



# AEPC ANNUAL PROGRESS REPORT FY 2066/67 (2009/10)

**Alternative Energy Promotion Centre  
Ministry of Environment  
Nepal**



Cover Photo Source:

1. Renewal Energy for Rural Livelihood (RERL)
2. AEPC Office Building

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Government of Nepal  
**MINISTRY OF ENVIRONMENT**



## MESSAGE

It gives me pleasure to bring the AEPC's Annual Report to you. In the prevailing situation of extreme shortage of electricity in the National Electricity Grid, people in rural areas through AEPC's support have been enjoying continuous supply of electricity generated by decentralized renewable resources. Harnessing of the resources like water and solar radiation has not only brought modern forms of energy to the people but also helped in the global endeavor to reduce carbon emission. The renewable energy technologies in use have markedly improved the living standards of the people. In the improved light available after sunset; children have additional hours to study and adults to engage in household chores and even income supplementing activities. Likewise, use of improved cooking stoves and biogas has helped reduce the injurious smoke intakes of the entire families. However, I would like to emphasize here, it is not a time to sit on the laurels of past and be complacent as the overwhelming majority of the people still do not have access to modern forms of energy.

The Ministry of Environment is willing to work with our external development partners and other stakeholders, specially the community people who are the direct beneficiaries, to disseminate decentralized renewable energy technologies in a much larger scale. I wish AEPC and its partners all the best in utilizing the immensely endowed indigenous resources to bring modern energy to the people and help improve their livelihoods. I would also like to take this opportunity to thank the donor community for their financial as well as technical assistances in supporting the AEPC in its endeavors and hope for its continuation in future.

Sunil Kumar Manandhar  
Minister of Environment  
Government of Nepal





Government of Nepal  
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**FOREWORD**

Date:..... **May 23, 2011**

The Government of Nepal, realizing the important role of Renewable Energy Technologies (RETs) in fulfilling the basic needs of rural people, has been supporting the sector since the Seventh Five Year Development Plan. Furthermore, to enhance the harnessing the locally available energy resources for the benefit of the people, especially the rural people, the Government established Alternative Energy Promotion Centre (AEP) in 1996. Since then, the nation has witnessed accelerated efforts to help people utilize energy resources available in their vicinities with the financial and technical supports of various development partners, both internal as well as external. Studies have indicated that the success of AEP lies in helping build up the capacity of the rural people to plan, implement and manage energy schemes. Realizing the forward and backward linkages for sustainable use of energy in rural areas, the Government of Nepal promulgated the national Rural Energy Policy (REP) 2006, which emphasizes decentralized approach and active participation of the beneficiaries. This has opened up the new window for effective promotion of renewable energy systems in the rural areas.

AEP publishes annual reports every year highlighting the major achievements of the year and this Annual Progress Report for the FY 2067/68 is the latest endeavour in this series. As the report presents achievements and constraints in facts and figures, the information would be valuable for donors, government, researchers, private sector and general public, who have interest/stake in the development of renewable energy sector. On behalf of National Planning Commission, I want to congratulate the AEP team for their effort in the establishment of rural energy fund, successful implementation of climate and carbon program, and publication of renewable energy data book. Their collective effort has brought success in the installation of biogas plants, piloting of portable rocket stoves in the Tarai region, gasification, installation of improved water mill, solar PV system, and mini/micro hydropower. They together with the beneficiaries have been successful in increasing the access to renewable energy services.

I would like to take this opportunity to appreciate the development partners for their continuous support in the renewable energy sector and AEP for its contribution to the development and promotion of renewable energy services in Nepal.

Dinesh Chandra Devkota, Ph.D  
Acting Vice Chairman  
National Planning Commission



# Government of Nepal

## Ministry of Tourism and Civil Aviation



### PREFACE

I am pleased to inform that AEPC as a national executive agency for renewable energy has been involved in policy and plan formulation, resource mobilization, technical support, quality assurance and coordination. It is also a great pleasure to know that the AEPC has been successful in fulfilling its mandates through providing electricity and other clean energy technologies to the people of rural Nepal. Utilization of the local resources has not only improved people's life in remote areas through the access of modern technologies and reducing their drudgery but also helped the nation to save precious foreign exchange used for importing fossil fuel to some extent. While working at the Ministry of Environment, I learned in depth about the alternative/renewable energy technologies, its potential and achievement so far made.

AEPC has greatly contributed for the promotion and development of the renewable energy sector in Nepal, which results in access to electricity to around 10% of the population and more than 1.6 million households have directly using the lighting and cooking services from RETs in Nepal. I would like to thank the AEPC and its devoted team of professionals for implementing important renewable energy programmes and projects across the country. This Annual Report is the reflection of such works targeted to the people of Nepal. I would also appreciate the hard work of AEPC management in bringing out this publication which will be useful for policy makers, researchers, development practitioners, students and professionals in the relevant field.

Ganesh Raj Joshi, PhD  
Secretary  
Ministry of Tourism and Civil Aviation



Government of Nepal  
**MINISTRY OF ENVIRONMENT**



## **PREFACE**

It is my great pleasure to learn that AEPC has published the Annual Report for Fiscal Year 2066/67. AEPC as a national executive agency for renewable energy has been involved in policy and plan formulation, resource mobilization, technical support, quality assurance and coordination. It has also been successful to a great extent in fulfilling its mandates through providing electricity and other clean energy technologies to the people of rural Nepal. Utilization of the local resources has not only improved people's life in remote areas through increasing the access to modern technologies and reducing their drudgery but also helped the nation to save precious foreign exchange used for importing fossil fuel to some extent.

The Government of Nepal is fully committed to scaling-up of successful renewable energy technologies for the welfare of rural communities through further strengthening of AEPC. I would like to thank the AEPC and its devoted team of professionals for implementing renewable energy programmes and projects across the country. The Government has given the high priority for the development and expansion of the renewable energy for improving the livelihood of the people. I would also appreciate the hard work of AEPC in bringing out this publication which will be useful for policy makers, researchers, development practitioners, students and professionals working in the renewable energy sector. I hope this report will provide the information about the achievements made during FY 2066/67.

Krishna Gyawali  
Secretary  
Ministry of Environment



## ACKNOWLEDGEMENT

The Alternative Energy Promotion Centre was established in 1996 under the Development Board Act of 2013 BS as an autonomous institution to support the promotion of alternative and renewable energy technologies in the country.



Since its establishment, the AEPC has become instrumental in promoting different alternative energy technologies that are decentralized and renewable resource-based to help support the community's needs in meeting basic energy services. It has been supporting the private sector to effectively deliver the services as well as the beneficiary users to have increased access to the technologies and the maximization of the benefits. As the nodal agency of the GoN for the promotion of the rural energy technologies (RETs) it has been formulating and implementing pragmatic and people-centered policies with the aim of ensuring wider access to the technologies, cost reduction, resource mobilization, enhancing partnership with concerned stakeholders as well as striving towards contributing to the mitigation of the effects of climate change. The AEPC has been giving utmost priority to the sustainable growth of the renewable energy sector and working on the CDM projects as well. The AEPC has been working in partnership with different donor agencies, private sectors, beneficiaries and government agencies and local bodies for the implementation of different programmes that have been generating impressive results in enhancing the livelihoods of the rural people. This annual report has been prepared in order to document and highlight the achievement made during the last Nepali Fiscal Year 2066/67 (2009-2010) by AEPC and its programmes and share the information to the wide range of stakeholders and others interested.

I would like to acknowledge the efforts of Mr Satish Gautam for finalizing and editing this report. I extend my thanks to Mr Surya Kumar Sapkota Sr Planning Officer for his hard work in information compilation and Mr Ram Prasad Dhital Sr Energy officer for coordination. I am very much thankful to all the staff of AEPC and its programmes in delivering the services in an efficient and professional manner and appreciative of the works of the staff involved in preparing this report.

I extend my special thanks to Dr Ganesh Raj Joshi for his support and guidance during his tenure as the Secretary of Ministry of Environment. I would also like to welcome Mr Krishna Gyawali, the newly appointed Secretary for Ministry of Environment and look forward to work under his guidance.

On behalf of the AEPC, I would like to extend my heart-felt thanks to all the Board Members, donor partners, support organizations, I/NGOs, AEPC staff and all the community people who have supported tremendously for the progress and up-scaling of AEPC.

A handwritten signature in black ink, appearing to read 'Narayan Prasad Chaulagain', written over a horizontal line.

Dr. Narayan Prasad Chaulagain  
Executive Director



## **1. AEPC AT A GLANCE**

## 1.1. BACKGROUND

Nepal, particularly in the rural areas, still relies heavily on traditional sources of energy like fuel-wood, agricultural residues and animal wastes. Over exploitation of these resources negatively affects the environment, diverts organic resources from agriculture and adversely affects the health of women and children. On the other hand, Nepal has not been able to exploit abundantly available renewable energy resources. It is estimated that less than 1 % of the renewable resources have been utilized so far. Further, only 56 % of the total population of Nepal has access to electricity, including from both the national electricity grid and the stand alone systems. Renewable energy in the form of micro-hydro, biogas and solar insolation and the efficient and environmentally sound technologies for biomass energy such as improved cooking stoves have a number of advantages. Substituting traditional biomass fuels with electricity helps in: (i) improvement of indoor air quality by reducing or eliminating smoke, (ii) reduction of pressure on forest and savings in time spent for collecting firewood, and (iii) creation of additional working time within households.

The Government of Nepal established the Alternative Energy Promotion Centre (AEPC) in 1996 to promote use of renewable energy and efficient use of energy in the country, particularly in the rural areas. The AEPC is a semi-autonomous government body governed by the Alternative Energy Promotion Development Board (AEPDB) with nine members representing the government, private sector, non-governmental organizations and financial institutions.

## 1.2. OBJECTIVES

The main objectives of the AEPC are to develop and promote renewable energy and energy efficiency to raise the living standard of the people, reduce the negative impacts on the environmental due to the use of traditional sources of energy and to develop commercially viable alternative energy technologies in the country.

## 1.3. MISSION STATEMENT

AEPC exists to develop, coordinate, promote,

disseminate and regulate the sustainable clean energy solutions for contributing to poverty reduction in Nepal.

## 1.4. VISION STATEMENT

AEPC is the national autonomous institution on sustainable clean/renewable energy solutions in Nepal.

## 1.5. MANDATE STATEMENTS

- Act as a regulatory body.
- Increase access to renewable energy.
- Support to formulate policies and regulatory frameworks to enable promotion of sustainable clean energy solutions including energy efficiency.
- Develop and coordinate plans and programs by mainstreaming renewable energy into national development plan.
- Mobilize and generate resources.
- Facilitate promotion of Renewable Energy Technologies and provide technical support to stakeholders.
- Design and oversee monitoring and evaluation systems.
- Facilitate networking and collaboration in the sector.
- Support R&D and innovations.
- Standardize and assure quality of Renewable Energy Systems.

## 1.6. AEPC'S WORKING MODALITY

AEPC is the focal agency mandated with the promotion and development of renewable energy technologies in Nepal. It formulates policies, prepares plans, programs and budget for renewable energy development in the country. It also coordinates with donors for resource mobilization, technological innovation and sector strengthening. At the same time, AEPC aims to align its programs towards possible sector wide approach through a basket funding. As a leader of the rural/renewable energy sector in Nepal, AEPC is collaborating with various partners like the government ministries and departments, non-governmental organizations, local authorities, private sector and civil societies for promotion of the renewable energy technologies.

Governmental, non-governmental and private sector organizations work through AEPC while communities, mainly in rural areas, benefit from the Centre's commitment to delivering clean, reliable and cost effective modern forms of energy. AEPC mainly works with four partners: i) governmental agencies; ii) donors; iii) private companies; and iv) the civil society (NGOs, CBOs, etc.). The stakeholders contribute in the following way;

#### I. The Government:

- Formulation and promulgation of policies, implementation modality and institutional arrangements,
- Preparation and implementation of programs and projects,
- Mobilization of financial resources,
- Facilitation of technical assistance,
- Coordination and networking with various organizations,
- Monitoring and Quality Assurance, and
- Support for Research and Development of new technologies and methodologies.

#### II. Donors:

- Provision of technical and financial assistance, and
- Monitoring of progress and evaluation of programs/projects.

#### III. Private Sector:

- Delivery of equipment and services,
- Promotion and marketing of products,
- Technological innovations and application, and
- Provision of loans and insurance.

#### IV. Civil Society:

- Promotion of renewable energy systems and end-uses, and
- Development, implementation and operation and management of energy projects.

