar PV Solar Thermal (Dryer/Cooker/Water Heater/Passive) Hydropower/Micro Hydro/Improved Water mill Wind Power Geothermal **Scope of work** Inputs to policy Formulation/Planning CDM
14	**Nepal Academy of Science and Technology (NAST)** Khumaltar, Lalitpur Tel: 5547717 Government	**Renewable Energy Technologies** Biomass (ICS/Biogas/Briquette/Biomass/Gasification) Solar PV Solar Thermal (Dryer/Cooker/Water Heater/Passive) Micro Hydro/Improved Water mill Wind Power **Scope of work** Inputs to policy Formulation/Planning Programmed/Project execution/Implementation R&D
15	**Nepal Oldenburg Renewable Energy Centre (NOREC)** Asan, Kathamndu Tel: 9851094963 Email: prashun@yahoo.com Non-Government Organization	**Renewable Energy Technologies** Biomass (ICS/Biogas/Briquette/Biomass/Gasification) Solar PV Micro Hydro/Improved Water mill Wind Power **Scope of work** Social Mobilizing Communication/Awareness Capacity building/Training
16	**Practical Action Nepal** Lazimpat, Kathmandu Tel: 4446015 Fax: 4445995 Email: practicalaction@practicalcaction.org.np International Non-Government Organization	**Renewable Energy Technologies** Biomass (ICS/Biogas/Briquette/Biomass/Gasification) Solar PV Solar Thermal (Dryer/Cooker/Water Heater/Passive) Hydropower/Micro Hydro/Improved Water mill Wind Power **Scope of work** Inputs to policy Formulation/Planning CDM Social mobilization Communication/Awareness Capacity building/Training
17	**Solar Energy Foundation** Babarmahal, Kathmandu, Nepal	**Renewable Energy Technologies** Biomass (ICS/Biogas/Briquette/Biomass/Gasification)

	Tel: 4277404 Fax: 4445523 Email: info@sef.org.np Consultancy	Solar PV Solar Thermal (Dryer/Cooker/Water Heater/Passive) Hydropower/Micro Hydro/Improved Water mill Wind Power **Scope of work** Inputs to policy Formulation/Planning CDM Social mobilization Communication/Awareness Capacity building/Training
18	**Swet Bhairab Power Supply (P) Ltd.** Kathmandu, Nepal Tel: 4425793 Fax: 4440332 Email: spbbs@infoclub.com.np Private Company	**Renewable Energy Technology** Hydropower Wind Power **Scope of work** Survey/Design
19	**Water and Energy Commission** Singh Durbar, Kathmandu Tel: 4211415 Fax: 4211425 Emil: wecs@mos.com.np Government	**Renewable Energy Technologies** Solar PV Solar Thermal (Dryer/Cooker/Water Heater/Passive) Hydropower/Micro hydro/improved water mill Wind Power Geothermal **Scope of work** Inputs to policy formulation/Planning
20	**Nepal Electricity Authority (NEA)** Ratnapark, Kathmandu Tel: 4252835 Fax: 4256091 Government	**Scope of work** Sole buyer of electricity generated by wind farms Inputs to policy formulation/Planning
21	**Nepal Agriculture Research Council (NARC)** Khumaltar, Lalitpur Tel: 5535981 Government	NA
22	**Department of Hydrology and Meteorology (DHM)** Babarmahal, Kathmandu Tel: 4255920, 4426348 Email: dg@dhm.gov.np Government	**Renewable Energy Technologies** Solar Radiation Wind Hydropower **Scope of work** Data Collection Data Publication
23	**National Trust for Nature Conservation (NTNC)** Jawalakhel, Lalitpur	NA