### **1.7. RENEWABLE ENERGY ACTIVITIES**

Presently, AEPC is implementing several programs and projects to promote the following renewable energy systems in the country;

- Mini and Micro Hydropower, including

- Improved Water Mill;
- Solar Photovoltaic and Solar Thermal;
- Biogas;
- Biomass and Bio-fuels;
- Wind Energy; and
- Energy Efficiency

There are six major externally co-funded programs/projects within AEPC with a total annual budget of approximately NPR 2.7 Billions. These programs are making an important contribution not only in promoting the use of renewable energy in the country but also to mitigate greenhouse gas emissions. There is a potential of developing AEPC projects into carbon projects. Clean Development Mechanism (CDM) opportunities are being pursued in biogas, micro hydro, improved cooking stoves, improved water mills and solar home systems.

### **1.8. FUTURE STRATEGY**

In 14 years since its establishment in 1996, the AEPC has successfully positioned itself as the focal agency for the development of renewable energy sector in the country. It has helped mainstream renewable energy in the development plans and programs of the government. A large number of professionals have been trained to undertake most of the activities related to the development of micro hydropower, solar photovoltaic, biogas, improved cooking stoves and improved water mills within the country. However, the achievements so far are just a small fraction of the total renewable energy potential of the country and the demand for clean, affordable and sustainable energy in the rural areas. In future, AEPC aims to restructure itself to provide efficient services and upscale its activities. The AEPC Act is in the process of being legislated. It is expected that the proposed Act will make the AEPC more autonomous and the Chief Executive will be selected on competitive basis rather than the present practice of political appointment. This will ultimately lead to more efficient and people orient organization that will upscale renewable energy development activities with a much enlarged out reach.





## **2. AEPC PROGRAMMES/PROJECTS IN BRIEF**

## 2.1 ENERGY SECTOR ASSISTANCE PROGRAMME (ESAP)

The ESAP was initiated by DANIDA and the Government of Nepal in 1999 with the view of up scaling and achieving ongoing sustainability in the rural/renewable energy sector in Nepal within a 20-years' timeframe. The first phase of the program built a strong foundation for future actions and benefitted around 1.5 million people, mostly living in rural Nepal. The second phase, the ESAP II, is supported by Denmark (DANIDA), Norway (NORAD) and Germany (KfW) and is executed by the Alternative Energy Promotion Centre (AEPIC). The program began from the 15<sup>th</sup> of March 2007 and will continue until March 14, 2012. A Joint Financing Agreement (JFA) was signed by the Governments of Nepal, Denmark Norway and Germany. The JFA includes contributions from Denmark of DKK 150 Million, from Norway of NOK 147.4 Million, from KfW of € 8.5 Million, and from the Government of Nepal of an amount equal to NPR 554 Million as the matching fund and kind contribution. The total budget for ESAP II equals about NPR 4.9 Billion. ESAP II aims to provide energy solutions to more than 1 million households in Nepal. Access to clean, cheap and reliable energy in remote rural areas can make an important contribution to improved health, better education, reduction of the workload and ultimately reduction of poverty. By promoting rural development, the program will help to support and sustain the ongoing peace process.

The development objective of ESAP II is to *“Improve the living conditions of the rural population by enhancing their access and affordability to rural energy solutions that are efficient, environment-friendly and socially justifiable.”*

The immediate objectives of the ESAP II components are;

1. Coherency in policy and coordination for delivery of rural energy services with focus on decentralization and private sector,
2. Alignment of national and external development partners to the national rural energy sector policy and institutional framework,

3. Relevant institutions are capable to coordinate, develop, implement, and monitor rural energy policy/programs

ESAP II is designed with the following three components:

1. Institutional Strengthening of Rural Energy Sector, ISRES ; to promote coherence and coordination of policies for rural energy supply,
2. Rural Energy Investment: Rural Energy Fund (REF) ; to promote access to and affordability of renewable energy solutions in rural areas, and
3. Technical Support within Biomass Energy, Solar Energy and Mini Grid Electrification to provide technical support for the development and implementation of renewable energy solutions

### ESAP II Programs and Activities

#### I. Mini-Grid Rural Electrification

To broaden the scope of technologies and means of electrification, the term Mini-Grid has been adopted instead of micro hydropower. Mini-Grid is seen as a pre-grid electrification that will be connected to the national electricity grid when it is extended to the area. MGSP has a national coverage and supports hydropower plants up to 1 MW.

MGSP provides support for creating awareness and social mobilization for promotion of mini and micro hydropower projects. It also provides technical assistance for survey, design and implementation of projects. Besides, the program provides subsidy through Rural Energy Fund (REF) as per the GoN policy.

About 25,000 households have already benefitted with electricity. Projects with the total installed capacity of about 15 MW have been identified.

### **Thapa Didi brings electricity to rural homes**

Ms. Dhan Kumari Thapa, a 40 years old woman from Kimjun Village located at 7 hours' walking distance from the district headquarters of Gorkha has built the Hilme Khola Micro Hydro Plant with her own money. She mobilized her women friends to electrify the village. Known locally as 'Thapa Didi', she helped install a 10.8 kW plant which provides electricity to 85 households in one of the very remote settlements in the mid-mountains of Nepal.



Dhan Kumari Thapa operating her MHP

### **II. Solar Energy**

The Solar Component of the ESAP II supports AEPC for commercialization of the existing solar photovoltaic market. The main objective of the Component is to make quality solar energy systems accessible to the rural poor. For this, the GoN has categorized Village Development Committees (VDC) in three groups – accessible, remote and very remote - and provides different amount of subsidies. Furthermore, to increase the access of the poor, solar photovoltaic system is categorized as Solar Home Systems (for 10 Wp and above) and Small Solar Home Systems (for less than 10 Wp and more than 5 Wp) and subsidized accordingly. Besides Solar Home Systems, support is also provided to solar photovoltaic technology for water pumping, communication, vaccine storage, etc.

### **III. Biomass Energy**

Main sources of biomass energy in use in Nepal are fuel-wood, agricultural residues and animal

waste. These resources are used inefficiently and unsustainably in the rural areas. The Biomass Component of the ESAP II envisages promoting technologies and approaches for efficient and sustainable use of biomass resources. During the first phase of ESAP, it was demonstrated that for large scale dissemination of Improved Cooking Stoves (ICS), tradition approach had to be replaced by demand driven, bottom-up and participatory one. Based on this experience, the second phase plans to;

- Improve capacity of local organizations to offer affordable biomass energy solutions and ensure quality,
- Address gender, health, environmental and other socio-economic issues, and
- Popularization of biomass energy solutions among rural communities.

### **ICS Entrepreneur**

Mr. Purna G.C, a resident of Okharbot, Pyuthan is an ICS promoter. All the toes of his right leg were burnt when he was just 2 years old. He participated in an ICS construction training organized by AEPC/ESAP and has constructed more than 500 stoves and earned around Rs. 400,000. He charges between Rs. 500 to Rs. 2,500 per stove depending on the type and size. As he is a skilled carpenter and mason, he also makes cupboards and racks for the kitchen and charges up to Rs. 2,500.



Purna G.C. building an ICS

#### IV. Rural Energy Fund (REF)

The need for a funding arrangement to channel grants for development of renewable/rural energy systems the Interim Rural Energy Fund (IREF) was established under the first phase of the ESAP. With main objective of delivering transparent and efficient development aid for rural energy the REF was established in the ESAP II. The main focus areas of the REF are;

- Channeling subsidy for rural electrification and other energy services ensuring financial viability,
- Quality assurance,
- Creation of efficient credit facility,
- Fund raising,
- Capacity development of financing institutions.

It is envisaged that the REF will ultimately evolve into the Central Rural energy Fund (CREF) as outlined by the Rural Energy Policy 2006.

#### 2.2 RURAL ENERGY DEVELOPMENT PROGRAMME (REDP)

The REDP was initiated by the UNDP and GoN in 1996 with the objective of promoting modern forms of energy in the rural areas to enhance livelihoods. The REDP take a holistic approach to the development of energy systems and provides support for activities like community mobilization, environment management, end-use promotion, capacity development and social inclusion and empowerment. It emphasizes extensive participation of the beneficiary communities and supports them to identify, implement and operate and manage energy systems. The REDP also supports the local governments (DDC and VDC) to plan and manage energy programs. The success of this broad based and holistic approach led to the extension of REDP with the financial support of the World Bank and the UNDP in 2003.

The Third Phase of the Rural Energy Development Programme – (REDP-III), which has been operational since August 2007, aims 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”.

The main objectives of the REDP III are: i) lessons and best practices are used for designing

a new model for the promotion of rural energy; ii) local level capacity building to increase access to energy in 40 districts; iii) capacity building at the grassroots to link energy services to poverty alleviation, including for women and socially excluded; iv) Support to Alternative Energy Promotion Center (AEPCC) for energy planning and conservation of the environment in all 75 districts; and v) implementation of innovative approaches for long-term sustainability of micro/mini hydro and other

RETs.



Community members of the Sain Gad MHVEP, Bajhang are transporting a 50 kVA generator.



Bakery run by electricity from Bom Khola MH plant in Solu.



### **Micro Hydro Powered F. M. Radio Station**

REDP supported the community of Kharband, Baglung to operate the Sarathi F.M. 107.4 with the electricity generated by the 75 kW Girindi Khola Micro Hydropower Plant. Initially, the FM radio was tested and operated by a 17 years old local youth Mr. Dinesh Balami, who assembled the FM set himself.



Later, the REDP through DDC: DEES Baglung supported the FM Station to acquire and install modern and efficient equipment. Now, the broadcasts are received in adjoining villagers of Baglung, Pyuthan, Palpa and Syanja districts.

### **2.3 THE KHIMTI NEIGHBORHOOD DEVELOPMENT PROJECT (KiND)**

The Khimti Neighbourhood Development Project (KiND) is a public-private partnership project of the Government of Nepal (GoN), United Nations Development Programme (UNDP) and the Himal Power Limited (HPL). The main objective of the KiND is to contribute to replace bio-mass based energy by cleaner sources ensuring a healthy environment and increasing income and employment in the selected VDCs of Dolakha and Ramechhap districts. The expected project output and outcome include (i) electrification of 3750 households in the Khimti Hydropower Plant neighborhood; (ii) provision of community infrastructures; and (iii) strengthening of the Khimti Rural Electric Cooperative (KREC) to manage the electricity network.

Rural electrification includes construction of a 400 kW Haluwakhola Min Hydropower

plant and distribution lines. KiND support in community mobilization, preparation of gender and social development plans, construction of small infrastructures and promotion of micro enterprises. The KREC is given support for institutional development as well.

The project is implemented as a component of the REDP. The Micro Enterprise Development Program (MEDEP) of UNDP is an important partner for implementing the entrepreneur development activities in the project area. Started in June 2007, the project will last till June 2011. The project is funded by Himal Power Limited, the developer of the 60 MW Khimti Hydro Electric Project and the UNDP.

### **2.4 RENEWABLE ENERGY PROJECT (REP)**

The Renewable Energy Project (REP) is a joint effort of the European Union and the GoN to create renewable energy infrastructure and services for the benefit of people in remote districts of Nepal. 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 the importance of the REP for development and peace process in Nepal.

The REP supports the installation of solar energy systems for public institutions such as schools (for powering computers, printers, photo copier, lighting etc.), health posts (for vaccine refrigeration, medical lamps etc.); and rural communities (for water pumping, milling agro-grains, communications, literacy classes, entertainment etc.). The project focuses on the communities that do not have proven potential for mini/micro hydro power generation and where the possibility of the extension of the national electricity grid within the next five years is remote. The total budget of the project is EUR 15.675 Million; thereof EUR 15 Million is grant of the European Union and EUR 0.675 Million is the GoN's in-kind contribution.

The project is being implemented in 281 VDCs of 21 districts. 933 solar PV systems with a total generation capacity of 1.023 MWp will be installed. Electricity will be provided to the end-users by the Community Energy Service Provider (CESP), a local private utility, on a "fee-for-service" basis. REP will assist in establishing about 200 CESPs serving 500 households on average.

### **Printing Exam Papers**

Some early impacts of REP assistance are noticed as a result of the energy services provided by the PV systems installed with the REP support in schools. The solar electricity is being used to print the examination question papers in some of the schools in Taplejung. Before this, they had to go Ilam or Biratnagar or even across the border for this job. The school is not only printing the question papers for its own requirements but also providing the service to other schools of the surrounding communities. Similarly, the communities are making good income from running the movie shows, photo copying and printing from the equipments powered by the REP-supported solar PV systems.

### **2.5 BIOGAS SUPPORT PROGRAMME**

Biogas is the mixture of different gases produced by methanogenic bacteria feeding on biodegradable materials in anaerobic (without oxygen) conditions. Biogas is 50 to 70 percent methane and 30-40 percent carbon dioxide. It also contains small amounts of other gases. Biogas is about 20 percent lighter than air. It is odorless and colorless and burns with a clear blue flame similar to that of LPG. Its calorific value is about 20 MJ per m<sup>3</sup> and it burns with 60% efficiency in a conventional biogas stove. The Biogas Support Programme (BSP) started in July 1992 with funding from the Netherlands Government through the Netherlands Development Organization (SNV) with the aim of promoting the use of biogas in rural households instead of direct burning of animal wastes and other resources. The Government of Nepal (GoN) through Alternative Energy Promotion Centre (AEPC) and Government of Germany through the Kreditanstalt für Wiederaufbau of Germany (KfW) also started funding the BSP from March 1997.

Until the Third Phase, the BSP was directly implemented by SNV where as the Fourth Phase (since July 2003) is being implemented by the Biogas Sector Partnership Nepal (BSP- Nepal). The overall objective of BSP-IV is to further develop and disseminate biogas plants as a mainstream renewable energy solution, while addressing poverty, social inclusion and regional balance issues and ensuring commercialization and sustainability. BSP Phase-IV plans to support installation of 135,000 plants.

### **2.6 IMPROVED WATER MILL PROGRAMME (IWM)**

Improved Water Mill (IWM) has better efficiency than traditional water mills. Beside agro-processing such as rice hulling and grain grinding, IWM can also generate electricity. There is a huge potential for replacing the traditional mills by IWM in Nepal. It is estimated that there are over 25,000 traditional water mills in operation.

The Improved Water Mill Program has been operational since 2003. The CRT/Nepal is implementing the program on the AEPC's behalf. The main objective of the program is to improve the livelihoods of traditional millers and to ensure sustainability of the IWM activities. Initially four districts were selected for piloting; the program now covers 19 districts. It plans to install 1,500 IWM with the total installed capacity of 2.65 MW. It is expected that 1,500 millers will have increased income from IWM by providing services to 78,000 households.

### **2.7 UJYALO RUKUM, UJYALO NEPAL & SPECIAL MICRO HYDROPOWER DEVELOPMENT PROGRAMME**

The Government of Nepal initiated Rukum Ujyalo in 2008 to provide electricity to all VDCs of Rukum district. The program was up scaled in 2009 to cover Jajarkot and Rolpa districts as well under Ujyalo Nepal. The GoN has earmarked about 550 million rupees to support the rapid implementation of micro hydropower schemes in remote area to generate 4,000 kW and provide electricity access to 40,000 households under the Special MH Program.

### **2.8 CLIMATE AND CARBON PROGRAMME**

In the Approach Paper of the Three Years' Plan, the Government stated the need for establishing a Climate and Carbon Unit (CCU) within the AEPC. The CCU was established in July 2010 with the financial assistance of the British Government and the Netherlands Development Organization (SNV) with main objectives of;

- i) Leveraging potential Climate Change mitigation and adaptation related renewable energy technologies installed and operated in the country to generate financial resources,

- ii) Formulating and implementing Climate Change and Clean Energy Plans at the central and district levels, and
- iii) Establishing Climate Change, Clean Energy and Carbon Financing knowledge center.

The Unit plans to work in preparing National Carbon Mitigation Strategy for Nepal, prepare sector wise baseline for carbon trading and help build up capacities of stakeholders to develop and manage carbon projects. Likewise, for adaptation, the Unit will support the GoN to formulate and implement climate change resilient rural energy policies and plans and the DDCs to formulate and implement Climate and Energy Plans.



The Community people from Micro Hydro functional group during Emission Reduction Right Transfer Workshop.

## 2.9 NATIONAL BIOFUEL PROGRAMME (NBP)

The National Biofuel Programme focuses on promoting *Jatropha* as a source of biofuel in Nepal. As the development of this sector in the country is still in infancy, the AEPC support has focused on research and field testing and hands on learning.



### **3. OVERVIEW OF PROGRESS: FY 2066/67 (2009/2010)**



### 3.1 RURAL ENERGY FUND (REF)

The GoN, DANIDA and NORAD supported Energy Sector Assistance Programme (ESAP) prepared the constitution and established the Rural Energy Fund (REF) to channel subsidy for the promotion of renewable energy as per the Government's policy. REF approved over NPR 345 Millions for establishment of micro hydropower plants in 2009/10. Likewise, over NPR 241 M was granted to install Solar Home Systems and over NPR 11 M for Small Solar Home Systems. REF also provided more than NPR 7 M for Metallic Improved Cooking Stoves. Besides, REF supported activities like power output verification of installed micro hydropower plants and incurred total expenditure of over NPR 614 Million.

The GoN, the Government of the Netherlands and the KfW are providing financial assistance for the installations of biogas plants. Likewise, the UNDP and the World Bank are supporting implementation of the Micro Hydro Village Electrification Projects in 40 districts of the country. The Government of the Netherlands has also been supporting promotion of Improved Water Mills.

### 3.2 CLIMATE AND CARBON PROGRAMME

The Climate and Carbon Unit of the AEPC has undertaken a number of activities within a short period since its establishment. The major activities undertaken are given below.

- Draft of Carbon Revenue Utilization Guidelines prepared.
- Guidelines for District Climate and Energy Plans (DCEP) have been prepared and DCEP of 3 pilot districts completed.
- Micro Hydropower Plants with the total installed capacity of 14.965 MW and 19,396 biogas plants have been registered as CDM projects.
- Biogas project and one program CDM are under registration.
- Project Design Document of ICS and IWM CDM programme have been developed.

### 3.3 RENEWABLE ENERGY DATA BOOK

The AEPC has brought out the Renewable Energy Data Book 2009 that provides consolidated information on the situation of renewable energy development in the country. It covers all the renewable energy resources and related technologies that have been developed in the country from the Fiscal Year 2064/65 to 2065/66. The data book shows that almost 15 MW of Mini, over 13 MW of Micro and about 2.5 MW of Pico Hydropower Plants have been built in the country. Likewise, over 200,000 biogas plants, almost the same number of solar PV systems and almost a half million improve cooking stoves have been installed up till the mid July 2009. The publication is useful for planners, researchers, service providers and the donors.

Other major achievements made during FY 2066/67 by the AEPC are presented in the following chapters.

## 3.4 BIOGAS



A Biogas Plant in operation.

### 3.4.1 Biogas Plants Installed

During the FY 2066/67, through the Biogas Support Programme (BSP), a total of 21,158 biogas plants were installed in the country. The installation is expected to have benefited about 118,000 people, mostly residing in rural areas. The district-wise installation of biogas plants during the FY 2067/68 is given in Annex I.

### 3.4.2 Annual Survey

The BSP carried out annual cost survey for revising quotation amounts for installation of biogas plants and after sales services. It was found that the cost went up proportionate to the inflation

compared to the previous year. It also conducted a survey to assess the partners' satisfactions. The regular Biogas Users' Survey was carried out for the Fiscal Year 2066/67. It was found that 92% of the plants were operational and the users in general were satisfied with the performance of their plants.

### 3.4.3 Training

During the FY 2066/67, the BSP Nepal conducted training for Biogas Supervisors, Masons, Users and Slurry Promotion besides providing orientation. Altogether, 41,340 participants benefited from these training and orientation activities.

### 3.4.4 International Workshop

In November 2009, AEPC co-organized with SNV 'The International Workshop on Domestic Biogas' with the theme: How to improve and scale up practices?' 150 persons representing 25 countries from Asia, Africa, Europe and Central and North America participated in the 3-days' workshop organized in Kathmandu.

### 3.4.5 Clean Development Mechanism

Two projects totaling 19,396 biogas plants installed after 2003/04 have been registered with the UNFCCC. Additional projects are under the process of being registered with the CDM both as small scale projects and Program of Activities (PoA) that are expected to be registered by 2013. The revenue thus generated will be crucial in sustaining the Biogas Support Program in Nepal.

### 3.4.6 Biogas Credit Fund

AEPC has established Biogas Credit Fund with the objective of providing loan for biogas installation through micro finance institutions, especially for low income groups from remote areas. A total of 4,525 biogas plants were installed through this fund.

## 3.5 BIOMASS ENERGY

### 3.5.1 Improved Cooking Stoves Installed

85,245 Mud ICS benefitting over 500,000 people were installed in 49 districts in the last Fiscal Year. Likewise, 1,957 Metal ICS were installed in 12 districts. The lists of Mud and Metal ICS Installed are given in Annex II.

### 3.5.2 Extension of Biomass Energy Programme

Biomass Energy Component of AEPC/ESAP has extended its activities in 2 new mid-hill districts - Solukhumbu and Kalikot and 10 districts of the Terai. The list of new Terai districts is given in Table 1 below.

Table 1: List of New Terai Districts

S.N	Name of Partner Organizations	Working Districts
1	Kailali Kanchanpur Rural Electrification Umbrella Organization (KKREUO), Attariya, Kailali	Kailali and Kanchanpur
2	Center for Health and Environment Conservation Nepal (CHEC-Nepal), Birgunj, Parsa	Bara and Parsa
3	Renewable Energy, Water Supply and Sanitation Promotion Center (REWSSPC), Chandranigahpur, Rautahat	Rautahat and Siraha
4	Rural Economic Development Association (REDA), Butwal, Rupandehi	Rupandehi and Kapilvastu
5	Namsaling Community Development Center (NCDC), Dharan	Sunsari and Jhapa

### 3.5.3 Bio-briquette Demonstration and Testing

AEPC implemented pilot projects to test and demonstrate Bio-briquette Technology in Lamjung, Kathmandu and Chitwan districts. Briquetting is densification of biomass to improve its combustion efficiency and easier handling. All the briquetting machines and stoves have been handed over to respective communities.

### 3.5.4 Policy Recommendations for Bio-briquette

Due to the absence of effective guidelines, policy and programs on bio-briquetting, the sector has not flourished as compared to other biomass technologies in Nepal. At the same time, AEPC has been facing problems to plan regular programs on bio-briquetting. AEPC conducted a study to provide policy inputs for promotion of bio-briquette in the fiscal year 2066/67 B.S. The study has details on existing briquette technology in the country, commercial, social and technical issues, organizations involved, etc.

### 3.5.5 MoU with Nepal Red Cross Society

A Memorandum of Understanding (MoU) has been signed between AEPC/ESAP and Nepal Red Cross Society on 26<sup>th</sup> March 2010 for collaboration in promotion of biomass energy technologies in Nepal.

### 3.5.6 Danish and Norwegian Embassy Team Visit

A team of Danish and Norwegian Embassy staff visited Ilam from 25<sup>th</sup> to 28<sup>th</sup> January, 2010. During the visit, the team observed improved cooking stoves at Fikkal and Pasupatinagar VDCs and a micro hydropower plant and ICS at Phakfok VDC. The team also observed the operation of recently piloted Tea Drying System using Gasification technology, specifically designed for small scale tea processing industries.

### 3.5.7 Piloting of Portable Rocket Stoves in the Terai Region of Nepal

The model identification and field testing of the Portable Rocket Stoves in the Terai - Sunsari, Bardia and Kailali has been completed. BEC has also come up with a dissemination strategy for the extension of its activities in the Terai. BEC organized a half day Result Sharing Workshop on “Piloting of Portable Rocket Stove in the Terai Districts” on 15th November, 2009 in Kathmandu. Representatives of stakeholders working in the Terai participated.

### 3.5.8 Piloting of Institutional Improved Cooking Stoves

BEC is piloting 165 units of Institutional Improves Cooking Stoves in strategic locations in its programme districts. BEC provides support for the metallic components. These IICS will be installed in student hostels, Army Barracks, hotels and guest houses and suitable small scale industries; etc. The main objective behind this pilot activity is to make potential users aware about the improved technology.

### 3.5.9 Gasification

Gasifier is environmentally friendly as it converts solid fuels into combustible gas at very high efficiency. From this clean and odorless gas, various herbs such as tea, ginger, cardamom, turmeric as well as other agricultural products can be dried. The gas can also be used as fuel in an engine to produce motive power. Though small gasifiers have previously been tested in Nepal, the technology has not been widely disseminated. BEC and REDP have undertaken gasifier pilot projects.



Madhuban Goth Gasifier and the Operator Sanjeeb Kumar Jaiswal

BEC successfully tested and implemented a gasifier for tea leaves drying in Kanyam VDC of Illam. The technology was developed by students of Institute of Engineering, Tribhuvan University. The main objective of this piloting activity is to test the efficacy of an efficient and low cost technology for drying tea leaves compared to electricity or direct biomass burning. Hot gases produced by the gasifier are passed through heat exchanger and from heat exchanger the required amount of clean hot gas passes into the drying unit. The drying unit is 'cabinet' type with provision of tray and can dry up to 25 kg of green leafs at a time which would produce 5 kg of dry leafs per batch. Drying different herbs by clean and odorless gas produced by gasification process are of superior quality.