	tel: 5526971 Email: info@kmtnc.org.np Government	
24	**Research Centre for Academy of Science and Technology** Kirtipur, Kathamandu Research Institute	**Renewable Energy Technologies** Biomass (ICS/Biogas/Briquette/Biomass/Gasification) Solar Thermal (Dryer/Cooker/Water Heater/Passive) Hydropower/Micro Hydro/Improved Water mill Wind Power **Scope of work** Experience in wind turbine installation for pumping water R & D in wind energy Inputs to policy formulation/Planning
25	**Kathmandu University, (KU)** Dhulikhel, Kavre District Tel: 6661399 Fax: 6661443 Research Institute	**Renewable Energy Technologies** Biomass (ICS/Biogas/Briquette/Biomass/Gasification) Solar PV Solar Thermal (Dryer/Cooker/Water Heater/Passive) Hydropower/Micro Hydro/Improved Water mill Wind Power **Scope of work** Experience in wind turbine installation for pumping water R & D in wind and other alternative energy
26	**Krishna Grill Engineering P. Ltd.** Biratnagar, Jhapa District Tel: (21)525492 Fax: (21) 531162 Email: kgktc@brt.wlink.com.np Private Manufacturer	**Renewable Energy Technologies** Biomass (ICS/Biogas/Briquette/Biomass/Gasification) Solar Thermal (Dryer/Cooker/Water Heater/Passive) Hydropower/Micro Hydro/Improved Water mill Wind Power **Scope of work** Experience in manufacturing wind pumps and wind turbine fo electricity generation
27	**Lotus Energy P. Ltd. (in the past it was involved in manufacturing)** Bhatbhateni, Kathmandu Tel: 4418203 Fax: 4412924 Email: info@lotusenergy.com Private Supplier	**Renewable Energy Technologies** Solar PV Hydropower/Micro Hydro/Improved Water mill Wind Power **Scope of work** Supply of SHS and other RETs including wind turbine and generators

4.5 Other Organizations related to Wind energy

NAME OF THE ORGANIZATION	CONTACT PERSON	FULL ADDRESS
Integrated Rural Development Services (IRDS)	Keshab K.C	Balkhu-14, Ringroad, Kathmandu, KMC-14

		Tel: 977-01-4279111 met@irds.wlink.com.np
Universal Consultancy Services Pvt. Ltd. (UCS)	Govinda P.Devkota	Banasthali, Balaju, Kathmandu,16 Tel: +977-01-4350580 ucs@ntc.net.np
Technology and Rural Upliftment Service Team (TRUST) Pvt. Ltd.	Pramila Shrestha	Jawalakhel, Manbhawan, Lalitpur,22 Tel: 977-01-5527068 trust@htp.com.np
C-ZONE HVAC Incorporate Pvt. Ltd	N. R Karki	352 Panchakumari Marg, New Baneswor, Kathmandu-34 Tel: +977-01-4496522 czone@wlink.com.np
EastConsult (P) Ltd.	Susil K. Shrestha	Hotel Marg, Lazimpat, Kathmandu-2 Tel: +977-1-4413267, 4412062 eastco@wlink.com.np
BISCONS Development and Management Consultants	Ramesh M. Singh	Adwait Marg, Bagbazar, Kathmandu Tel: +977-1-4227470 rmsingh@biscons.wlink.com.np
Balaju Technical Training Centre (BTTC)		Balaju, Kathmandu, Nepal Tel: +977-1-4350213, 4350228 balaju@bttc.wlink.com.np
Centre of Energy Studies CES)/Institute of Engineering/Tribhuvan University		Pulchowk, Lalitpur, Nepal Tel: +977-1-5532235 casioe@healthnet.org.np