REDP has supported the community to install and operate a 10kW biomass gasifier based electricity plant in Madhuban Goth, Sarlahi. A 20 HP gas engine is directly coupled to a 15 KVA generator. On average 14-15 kg/hr biomass is consumed. Agricultural wastes, firewood and bio-briquette can be used as fuel input. The plant has been supplying electricity to 122 houses. Previously, the community was using diesel generating



sets. Anticipated endues include lift irrigation replacing existing diesel plants, agro processing mill and communication centers.

### 3.5.10 Consultative meeting with KKREUO

Biomass Energy Component organized consultative meeting with Kailali Kanchanpur Rural Electrification Umbrella Organization (KKREUO) on 18th March 2010 with the aim of replacing traditional biomass energy technologies with improved biomass energy technologies. KKREUO includes more than 50,000 households.

### 3.5.11 Biofuel

National Biofuel Programme initiated its activities from the Fiscal Year 2065/66. The program focuses on promotion of Jatropha as the main source of biofuel in the country. Some of the major activities undertaken by the program are given below.

- Preparation of the Biofuel Promotion Strategy.
- Jatropha plantation training.
- Establishment of two jatropha oil transesterification plants – in Palpa and Chitwan.
- Orientation programs in 5 Development Regions
- Establishment of nurseries in 5 Development Regions.
- Pilot project using biofuel has been undertaken.



A glimpse of biofuel Jatropha plants at Tumlingtar in Sankhuwasabha district.



## 3.6 IMPROVED WATER MILL

### 3.6.1 IWM Installed



Long Shaft IWM. Photo: CRT/N

A total of 986 IWM, 879 short-shafted and 109 long-shafted, were installed in 19 districts in this Fiscal Year. It is estimated that over 50,000 new households benefitted from this technology in the country.

### 3.6.2 IWM Study

A 3 months long study on performance of IWM electrification schemes was undertaken this fiscal year. The average overall efficiency was found to be 38%. Among others, the study recommended preparation of a detailed design and installation manual. Another study on quality verification of installed IWM was also undertaken. 1300 IWM were verified during the course of study.

### 3.6.3 Training and Workshop

Nine IWM repair and maintenance training were organized for the millers, 166 participants, including 20 women, benefitted from the 3-days long training. Likewise, a, IWM networking workshop was attended by 30 participants. IWM related experiences were shared and the participants agreed to establish IWM Network.

### 3.6.4 Awards

IWM Programme was among the final nominees for Energy Globe Award 2010 organized by Energy Globe Portal of Austria. Altogether, 886 projects from 105 countries had competed for the prestigious award.

Previously, IWM was awarded the Ashen Awards for Sustainable Energy in 2007.

## 3.7 WIND ENERGY

### 3.7.1 Preparation of Guidelines for Pre-qualification

The study identified the basic requirements for pre-qualification of companies to work on wind energy. The main objective of pre-qualification is to maintain quality of the equipment and materials needed for wind power projects and ensure capacity of service providers to generate and supply reliable electricity in rural areas. AEPC is planning to pre-qualify companies to work on wind energy from this fiscal year.

### 3.7.2 Integration of Wind Power Plants with the National Electricity Grid of Nepal

To explore the possibility of grid integration of wind power plants, AEPC undertook a study. The main objective of this study was to conduct a comprehensive statistical assessment of integrating wind power plants of total capacity of 20 MW with the National Electricity Grid of Nepal.

### 3.7.3 Development of Database Management System

Reliable wind data is the key element for prospecting, resource assessment and site suitability and investment decisions on the wind energy projects. AEPC aims to provide 'investment grade' wind data to prospective developers to promote wind energy in Nepal. AEPC has been collecting wind data from a number of meteorological stations around the country. AEPC has already collected more than 36 cumulative years' wind data from 12 stations. In order to efficiently store and retrieve 'wind' information, AEPC has awarded a project to National Alternative Energy and Engineering Services (NAEES) for developing wind database management system.

### 3.7.4 Wind Pumping

AEPC installed a wind pumping system in Vauda VDC, Morang a year ago. AEPC aims to promote this cost effective technology based on the lessons learnt. Although similar systems had already been installed and operated by different institutions at different locations, none of the plants are operating.



Wind pumping site at Bhaua VDC in Morang district.

## 3.8 SOLAR ENERGY

### 3.8.1 Solar PV Systems Installed

In the last fiscal year, 34,219 Solar Home Systems (10 Wp and above) were installed in 71 districts. Likewise, 5,913 Small Solar Home Systems (more than 5 Wp and less than 10 Wp) were installed. District wise installation of both these systems is provided in the Annex IV. It is estimated that over 250,000 people have access to electricity from these systems.



A cluster of 50 houses in Dolpa have installed Solar Home Systems.

### 3.8.2 Solar PV Systems Installed with the GoN funding

A total number of 450 solar dryers/cookers, 7 solar PV water pumping systems and 21 PV systems to operate school computers were installed in the last fiscal year with the funding of the GoN. List of district wise solar Dryers/Cookers, Water Pumping Systems and Solar PV for computer operation installed over the years is in Annex IV.

### 3.8.3 Solar PV Systems under REP

The REP is supporting the communities in remote areas where installation of micro hydropower plants is not feasible. The REP is supporting for installing over 900 PV systems in 21 districts. The systems include Solar PV for operating computers in schools and refrigerators in health centers, communication and entertainment centers, grain grinding mills and water pumps. The lists of solar PV systems being installed with the REP support are provided in Annex IV.

### **3.8.4 Training**

A number of training related to solar energy technologies was organized by AEPC/ESAP during this fiscal year. 204 persons received basic training on solar electric system and 50 persons participated in the higher level training. 100 technicians belonging to the pre-qualified companies were given field monitoring training. Likewise, representatives of pre-qualified companies also participated in refresher courses on subsidy processing.

### **3.8.5 Used Lead Acid Battery Management in Nepal**

The study on used Lead Acid Battery management in Nepal was conducted to review the existing practices and policies in Nepal and the region. The study updated on previous study done by DANIDA titled "Study on environmentally benign handling, disposal and recycling of used lead acid batteries in Nepal- Jan, 2003". Data on the quantities of lead acid batteries used in various sectors was collected and scarp generated annually was estimated. The study also analyzed technical and financial aspects of an optimum sized recycling plant and recommended necessary policy for short and long term management of used batteries in the country.

### **3.8.6 Socio-economic Impact of Solar Home System**

A study on socio-economic impacts of SHS was conducted by AEPC. The objectives of this study were to investigate the socio-economic impacts caused by SHS disseminated under subsidy of AEPC/ESAP, investigate the satisfaction level of SHS users and identify the possible uses other than lighting. The study found that household heads with better education compared to less educated and households with more land and extra income such as remittance are more likely to install SHS. The study also found that children from households with SHS on average put in extra 15 minutes for studies and performed well in school and were less likely to drop out. It was also observed that the owners are actively involved in repair and maintenance of their systems and regularly clean the panels and add water in their batteries. On the other hand, the respondents complaint of lack of technicians in their vicinity to repair SHS. It was also found that almost half of owners want to upgrade their systems to operate televisions, refrigerators and other electrical gadgets.

### **3.8.7 Solar PV Status 2010**

The status of Solar PV 2010 in the form of report is under preparation with the objective is to collect and disseminate information to stakeholders and others interested in the solar PV sector of Nepal in the book form. The publication includes data on solar PV installed and other important information like the policies and plans of the government, subsidy disbursement mechanism, organizations involved in the sector, etc.

### **3.8.8 Promotional activities**

100,000 Information booklet and poster on solar energy technologies were printed and distributed. Likewise, 10,000 ESAP Solar Programme brochures in Nepali were distributed. Annual contract has been signed with Ujyalo Network (FM Radio Network) for year round announcement of PSAs on Solar Energy Component's activities.



### 3.9 MINI/MICRO HYDROPOWER

Among the renewable energy technologies promoted by AEPC in rural areas to provide electricity to help meet the needs of the people, micro hydropower is the most prominent one. Two main programs of AEPC have been actively working for the development of micro hydropower plants. The UNDP and the World Bank funded Rural Energy Development Programme (REDP) and the DANIDA and NORAD funded Mini Grid Support Programme under Energy Sector Assistance Programme (MGSP/ESAP) are the main vehicle through which AEPC promotes micro hydropower in Nepal. The REDP has been supporting installations of community managed micro hydro systems in the selected VDCs of 40 districts with its holistic approach and the MGSP/ESAP has been supporting for the installations of both community managed and private entrepreneur developed and managed systems throughout the country.

In the previous fiscal year, the AEPC supported in installing 80 MH plants in the rural areas of the country that generated 1,500 kW of power and benefited 15,000 households. The AEPC carried out the detailed feasibility studies of 296 MH sites with the total capacity of 8,116 kW benefitting 84,572 households. Moreover, to enhance rural livelihoods, both the REDP and the ESAP support end-uses of electricity. Beside agricultural produce processing, electricity from micro hydropower plants have been used to operate communication centers, computer training institutes, a FM Radio Station, saw mill, etc.



Saw Mill driven by a 22kW Micro Hydropower Plant in Burtibang of Baglung supported by the ESAP.

### 3.10 REDP SUPPORTED ACTIVITIES

#### 3.10.1 Detail Feasibility Study of MH

During FY 2066/67, the REDP carried out detailed feasibility study of 88 micro hydropower sites in 27 districts. The total capacity of the plants will be 2,590 kW and directly benefit 26,624 households.

#### 3.10.2 Completed MH Schemes

During FY 2066/67, the REDP supported the communities to install 35 MH plants in 17 districts with the total capacity of 828 kW benefitting 8,754 households.

The REDP supported 100 kW Bom Khola Micro Hydropower Plant supplies electricity to Lukla Bazaar, the get way to the Everest Region. As the project area has very high movement of tourists, electricity is used for diverse applications such as space and water heating in hotels and lodges, operating communication equipment, including that of the airport and cooking and baking in restaurants.



Electric Oven at the German Bakery, Lukla.

#### 3.10.3 Haluwa Khola Mini Hydropower Plant

The construction of Haluwa Khola Mini Hydro Power Plant initiated under the Kind Project implemented by the REDP started from November 2009. The civil work is being carried out by Haluwa Khola Mini Hydro Functional Group (HKMHFG). The excavation of headrace alignment, intake, desilting basin forebay and some portion of the penstock alignment has been completed. The construction of Intake, Desilting basin, Forebay, Anchor blocks, Support Piers and Geological Mitigation works is ongoing. It is expected that the civil construction work will be completed within April 2011. The headrace and penstock pipes are being fabricated and erected by UDECO Pvt. Ltd. 40 m of headrace pipe and 60 m penstock pipe have been installed. An agreement has been signed with Shaoyang Hengyuan Zijiang Hydroelectric Equipment Co. Ltd., China for supply and installation of the electro-mechanical equipment, which will be supplied within 20 weeks.





Construction Work at Haluwa Khola Mini Hydropower Plant, Namadi, Ramechap. Photo: KiND Project.

### 3.11 STUDY / RESEARCH SUPPORTED BY REDP

#### 3.11.1 Gender Audit:

The REDP carried out Gender Audit with the main objective of gender tracking of the program both at the institutional level and the field for further enhancing gender mainstreaming in the rural energy. Besides, the REDP also conducted Gender Mainstreaming in Malekhu Khola Micro Hydropower Project area in Dhading district to make it responsive to the energy needs of men and women and the community to widen the energy services.

#### 3.11.2 Smart Subsidy:

The study is to advise a pro-poor smart subsidy mechanism with adjustment/extension in the existing subsidy policy with reliable and sustainable institutional instrument.

#### 3.11.3 Testing of a Micro Francis Turbine

In Nepal, the Cross Flow turbine has normally been used in low and medium head micro hydropower schemes, which has been working well. On the other hand, the Francis turbine is known as being robust and more efficient compared to the Cross Flow. However, due to complex design and fabrication, it has not been in use in micro hydro schemes in Nepal. REDP recently pilot tested a micro Francis Turbine at Handi Khola, Sindhupalchok. In the pilot project, power output increased by 6 kW when the Cross Flow turbine was replaced by a locally designed and fabricated micro Francis. Moreover, the weight

of the micro Francis was just 90kg compared to 400 kg for the Cross Flow turbine, which is a major achievement in the Nepali context, where turbines and other equipment have to be portered for days to reach the micro hydropower project sites.