4.6 Service Providers in ICS Technology

S.No	REGIONAL RENEWABLE ENERGY SERVICE CENTER (RRESC)	CONTACT DETAILS	DISTRICTS LOOKED AFTER
1.	**Dhaulagiri Community Resource Development Centre (DCRDC)** Baglung Municipality, Ward No. 11 PO Box No. 1, Upallachour Baglung, Nepal	Tel.: 068 520249 / 520665 Tel. / Fax: 068 520665 E-mail: dcrdc@ntc.net.np	Baglung Parbat Mygdi Kaski
2.	**Namsaling Community Development Centre (NCDC)** Ilam Bazar, Ilam, Nepal	Tel.: 027 520792 / 027 520411 Tel. / Fax: 027 521622 E-mail: ncdcilam@ntc.net.np Website: www.ncdcilam.org	Ilam Taplejung Panchthar Dhankuta Terathum

3.	**Rural Economic Development Association (REDA)** Tansen-4, Bishal Bazar, Palpa, Nepal	Tel. / Fax.: 075 521610 / 075 520365 E-mail: reda_plp@ntc.net.np	Palpa Arghakhanchi GulmiSyanja
4.	**Sundar Nepal Sanstha (Beautiful Nepal Association)** Birendranagar 9, Aabas Area, Surkhet, Nepal	Tel. / Fax.: 083 520926 E-mail: sundarnepal@ntc.net.np	Surkhet Dailekh Jajarkot
5.	**Rural Empowerment Society Damauli, Tanahun Nepal (RESDTN)** Vyas Municipality, Damauli, Tanahun, Nepal	Telephone: 065-560539E-mail: restanahun@wlink.com.np	Tanahun Gorkha Lamjung
6.	**Resource Management and Rural Empowerment Center (REMREC)** PO Box 019, DhulikhelKavrepalanchowk, Nepal	Tel.: 011-490021 Fax: 011-490545E mail: remrec@ntc.net.np	Kavre Sindhupalchowk Ramechhap Dolakha
7.	**Rural Development Service Centre (RDSC)** Main Office: Latamandu VDC-9,Ward No. 6, Tiltali, Doti, Nepal Contact Office: Jawalakhel, Lalitpur, G.P.O. Box 21241, Kathmandu, Nepal	Tel. / Fax: 5542040 E-mail: rdscdoti@yahoo.com, rdsc@wlink.com.np	Doti Dadeldhura Baitadi Bajura Accham Darchula Bajhang
8.	**Rural Environmental Development Centre (REDC)** Triyuga Municipality-2, Gaighat, Udayapur	Tel.: 035-420291 Fax: 035-420206	Udayapur Sindhuli Khotang
9.	**Centre for Rural Technology, Nepal (CRT/N)** Tripureshwor, Kathmandu	Tel: 4260165/4256819 Fax: 4257922E mail: ics@crtnepal.org, damodar@crtnepal.org Website: www.crtnepal.org	Dang Rukum Rolpa Salyan Pyuthan Nuwakot Makwanpur Dhading

10. **Center for Self Help Development (CSD)**
Dillibazar, Kathmandu

Tel: 4425597, 4424787
Fax: 4430363
Email: csd@mos.com.np
Contact Person: Sabin zoowa (984142087)

CHAPTER V

5.1 Identification and analysis of barriers to the promotion of renewable energy technologies

5.2 Technical barriers:

Technical immaturity. Most traditional Nepalese renewable energy technologies have been focused on small scale projects and only in recent years have medium and large-scale energy projects begun to emerge. This evolving nature of these technologies creates significant risk for the suppliers and users.

Technology transfer. Prevailing practices of technology transfer often do not sufficiently take into account the local conditions under which imported technology has to be operated and managed, the training required for its use, maintenance requirements and capabilities, and backstopping arrangements. Promoters need to consider both hardware and software aspects of technology transfer.

Limited adaptive R&D and Demonstration. The adapted renewable energy technologies are not standardized and local artisans are not trained to the extent at which they are capable of perform necessary repair and maintenance job. The lack of national standards and specifications of end use devices is the main hindrance on the promotion and commercialization of RETs. There exist not sufficient expertise, manufacturers, agents and researchers to promote renewable energy technologies. Limited site demonstration on biomass energy technologies by promoters is not sufficient to convince the users to invest on these technologies.