Micro Francis turbine at Handi Khola, Sindhupalchok.



Runner of a 33 kW Micro Francis Turbine.

### 3.11.4 Urja Upatyaka Mini Grid

Urja Upatyaka in the southern part of Baglung has 7 Micro Hydropower Plants within the distance of 8 km. REDP is supporting the communities to establish Urja Upatyaka Mini Grid by synchronizing them at 11 kV, first of its kind in Nepal. The total installed capacity of the 7 MHP is 132KW and provides electricity to 1400 HHs. Ytek Control, India provided the equipment and technical assistance for synchronization. The Programmable Logic controller (PLC) based grid synchronizable Electronic load Controller (ELC) is the core of the Mini Grid.



Grid Synchronisable PLC based control panel in Mini Grid Project, Baglung.

There are various anticipated benefit of the Mini Grid project such as; i) increased quality, reliability and availability of the electricity, ii) balancing the surplus electricity of one or more MHP with the deficit electricity of others, iii) opportunity to establish bigger industries, and iv) ability to carry out maintenance (with plant shutdown) in any one/few plant(s) without totally depriving the beneficiaries of electricity. Furthermore, the Mini-grid offers a sizable amount of electricity to be connected to the National Electricity Grid compared to individual plants. The control panel from Y-tekc control Dehradun already been transported to the site where as erection of 8 km, 11 kV transmission line had already been completed. The installation of the control panel and testing and commissioning of the mini grid will take place soon. In addition capacity building of the Kalung Khola Urja Upatyaka Mini Grid Working Committee (KKUUMGWC) members on the operational modality of the mini Grid was already taken place.



## 3.12 ESAP SUPPORTED ACTIVITIES

### 3.12.1 Detail Feasibility Study of MH

The MGSP/ESAP identified micro hydropower schemes capable of generating a total of 5.7 MW to provide access to electricity to some 61,159 households. Out of which the detailed feasibility study of schemes with total capacity of 4.4 MW was completed and detailed feasibility studies of schemes with 1.4 MW capacity is in progress. Business plans for 93 with cumulative power output of 3.98 MW has been prepared and forwarded to the Rural Energy Fund for implementation.

### 3.12.2 MH Installed

The MGSP /ESAP supported the installation of 25 MH plants that generate a total of 680 kW and benefited 6,287 rural households. Furthermore, construction works are at different stages of a number of micro hydropower schemes whose total capacity is 3,355 kW and will benefit 31,761 households. The MGSP/ESAP also completed 'one-year check' of 27 plants that have been operational for at least a year.



Members of the Users' Committee preparing construction material for of the 40kW Charibang Khola MHP, Baglung

### 3.12.3 Grid Connection of Micro Hydro

Shree Mahankal Bahuuddesiya Ghatte Bijuli Pariyojan with the installed capacity of 18kW has been connected to the National Electricity Grid. This project is located in Gotikhel, Lalitpur. This is the first Micro Hydro Plant that has been connected to the Grid. Equipment and technical support was provided by ENTEC Switzerland through GIZ Nepal. It is expected that this pilot project would pave a way for grid connection of other Micro Hydropower Plants.



## **4. BUDGET AND EXPENDITURE**

## Annual Budget and Expenditure for FY 2066/67

(Figure in NPR in x 000)

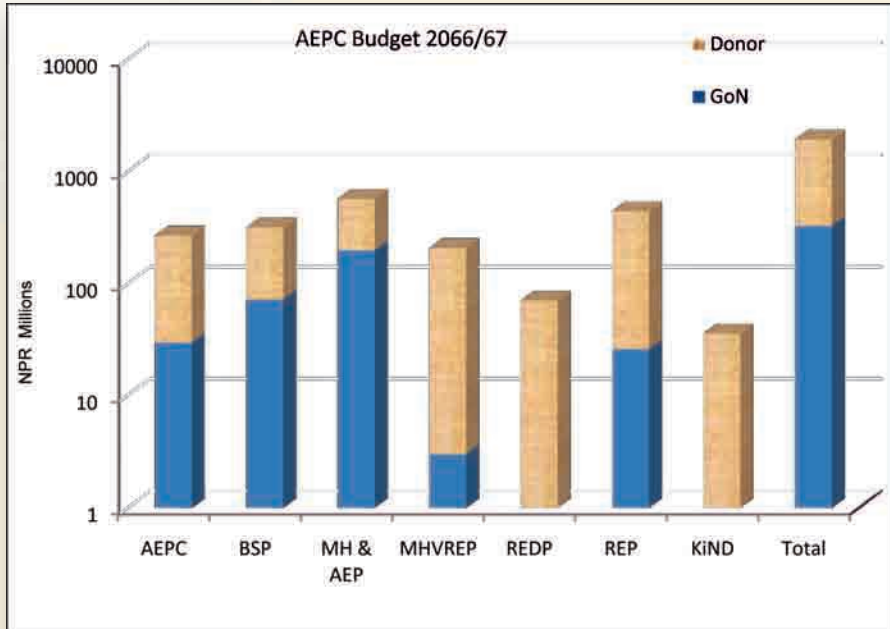
**Table:1**

SN	Programme	Budget Code	Budget			Expenditure		
			GoN	Donor	Total	GoN	Donor	Total
1	Alternative Energy Promotion Centre	61-3/4-220	34361	236000	270361	29524.93	237784.47	267309.40
2	Biogas Production Programme	61-4-221	71500	159442	230942	71500.00	245790.50	317290.50
3	MH and Alternative Energy Programme	61-3/4-222	205724	465919	671643	196916.79	372011.05	568927.84
4	Micro Hydro Village Rural Electrification Programme	61-3/4-223	3552	212827	216379	2975.58	203859.79	206835.37
5	Rural Energy Development Programme	61-4-224	0	42750	42750	0.00	69855.98	69855.98
6	Renewable Energy Project	61-3/4-260	27020	326354	353374	25847.79	416278.00	442125.79
7	Khimti Neighborhood Development Project	61-4-263	0	120228	120228	0.00	35564.25	35564.25
	<b>Total</b>		<b>342,157</b>	<b>1,563,520</b>	<b>1,905,677</b>	<b>326,765</b>	<b>1,581,144</b>	<b>1,907,909</b>

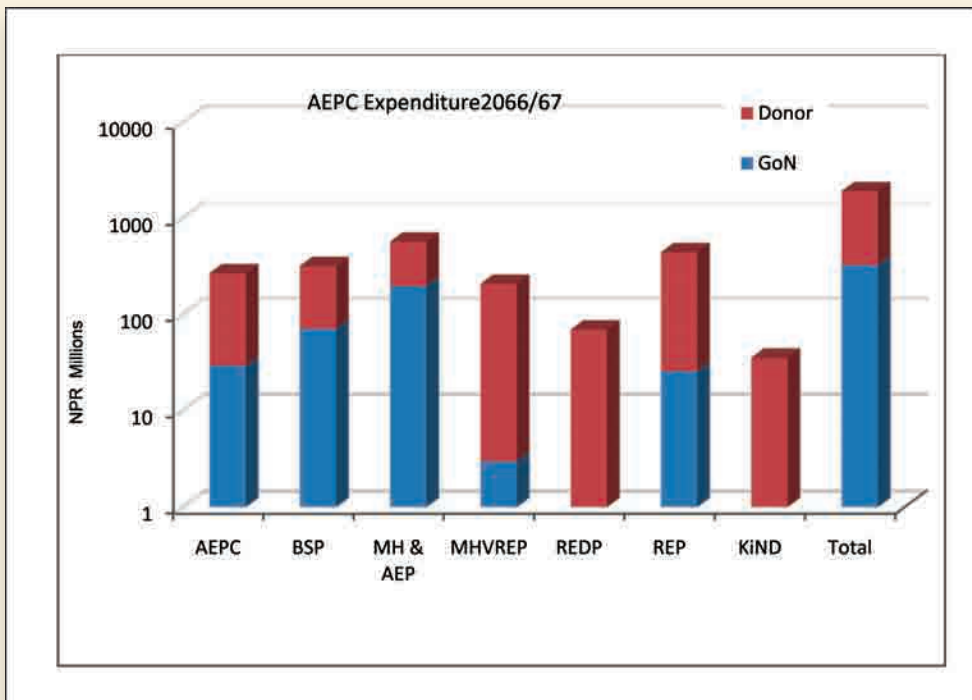
Note: As can be seen the table above, the Expenditure of the donor fund is more than the budget. This is due to direct funding to some of minor activities.



## AEPC Budget 2066/67



## AEPC Expenditure 2066/67





## **5. ANNEXES**

## ANNEX I

**Table 2: Study/Research of Biogas Support Programme**

Topic	Objectives	Duration
Annual Cost Survey for revision of Quotation for Biogas Plant construction and after –sale service under BSP.	<ol style="list-style-type: none"> <li>1) To undertake an annual cost survey to analyse the change in price of raw materials, labour and mason, appliance etc,</li> <li>2) To recommend a revised quotation for biogas plants construction and ASS for FY 2009/10, etc.</li> </ol>	6 weeks
Annual partners' satisfaction survey- 2009	<ol style="list-style-type: none"> <li>1) To assess overall quality service provided</li> <li>2) To assess the level agreements adhered to</li> <li>3) To assess the level of service provided by the staff of BSP-N</li> <li>4) To identify the key issue and advices for the future improvements</li> <li>5) To explore suggestions from the companies</li> </ol>	6 weeks

**Table 3: Trainings by Biogas Support Programme**

Topic	No. of Participants	Duration (days)	Target Group
Biogas Supervisors Training	75	5	Unskilled workers
Biogas Masons Training	538	6	Unskilled workers
Biogas Users Training	23,106	1	Users
Slurry Promotion Training	17,321	1	Users
Biogas Promotional Training	270	1	Participants from GOs, NGOs, CBOs, MFIs, etc.
Biogas Orientation for Micro Finance	30	2	MFIs.

**Table 4: District wise Installation of Biogas Plants**

SN	District	Plants constructed	HHs Benefited	Population Benefited
1	Arghakhanchi	32	32	176
2	Baglung	58	58	319
3	Bajhang	30	30	165
4	Banke	427	427	2,349
5	Bara	392	392	2,156
6	Bardiya	626	626	3,443
7	Bhaktapur	64	64	352
8	Bhojpur	27	27	149
9	Chitwan	1105	1,105	6,078
10	Dadeldhura	1	1	6
11	Dailekh	3	3	17
12	Dang	745	745	4,098
13	Darchula	18	18	99
14	Dhading	847	847	4,659

SN	District	Plants constructed	HHs Benefited	Population Benefited
15	Dhankuta	61	61	336
16	Dhanusa	38	38	209
17	Dolakha	134	134	737
18	Dolpa	4	4	22
19	Doti	1	1	6
20	Gorkha	397	397	2,184
21	Gulmi	63	63	347
22	Humla	1	1	6
23	Ilam	601	601	3306
24	Jhapa	1647	1,647	9,059
25	Jumla	1	1	6
26	Kailali	1229	1,229	6,760
27	Kalikot	14	14	77
28	Kanchanpur	815	815	4,483
29	Kapilbastu	361	361	1,986
30	Kaski	947	947	5,209
31	Kathmandu	22	22	121
32	Kavrepalanchowk	655	655	3,603
33	Khotang	7	7	39
34	Lalitpur	100	100	550
35	Lamjung	628	628	3,454
36	Mahottari	93	93	512
37	Makwanpur	2125	2,125	11,688
38	Morang	715	715	3,933
39	Mugu	2	2	11
40	Mustang	1	1	6
41	Myagdi	86	86	473
42	Nawalparasi	709	709	3,900
43	Nuwakot	154	154	847
44	Okhaldhunga	1	1	6
45	Palpa	361	361	1,986
46	Panchthar	60	60	330
47	Parbat	35	35	193
48	Parsa	43	43	237
49	Pyuthan	72	72	396
50	Ramechhap	94	94	517
51	Rasuwa	54	54	297
52	Rautahat	179	179	985
53	Rolpa	2	2	11
54	Rukum	14	14	77
55	Rupandehi	419	419	2,305
56	Salyan	31	31	171
57	Sankhuwasabha	56	56	308

SN	District	Plants constructed	HHs Benefited	Population Benefited
58	Saptari	16	16	88
59	Sarlahi	277	277	1,524
60	Sindhuli	480	480	2,640
61	Sindhupalchowk	171	171	941
62	Siraha	58	58	319
63	Solukhumbu	22	22	121
64	Sunsari	193	193	1,062
65	Surkhet	262	262	1,441
66	Syangja	462	462	2,541
67	Tanahu	1455	1,455	8,003
68	Tehrathum	62	62	341
69	Udayapur	293	293	1,612
<b>Total</b>		<b>21,158</b>	<b>21,158</b>	<b>116,369</b>

## ANNEX II

Table 5: District wise Installation of Mud Improved Cook Stoves

S.N.	District	ICS Installation	HH benefited	Population benefited
1	Baglung	5,067	5,067	30,402
2	Myagdi	2,540	2,540	15,240
3	Parbat	4,365	4,365	26,190
4	Kaski	539	539	3,234
5	Surkhet	1,733	1,733	10,398
6	Dailekh	1,484	1,484	8,904
7	Jajarkot	1,458	1,458	8,748
8	Dang	3,379	3,379	20,274
9	Salyan	3,363	3,363	20,178
10	Pyuthan	3,159	3,159	18,954
11	Rolpa	2,811	2,811	16,866
12	Rukum	2,594	2,594	15,564
13	Dhading	3,491	3,491	20,946
14	Makawanpur	2,140	2,140	12,840
15	Nuwakot	2,177	2,177	13,062
16	Rasuwa	628	628	3,768
17	Bhaktapur	159	159	954
18	Kathmandu	322	322	1,932
19	Lalitpur	217	217	1,302
20	Darchula	358	358	2,148
21	Doti	1,111	1,111	6,666
22	Baitadi	1,290	1,290	7,740



S.N.	District	ICS Installation	HH benefited	Population benefited
23	Kailali	331	331	1,986
24	Dadeldhura	373	373	2,238
25	Kavrepalanchowk	2,168	2,168	13,008
26	Sindhupalchowk	3,529	3,529	21,174
27	Ramechhap	3,019	3,019	18,114
28	Dolakha	2,168	2,168	13,008
29	Tanahun	1,115	1,115	6,690
30	Nawalparasi	1,130	1,130	6,780
31	Gorkha	1,108	1,108	6,648
32	Lamjung	955	955	5,730
33	Dhankuta	1,466	1,466	8,796
34	Tehrathum	1,510	1,510	9,060
35	Bhojpur	1,396	1,396	8,376
36	Sankhuwasabha	760	760	4,560
37	Khotang	1,671	1,671	10,026
38	Udayapur	1,460	1,460	8,760
39	Sindhuli	2,583	2,583	15,498
40	Okhaldhunga	2,013	2,013	12,078
41	Taplejung	1,842	1,842	11,052
42	Panchthar	1,237	1,237	7,422
43	Ilam	2,586	2,586	15,516
44	India	515	515	3,090
45	Palpa	1,268	1,268	7,608
46	Gulmi	1,409	1,409	8,454
47	Syangja	989	989	5,934
48	Arghakhanchi	1,797	1,797	10,782
47	Achham	268	268	1,608
48	Bajura	417	417	2,502
49	Bajhang	135	135	810
<b>Total</b>		<b>85,245</b>	<b>85,245</b>	<b>5,11,470</b>

**Table 6: District wise Installation of Metallic ICSs**

S.N.	District	MICS installation	HH benefited	Population benefited
1	Kavre	49	49	294
2	Sindhupalchok	456	456	2736
3	Rasuwa	104	104	624
4	Makwanpur	131	131	786
5	Jumla	536	536	3216

6	Dolakha	210	210	1260
7	Kathmandu	76	76	456
8	Nuwakot	213	213	1278
9	Myagdi	40	40	240
10	Mugu	23	23	138
11	Lalitpur	98	98	588
12	Kaski	21	21	126
<b>Total</b>		<b>1957</b>	<b>1957</b>	<b>11,742</b>

**Table 7: List of Trainings Supported by Biomass Energy Component/ESAP**

S.N.	Topics	No. of training conducted	Duration	Target Group	No. of Participants		
					Male	Female	Total
1	New Promoters Training	73	7 days	ICS promoter	805	384	1189
2	LPO ToT	4	7 days	Local partner organization	32	23	55
3	Promoter Refresher training	19	7 days	old promoters	68	41	109
4	Training to Master Installers of MICS	1	2 days	Master Installers of MICS of pre-qualified companies	25	3	28

**Table 8: List of Seminar/Workshop/Conferences organized by BEC/Seminar**

S.N.	Seminar/Workshop/Conference	Topics	Duration	No. of participants	Remarks
1	Workshop	Midterm review and planning workshop with RRESCs and SPs	3 days	33	
2	Workshop	Staff induction	1 days	10	
3	Workshop	Annual review and planning Workshop with RRESCs/SPs	3 days	30	
4	Workshop	Consultative Workshop on Working Modality developing and Sharing with terai stakeholders	3 days	24	
5	Interaction	Interaction programme with Curriculum development Center	1 days	13	
6	Interaction	interactive meeting with metallic stove companies	1 days	20	

## ANNEX III

**Table 9: District wise Installation of IWM**

S. N.	District	Progress			Benefited Households
		Short Shaft	Long Shaft	Total	
1	Baitadi	49	1	50	1873
2	Dadeldhura	30	2	32	1745
3	Dhading	85	15	100	5541
4	Dolakha	43	14	57	3503
5	Ilam	0	0	0	
6	Jumla	39	0	39	3756
7	Kalikot	71	0	71	2325
8	Kavre	38	4	42	2585
9	Lalitpur	10	0	10	189
10	Makawanpur	79	6	85	5115
11	Mugu	4	0	4	46
12	Nuwakot	86	7	93	4948
13	Panchathar	0	0	0	
14	Pyuthan	16	1	17	843
15	Ramechhap	44	11	55	3008
16	Rasuwa	19	0	19	845
17	Sindhuli	112	28	140	7294
18	Sindhupalchowk	70	3	73	3277
19	Surkhet	84	15	99	4563
<b>Total</b>		<b>879</b>	<b>107</b>	<b>986</b>	<b>51456</b>
<b>Percentage</b>		<b>89%</b>	<b>11%</b>	<b>100%</b>	

**Table 10: The basic functional features of the traditional and improved water mill**

Comparison Parameter	Traditional Water Mill	Improved Water Mill
Water Discharge(lps)	40-100	30-100
Speed(rpm)	120-160	200-250
Output ( kW)	0.2-0.5	0.5-3
Grinding stone	Local	Local
Efficiency ( %)	Below 25	30-50
Functions and capacity	Cereal Grinding (only maize, wheat, millet rice, etc.): 10-20kg/hr	Cereal Grinding: >20kg/hr
		Paddy dehusking/partial polishing: 50-70 kg/hr
		Oil expelling: 10-15 kg/hr

Source: <http://www.energyhimalaya.com/information-center/improved-watermill.html>

## ANNEX IV

Table 11: District-wise installations of Solar Home System

S No	District	No of SHS	Beneficiary Households	Beneficiary Population
1	Achham	699	699	4979
2	Arghakhanchi	590	590	3674
3	Baglung	374	374	2231
4	Baitadi	566	566	4183
5	Bajhang	909	909	6933
6	Bajura	228	228	1795
7	Banke	461	461	2954
8	Bara	202	202	1332
9	Bardiya	91	91	647
10	Bhojpur	768	768	4995
11	Chitwan	302	302	1786
12	Dadeldhura	169	169	1362
13	Dailekh	1373	1373	9605
14	Dang	409	409	2714
15	Darchula	702	702	4821
16	Dhading	730	730	4897
17	Dhankuta	71	71	443
18	Dhanusa	38	38	268
19	Dolakha	77	77	474
20	Dolpa	55	55	323
21	Doti	325	325	2320
22	Gorkha	298	298	1780
23	Gulmi	733	733	4736
24	Humla	32	32	269
25	Ilam	98	98	541
26	Jajarkot	877	877	5828
27	Jumla	316	316	1981
28	Kailali	458	458	3293
29	Kalikot	181	181	1276
30	Kanchanpur	103	103	808
31	Kapilbastu	14	14	91
32	Kaski	77	77	460
33	Kavrepalanchowk	178	178	1329
34	Khotang	857	857	5541
35	Lalitpur	31	31	191
36	Lamjung	258	258	1419
37	Mahottari	224	224	1517

S No	District	No of SHS	Beneficiary Households	Beneficiary Population
38	Makawanpur	838	838	5795
39	Manang	2	2	11
40	Morang	69	69	390
41	Mugu	188	188	1504
42	Mustang	27	27	142
43	Myagdi	354	354	2198
44	Nawalparasi	411	411	2785
45	Nuwakot	246	246	1628
46	Okhaldhunga	641	641	4190
47	Palpa	502	502	3644
48	Panchthar	473	473	2980
49	Parbat	366	366	2375
50	Parsa	103	103	604
51	Pyuthan	351	351	2546
52	Ramechhap	1482	1482	10319
53	Rasuwa	10	10	45
54	Rautahat	59	59	427
55	Rolpa	2975	2975	19374
56	Rukum	2138	2138	13299
57	Rupandehi	6	6	31
58	Salyan	1221	1221	8378
59	Sankhuwasabha	629	629	3818
60	Saptari	17	17	108
61	Sarlahi	153	153	995
62	Sindhuli	2085	2085	14237
63	Sindhupalchowk	148	148	1039
64	Siraha	79	79	577
65	Solukhumbu	143	143	938
66	Surkhet	976	976	6694
67	Syangja	176	176	1161
68	Tanahu	1026	1026	6694
69	Taplejung	441	441	2717
70	Terhathum	82	82	495
71	Udayapur	1928	1928	11909
	<b>Total*</b>	<b>34,219</b>	<b>34,219</b>	<b>227,843</b>

\* The differences in the total systems installed is due to the difference in the number of SHS recommended for installation and the final approval given by the REF.



**Table 12: District Wise Installation of Small Solar Home System**

S No	District	No of SSHS	Beneficiary Households	Beneficiary Population
1	Arghakhanchi	141	141	846
2	Baglung	2	2	12
3	Banke	1	1	6
4	Bara	2	2	12
5	Bardiya	33	33	198
6	Bhaktapur	2	2	12
7	Chitwan	2542	2542	15252
8	Dadeldhura	1	1	6
9	Dhading	38	38	228
10	Gorkha	231	231	1386
11	Gulmi	5	5	30
12	Jajarkot	217	217	1302
13	Jhapa	98	98	588
14	Kalikot	3	3	18
15	Kaski	17	17	102
16	Kavrepalanchowk	6	6	36
17	Khotang	69	69	414
18	Lalitpur	1	1	6
19	Lamjung	59	59	354
20	Mahottari	1	1	6
21	Makawanpur	1200	1200	7200
22	Morang	1	1	6
23	Nawalparasi	37	37	222
24	Nuwakot	608	608	3648
25	Palpa	11	11	66
26	Panchthar	16	16	96
27	Parbat	5	5	30
28	Parsa	6	6	36
29	Ramechhap	73	73	438
30	Rasuwa	52	52	312
31	Rautahat	1	1	6
32	Rupandehi	1	1	6
33	Salyan	11	11	66
34	Sankhuwasabha	1	1	6
35	Sarlahi	4	4	24
36	Sindhuli	2	2	12
37	Siraha	55	55	330
38	Syangja	243	243	1458
39	Tanahu	105	105	630
40	Taplejung	4	4	24
41	Terhathum	1	1	6
42	Udayapur	7	7	42
	<b>Total</b>	<b>5,913</b>	<b>5,913</b>	<b>35,478</b>

**Table 13: District-wise number of solar PV systems supported by REP (Under Installation)**

S.No.	Districts	Number of Solar PV Systems					
		Lot 1 (Mill)	Lot 2 (ISPS for Far West)	Lot 3 (ISPS for Mid West)	Lot 4 (ISPS for Western & Central)	Lot 5 (ISPS for Eastern)	Lot 6 (water pumping)
1	Darchula	3	39				3
2	Baitadi	4	30				8
3	Doti	5	33				1
4	Achham	8	47				0
5	Bajhang	5	54				1
6	Bajura	6	31				4
7	Salyan	5		34			7
8	Jumla	12		44			0
9	Mugu	11		20			0
10	Dolpa	10		28			0
11	Humla	12		30			0
12	Myagdi	3			24		1
13	Mustang	2			26		0
14	Gorakha	2			31		3
15	Dhading	3			17		0
16	Ramechhap	5			52		0
17	Dolakha	7			43		0
18	Okhaldhunga	2				59	0
19	Shankhuwasabha	0				48	0
20	Panchathar	0				67	2
21	Taplejung	2				39	0
	<b>Total</b>	<b>107</b>	<b>234</b>	<b>156</b>	<b>193</b>	<b>213</b>	<b>30</b>