5.3 Institutional barriers:

- No priority in policy regarding biomass energy (forest management, production and utilization).
- No integrated/comprehensive energy policy.
- Lack of co-ordination amongst relevant institutions involved in RETs
- No incentives on RETs except in Biogas.
- Adoptive Technology for policy to support need base R & D.
- Need for demonstration/ pilot units for boosting the use of technologies.
- Inventory of locally available technologies

5.4 Policy Barrier:

- Adoption of unified classification of biomass resources/ RETs
- Identify technologies by purpose.
- Program to embrace the needs of the poorest of the poor.
- Institutional support for dissemination & regulation of RETs.
- Policy to raise the awareness of the technology.
- Need for centralized data on available RETs.
- Need for incentives for energy switching.
- Policy to be revisited for rationalizing incentives for RETs development.

5.5 Information barriers:

There exists limited information on national renewable energy resources and renewable energy technologies in Nepal. Even this information is not accessible by all stakeholders. Lack of information about efficient and reliable technologies, on biomass energy resources, market potential etc are the primary barriers for commercialization of renewable energy technologies.

5.6 Financial barriers:

Investment in bio-energy is minimal in Nepal. The reason may be perceived high risks of investment on renewable energy technologies. That is, investors lack confidence in technology to finance. And fund available from donors is also limited.

5.7 Market barriers:

Biomass energy technologies are expensive against those technologies run on subsidized fossil fuels. Subsidy for fossil fuel distorts market in biomass energy; technology push policies need to be substituted or augmented by market pull polices as mentioned by Shukla (1997). Lack of renewable energy market has been the barrier to the penetration of renewable energy technologies. Technology push policy will not create market. It should be other way round – market pull policy for renewable energy technologies by providing lucrative incentives.

5.8 Social barriers:

Unacceptance of technology. Some technologies are difficult to accept by the communities. For example, beehive briquettes stove was promoted to Phakdin village (2653m) of Khumbu Region in Nepal. After the training period the conclusion was that the making of the briquettes was a dusty affair and disliked by the women because of the high emission of black charcoal dust (Nienhuys, 2003).

6 Conclusions and Recommendations

Nepal's energy scenario is dominated by traditional energy sources as it supplies more than 85 per cent of the total energy demand. Improved cooking stoves are being used in the places where access to fuel wood is limited. Micro-hydro and biogas technologies have been proved to be viable alternative energy technologies in Nepal. These technologies have created awareness among the rural people, made the life of rural people more comfortable, improved the educational status of rural children and has promoted some industrial activities which has to some extent generated opportunities. Solar energy technologies, both Photovoltaic and Solar Thermal technologies have been promoted

gradually in the country while the Wind energy and Geothermal energy technologies have yet to be harnessed.

Several government agencies, NGOs, INGOs, CBOs, International agencies, as well as private organizations have been involved in the development and promotion of renewable energy technologies in the country. However, RETs have not been massively disseminated as compared to their technical potentialities in Nepal. For commercialization of RETs, various promotional and marketing activities should be done. Integration of RETs with industry, agriculture, livestock, irrigation and health sector might create a good market for RETS in the country.

Recommendations:

- AEPC as an apex organization in the promotion of RETs can undertake its monitoring and evaluation role. Involvement of private sectors, NGO, INGOS and other service providers should be increased to meet the objective.
- Research institutions like NAST and RECAST should be strengthened and should be provided with adequate funding to carry out R&D work on RETs.
- Interdisciplinary coordination between different organizations directly or indirectly involved in energy sector to be enhanced.
- Institutional strengthening is necessary in multifold to ensure dissemination of targeted technology.
- Capacity building through formal/informal trainings, vocational education to be carried out.
- The rural-urban divide in access to energy can also beaddressed through appropriate energy pricing policy.
- Micro Financing Institutes (MFIs) and cooperatives should be linked with energy program effectively so that energy access can be maintained to pro-poor.

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