**Table 14: Number of solar PV systems by PV package supported by REP (Under Installation)**

S No	PV package	Number of systems				
		Far west	Mid West	Western & Central	Eastern	Total
1	Local health post	68	39	42	57	206
2	School package 1	74	45	47	72	238
3	School package 2	31	29	34	46	140
4	Computer Literacy	12	6	11	0	29
5	Entertainment Center	16	17	21	5	59
6	Communication Centre	33	20	38	33	124
7	Grinding mill	31	50	22	4	107
8	Water Pumping	17	7	4	2	30
	<b>Total</b>	<b>282</b>	<b>213</b>	<b>219</b>	<b>219</b>	<b>933</b>

**Table 15: Solar PV for Computers in Schools, (with the GoN Funding)**

S. No.	District	Number of System				Total
		Up to 2007	in 2008	in 2009	in 2010	
1	Syangja	2	0	0	0	2
2	Makawanpur	5	0	0	2	7
3	Terhathum	3	0	0	0	3
4	Jajarkot	2	0	2	0	4
5	Sindhuli	4	0	1	2	7
6	Lamajung	5	0	0	0	5
7	Tanahun	6	0	0	1	7
8	Dolakha	3	0	0	0	3
9	Baitadi	1	1	0	0	2
10	Dailekh	1	1	1	1	4
11	Darchula	2	2	2	0	6
12	Sankhuwasabha	3	3	1	0	7
13	Sarlahi	3	5	0	0	8
14	Sindhuli	4	4	0	0	8
15	Surkhet	1	2	2	0	5
16	Solukhumbu	1	1	0	0	2
17	Okhaldhunga	4	0	0	0	4
18	Bhojpur	0	0	1	1	2
19	Dolpa	0	0	1	1	2
20	Taplejung	0	0	1	0	1
21	Rolpa	0	0	1	0	1
22	Manang	0	0	1	0	1
23	Mugu	0	0	0	1	1
24	Kalikot	0	0	0	2	2
25	Bajura	0	0	0	2	2
26	Rautahat	0	0	0	2	2
27	Dhading	0	0	0	1	1
28	Achham	0	0	0	1	1
	<b>Total</b>	<b>50</b>	<b>19</b>	<b>14</b>	<b>17</b>	<b>100</b>

**Table 16: Solar Water Pumping Systems Installed, (with the Gon Funding)**

S. No.	District	Number of Systems				Total
		Up to 2007	in 2008	in 2009	in 2010	
1	Dhading	7	1	0	0	8
2	Syangja	1	1	0	1	3
3	Salyan	1	0	0	0	1
4	Arghakhanchi	1	1	1	0	3
5	Kavre	0	1	0	0	1
6	Udayapur	0	1	1	0	2
7	Tanahun	2	0	0	1	3
8	Pyuthan	2	0	0	0	2
9	Gorkha	2	0	0	0	2
10	Okhaldhuinga	3	0	0	0	3
11	Darchula	2	0	1	0	3
12	Bhojpur	2	0	0	0	2
13	Palpa	1	0	1	0	2
14	Parsa	0	0	1	0	1
	<b>Total</b>	<b>24</b>	<b>5</b>	<b>5</b>	<b>2</b>	<b>36</b>

**Table17: Solar Dryers/Cookers Installed, (with the GoN Funding)**

S. No.	District	Number of Systems			Total
		Up to 2006	2007	2008	
1	Kathmandu	332	0	45	377
2	Tanahun	22	5	11	38
3	Nawalparasi	2	4	3	9
4	Gorkha	7	5	2	14
5	Rukum	2	2	0	4
6	Kavre	39	6	5	50
7	Sunsari	2	5	15	22
8	Lalitpur	21	0	39	60
9	Dang	2	7	0	9
10	Dhankuta	1	6	5	12
11	Bhaktapur	19	0	22	41
12	Dhading	5	5	7	17
13	Lalitpur	78	0	0	78
14	Chitawan	9	8	6	23
15	Jajarkot	2	5	0	7
16	Dolpa	2	8	0	10

S. No.	District	Number of Systems			
		Up to 2006	2007	2008	Total
17	Sindhupalchowk	7	5	4	16
18	Ramechhap	65	11	11	87
19	Dolakha	2	3	0	5
20	Mustang	1	20	25	46
21	Manang	1	23	12	36
22	Ilam	18	7	10	35
23	Taplejung	3	2	0	5
24	Sunsari	2	4	18	24
25	Palpa	17	4	8	29
26	Rasuwa	2	0	3	5
27	Nuwakot	2	0	0	2
28	Rautahat	1	0	0	1
29	Makawanpur	1	0	9	10
30	Sankhuwasabha	1	0	0	1
	<b>Total</b>	<b>668</b>	<b>145</b>	<b>260</b>	<b>1073</b>



## ANNEX V

**Table 18: Feasibility Study of MH Supported by REDP**

S.N.	Schemes	Location	Output (kW)	No. of HHs to benefit	Population Benefited
<b>Far-Western Region</b>			<b>790</b>	<b>8210</b>	<b>45,155</b>
<b>Darchula</b>			<b>196</b>	<b>1972</b>	<b>10,846</b>
1	Riting Gad	Sunsera	51	553	3,042
2	Bhartola Gad II	Dattu	45	472	2,596
3	Bhartola Gad	Shankarpur	15	150	825
4	Maune Khola	Dhuligada	45	484	2,662
5	Kala Gad II	Dhari	40	313	1,722
<b>Baitadi</b>			<b>26</b>	<b>312</b>	<b>1,716</b>
6	Jhadbo Khola	Shikharpur	12	150	825
7	Lamuni Gad	Malladehi	14	162	891
<b>Bajhang</b>			<b>206</b>	<b>2077</b>	<b>11,424</b>
8	Bhyagute Gad	Matela	17	174	957
9	Maubheri Khola	Koiralakot	30	386	2,123
10	Sanni Gad	Kafalseri	100	992	5,456
11	Bahuli Gad	Daulichour	25	225	1,238
12	Suni Gad	Sunikot	34	300	1,650
<b>Bajura</b>			<b>137</b>	<b>1350</b>	<b>7,425</b>
13	Mana Gad II	Brahmtola	32	300	1,650
14	Gudu Gad	Gudukhati	15	150	825
15	Barju Gad	Kuldevmandu	90	900	4,950
<b>Doti</b>			<b>110</b>	<b>1280</b>	<b>7,040</b>
16	Gadseri Gad II	Gadsera	20	180	990
17	Gadseri Gad III	Niraula	30	400	2,200
18	Tuna Gad III	Dhirmamandu	20	250	1,375
19	Tuna Gad II	Satferi	40	450	2,475
<b>Achham</b>			<b>115</b>	<b>1219</b>	<b>6,705</b>
20	Jijadi Gad	Devasthan	27	319	1,755
21	Chaira Khola III	Hichma/ Dhakari	60	500	2,750
22	Chaira Khola II	Sera	18	200	1,100
23	Kuika Khola	Kalikasthan	10	200	1,100
<b>Mid-Western Region</b>			<b>557</b>	<b>5627</b>	<b>30,949</b>
<b>Dailekh</b>			<b>72</b>	<b>700</b>	<b>3,850</b>
24	Chhadi Khola	Tilepata	20	200	1,100
25	Rama Gad	Visalla	16	150	825
26	Takuri Khola	Kashikad	36	350	1,925
<b>Kalikot</b>			<b>190</b>	<b>1880</b>	<b>10,340</b>
27	Vaccunegad	Gela	70	680	3,740
28	Lafegad	Ramnaktot	70	700	3,850
29	Raksar khola	Odanaku	30	310	1,705
30	Bhartagad	Sukatiya	20	190	1,045
<b>Jajarkot</b>			<b>263</b>	<b>2677</b>	<b>14,724</b>

S.N.	Schemes	Location	Output (kW)	No. of HHs to benefit	Population Benefited
31	Garghatta	Dhimme-5	80	815	4,483
32	Gadgadaket	Salma-2	65	675	3,713
33	RC Khola	Phajaru-4	18	254	1,397
34	Maskot Khola	Maskot- 2	100	933	5,132
<b>Rolpa</b>			<b>32</b>	<b>370</b>	<b>2,035</b>
35	Hyme Khola	Kureli	22	250	1,375
36	Kureli Khola	Kureli	10	120	660
<b>Western Region</b>			<b>220</b>	<b>2049</b>	<b>11,270</b>
<b>Baglung</b>			<b>98</b>	<b>964</b>	<b>5,302</b>
37	Gaudi Khola III	Dhudhilabhathi	21	204	1,122
38	Lower Pachuwa Khola	Kandebas	15	150	825
39	Taman Khola II	Taman	18	180	990
40	Girindi Khola II	Dagathundanda	30	300	1,650
41	Urja Khola IV	Dameh	14	130	715
<b>Gorkha</b>			<b>122</b>	<b>1085</b>	<b>5,968</b>
42	Daraudi Jholunge Khola	Sinjung	100	800	4,400
43	Hundi Khola III	Saurpani/ Swara	22	285	1,568
<b>Central Region</b>			<b>388</b>	<b>4135</b>	<b>22,743</b>
<b>Dhading</b>			<b>100</b>	<b>979</b>	<b>5,385</b>
44	Manpang Khola VI	Budhathum	10	102	561
45	Kheste Khola II	Baireni	12	107	589
46	Kalsyong Khola	Ri	20	250	1,375
47	Malekhu Khola II	Mahadevsthan	18	170	935
	Kingtang Khola	Darkha, Gumdi and Marpark	40	350	1,925
<b>Kavrepalanchowk</b>			<b>65</b>	<b>679</b>	<b>3,735</b>
48	Banakhu Khola II	Banakhu	25	259	1,425
49	Durlung Khola II	Milche	20	215	1,183
50	Chau Khola IV	Dandagaun	20	205	1,128
<b>Sindhupalchowk</b>			<b>70</b>	<b>684</b>	<b>3,762</b>
51	Supling Khola	Golche-3	14	140	770
52	Selang	Golche-9	16	164	902
53	Golche Khola	Golche	40	380	2,090
<b>Dolakha</b>			<b>110</b>	<b>1192</b>	<b>6,556</b>
54	Kelpati Khola	Jhyanku	60	594	3,267
55	Kolung Khola	Suri	50	598	3,289
<b>Ramechhap</b>			<b>77</b>	<b>944</b>	<b>5,192</b>
56	Phedi Khola	Dadhuwa	22	226	1,243
57	Pokudobhan Khola	Bijulikot	45	600	3,300

S.N.	Schemes	Location	Output (kW)	No. of HHs to benefit	Population Benefited
58	Phalate Khola MHS	Him Ghange	10	118	649
<b>Sindhuli</b>			<b>43</b>	<b>601</b>	<b>3,306</b>
59	Marin Khola	Amale	18	225	1,238
60	Shakhar Khola	Kholagaun	13	218	1,199
61	Soku Khola	Ratnawati	12	158	869
<b>Eastern Region</b>			<b>635</b>	<b>6603</b>	<b>36,317</b>
<b>Okhaldhunga</b>			<b>106</b>	<b>1370</b>	<b>7,535</b>
62	Molung Khola IV	Kuntadevi	46	560	3,080
63	Lingchar Pokting	Bigutar	30	400	2,200
64	Pankhu Khola	Waksa	30	410	2,255
<b>Solukhumbu</b>			<b>143</b>	<b>1430</b>	<b>7,865</b>
65	Shumbu Khola	Deusa	25	250	1,375
66	Solu Khola	Salyan	58	580	3,190
67	Dudu Khola II	Jubu	60	600	3,300
<b>Khotang</b>			<b>50</b>	<b>490</b>	<b>2,695</b>
68	Buwa Khola I	Damakhushibalaya	18	230	1,265
69	Buwa Khola II	Bopung	19	167	919
70	Sawa Khola II	Sawa Katahare	13	93	512
<b>Bhojpur</b>			<b>79</b>	<b>725</b>	<b>3,988</b>
71	Chhange Khola	Khartamchha	40	332	1,826
72	Phedi Khola	Khatamma	39	393	1,162
<b>Udayapur</b>			<b>47</b>	<b>470</b>	<b>2,585</b>
73	Nagdaha Khola	Hardeni	17	170	935
74	Yari Khola II	Rupatar	30	300	1,650
<b>Taplejung</b>			<b>460</b>	<b>4160</b>	<b>22,880</b>
75	Suntela Khola MHS	Mahde/Abegudin	100	930	5,115
76	Maiwa Khola MHS	Tinglabu/Thakumba	100	750	4,125
77	Lauwa Khola	Thukima/ Nalbu/ Lingtep	100	950	5,225
78	Tewa Mekwa Khola	Ekhabu	60	550	3,025
79	Yaphre Khola	Hangdewa/Phurumbu	100	980	5,390
<b>Panchthar</b>			<b>76</b>	<b>745</b>	<b>4,098</b>
80	Nibu Khola VI	Lumphabung	12	110	605
81	Nibu Khola VII	Nawami dada	14	135	743
82	Nibu Khola VIII	Nawami dada	12	120	660
83	Nibu Khola ix	Nawami dada	18	180	990
84	Feme Khola	Lungrupa	20	200	1,100
<b>Tehrathum</b>			<b>76</b>	<b>838</b>	<b>4,609</b>

S.N.	Schemes	Location	Output (kW)	No. of HHs to benefit	Population Benefited
85	Koya Khola III MHS		29	290	1,595
<b>Sankhuwashava</b>			<b>58</b>	<b>535</b>	<b>2,943</b>
86	Sano Basuwa Khola	Pawa Khola/ Pathibhara	25	205	1,128
87	Chhuksum Khola	Hatiya	15	150	825
88	Newa Khola	Sisuwa	18	180	990
<b>Total</b>			<b>2590</b>	<b>26624</b>	<b>146,432</b>

**Table 19: List of Completed MH schemes supported by REDP**

S.N.	Schemes	District	Location (VDC)	Power Output (kW)	Beneficiary HHs	Population
1	Hopari Gad	Darchula	Sipti	50	583	3207
2	Khar Khola II	Darchula	Khar	32	400	2200
3	Nuwgari Gad	Baitadi	Shivalinga	16	150	825
4	Kathmada Gad	Baitadi	Patthekot	28	289	1590
5	Chuwa Gad	Baitadi	Chaukham	23	237	1304
6	Suk Gad	Bajhang	Dhamena	13	190	1045
7	Jadari Gad	Bajhang	Lamatola	42	411	2261
8	Thar Khola II	Bajura	Manakot	22	232	1276
9	Katti Khola	Dailekh	Ruma	13	134	737
11	Sani Gad	Doti	Daud	22	300	1650
12	Pinara Khola	Humla	Karpunath	11	114	627
13	Khatyad Khola	Mugu	Seri	27	273	1502
14	Susaune Khola	Pyuthan	Arkha	10	112	616
15	Ghatte Khola	Pyuthan	Arkha	10	90	495
16	Upasibang Khola	Baglung	Khungkhani	25	284	1562
17	Urja Khola IV	Baglung	Sarkuwa	14	133	732
18	Saune Khola	Baglung	Shishakhani	18	150	825
19	Khabang Khola	Baglung	Khungkhani	9	97	534
20	Upper Girindi Khola	Baglung		50	450	2475
21	Riththe Khola	Myagdi	Arman	14	187	1029
22	Malekhu Khola	Dhading	Mahadevthan	26	265	1458
23	Lapang Khola	Dhading	Marpak	9	91	501
24	Kakchepu Khola	Dolakha	Jhyanku	32	320	1760
25	Dorung Khola	Dolakha	Chilankha	29	324	1782
26	Thotne Khola	Okhaldhunga	Mamkha	15	205	1128
27	Molung Khola II	Okhaldhunga	Molung	26	255	1403
28	Para Khola II	Okhaldhunga	Mulkharka	13	149	820
29	Deumai Khola	Sankhuwashaba	Tamafok	14	158	869
30	Sabha Khola	Sankhuwashaba	Shaba Pokahri	25	254	1397
31	Subuwa Khola II	Taplejung	Hampang	20	215	1183
	Phawa Khola	Taplejung	Sikaichana	70	700	3850

S.N.	Schemes	District	Location (VDC)	Power Output (kW)	Beneficiary HHs	Population
32	Nibu Khola III	Panchthar	Angsarang	12	116	638
33	Thado Khola II	Panchthar	Oyam	16	166	913
34	Nibu Khola IV	Panchthar		20	200	1100
35	Dudu Khola	Solukhumabu	Lokhim	52	520	2860
<b>Total</b>				<b>828</b>	<b>8754</b>	<b>48147</b>

**Table 20: List of End Uses promoted with REDP's support**

S.N.	District/Region	Name of Schemes	Name of Enterprise /End-uses
<b>Far-Western Region</b>			
1		Kala Gad	Cable TV Network
2		Hopari Gad	Computer Institute
3			Agro Processing Mill
4			Agro Processing Mill
5		Loli Gad	Oil Expeller
6		Nuwagari Gad	Oil Expeller
7		Surnaya Gad III	Oil Expeller
8		Thalali Gad	Oil Expeller
9		Balle Khola	Oil Expeller
10		Jamari Gad	Oil Expeller
11			Grinder
12			Soy Processing Center
13			Oil Expeller
14		Rel Gad	Expeller, Huller, Grinder
15			Radio & Watch Repairing Center
16		Jadari Gad	Computer Institute
17		Narighat Khola	Home TV
18		Sailly Gad II	Agro Processing Mill
19		Sani MHEP	Computer Institute
20			Home TV
21		Kailash Khola III	Agro Processing Mill
22			Computer Institute
23		Putru Khola	Agro Processing Mill
24			Rural Telecom Center
25			Agro-processing
26			Rural Medicinal Plant Collection Center
27		Lohare Khola MHVEP	Agro Processing Mill
28		Arya Khola MHDS	Poultry Farming



S.N.	District/Region	Name of Schemes	Name of Enterprise /End-uses
<b>Western Region</b>			
29		Retthe Khola	Agro Processing Mill
30			Agro Processing Mill
31		Lower Labdi Khola	Agro Processing Mill
32			Saw Mil
33			Poultry Farming
34			Girill Industry
35			Water Mill
36			Water Mill
37		Lamela Khola	Saw Mil
38			Agro Processing Mill
39		Upper Girindi Khola	Agro Processing Mill
40			Agro Processing Mill
41			TV Cable Networks
42			Meat Shop with defreeze
43			Chiuri processing factory
44			FM Station
45			Rural Telecommunication Center
46			Computer Training Institute
<b>Central Region</b>			
47		Kakchapu Khola	Agro Processing Mill
48			Agro Processing Mill
49			Agro Processing Mill
50			Agro Processing Mill
51			Rural Carpenteruy
52			Cable TV networ
53			Paper Manufacture
54			Tele Comunication Center
55			Rural Recreation Center/ Vedio Hall
56			Poultry Farming
57		Dorung Khola	Rural Recreation Center/ Vedio Hall
58		Gumba Khola	Rural Carpentry
59		Churi Khola MHDS	Poultry Farming
60		Churi Khola MHDS	Poultry Farming

S.N.	District/Region	Name of Schemes	Name of Enterprise /End-uses
61		Daunne Khola MHDS	Poultry Farming
62			Poultry Farm
63			Coffee Processing Plant
64			Handicraft Shop
65			Agro Processing
66		Malekhu Khola	Agro processing Mill
67			Computer Institute
68			Poultry Farming
69			Sewing Machine
70			Home TV
71		Lapang Khola	Poultry Farming
72			Huller Grinder
<b>Eastern Region</b>			
73		Moulung Khola I	Computer Institute
74		Moulung Khola I	Agro Processing mill
75		Moulung Khola I	Hular Grinder
		Para Khola I	Dish TV
		Thotne Khola	Dish TV
		Thotne Khola	Computer
		Moulung Khola II	Dish TV
		Molung Khola II	Computer
		Rumdu Khola	Dish TV
		Rundu Khola	Computer
		Rumdu Khola	Photo Copy
		Rumdu Khola	Photo Studio
76		Siku Khola II	Agro Processing mill
77			Cable TV Network
78		Siku Khola I	Computer Institute
79			Computer Institute /Photo copy
80		Hywa Khola	Computer/ Photocopy
81		Churikhra	Siber Café
82			Sauna Bath
83			Sewing Michine
84			Photocopy email/ internet/fax
85			Hi-vision Hall

S.N.	District/Region	Name of Schemes	Name of Enterprise /End-uses
86			Bakery
87			Computer Education
88			X-RAY Mechine
89		Niduwa Khola	Ginder
90			Saw Mill
91		Deumai Khola	Griner
92			Saw Mill
93		Koya Khola II	Agro Processing Mill
94			Agro Processing Mill
95			Agro Processing Mill
96			Agro Processing Mill
97			Agro Processing Mill
98			Agro Processing Mill
99			Agro Processing Mill
100			Lokta Processing
101			Photocopy
102			Computer Institute
103			Dairy Production
104			Tailor Center
105		Koya Khola I	Computer Institute
106			Computer Institute
107			Computer Institute
108			Cable TV Network
109			Photocopy
110			Photocopy
111			Photocopy
112			Electronic Shop
113			Electronic Shop
114			Electronic Shop
115			RTC
116			Computer Training Institute
117			Chiura Mill
118			Saw Mill
119			Oil Expeller
120			Grinder Huller

S.N.	District/Region	Name of Schemes	Name of Enterprise /End-uses
121		Goduma Khola	Rice/Grinder Haller
122			Rice/Grinder Haller
123		Tawa Khola NHS	Agro Processing Mill
124			Rural Communication Center
			Photo Studio
			Poultry Farming
			Cold Center
			Rural Carpentry
125		Thodo Khola II	Agro Processing Mill
126		Nibu Khola III	Agro Processing Mill
127			Jatropha Processing Plant
128			Lokta Paper
129			Rural Telecom Center
130			Rural Carpentry Shop
131			Computer Institute

**Table 21: List of district wise detail feasibility study of MHPs under ESAP**

S.No.	Districts	DFS for the FY 2066/67		
		No.	kW	No. of HH to benefit
1	Achham	8.0	222.0	2,181
2	Baglung	5.0	107.0	1,096
3	Baitadi	4.0	220.0	2,194
4	Bajhang	22.0	465.0	5,947
5	Bajura	8.0	327.0	3,685
6	Bhojpur	3.0	94.0	805
7	Darchula	7.0	144.0	1,540
8	Dhankut	1.0	40.0	426
9	Doti	8.0	138.5	1,412
10	Dolakha	7.0	329.0	2,577
11	Dolpa	6.0	319.0	2,926
12	Gorkha	6.0	79.2	843
13	Jajarkot	11.0	178.5	2,627
14	Jumla	5.0	107.0	1,081
15	Gulmi	2.0	109.5	1,027
16	Humla	1.0	64.0	550
17	Kalikot	2.0	118.5	1,140
18	Kaski	2.0	97.0	662
19	Khotang	6.0	348.2	3,731

S.No.	Districts	DFS for the FY 2066/67		
		No.	kW	No. of HH to benefit
20	Lamjung	3.0	132.0	1,015
21	Makwanpur	2.0	18.0	268
22	Manang	2.0	140.0	638
23	Mugu	2.0	77.0	666
24	Nawalparasi	10.0	149.0	1,758
25	Nuwakot	2.0	23.0	331
26	Okhaldhunga	11.0	308.2	3,105
27	Palpa	5.0	135.0	1,221
28	Panchthar	3.0	43.0	371
29	Ramechhap	1.0	16.0	108
30	Rasuwa	1.0	17.0	145
31	Rolpa	20.0	428.0	3,898
32	Rukum	15.0	371.5	3,591
33	Sindhuli	4.0	32.0	320
34	Solu	8.0	267.0	2,588
35	Taplejung	2.0	137.0	1,204
36	Udaypur	3.0	25.1	271
	<b>Total</b>	<b>208.0</b>	<b>5,826</b>	<b>57,948</b>

**Table 22: List of completed MH under ESAP**

S. No.	Micro Hydropower Project	District	VDC	kW	Beneficiary Households
1	Togo Khola	Lamjung	Pasgaun	35	280
3	Daram Khola	Baglung	Kandebas	35	306
4	Patale Khola	Baglung	Devisthan	37	338
5	Bhusinga Khola	Okhaldhunga	Bhusinga	75	750
6	Siwa Khola (Maluwa)	Panchthar	Amchowk	5.5	90
7	Pelu Khola	Okhaldhunga	Khijikati	19	210
8	Kisedi Khola	Lamjung	Pachowk	21	194
9	Selele Khola	Okhaldhunga	Pokali	22	200
10	Badar MHP	Arghakhanchi	Subarnakhal	8	120
11	Jaya Khola	Taplejung	Dhunge Shangu	31	280
12	Khari Khola 1	Udayapur	Bhutar	7.35	72
13	Golang Khola	Rolpa	Ghartigaun	17	159
14	Kawa Khola	Bhojpur	Bayang	18	170
15	Nishi Dovan	Baglung	Burtibang	32	280
16	Sahi Khola	Baglung	Adhikarichaur	40	375
17	Pangraghari Khola	Baglung	Adhikarichaur	12.5	105
18	Mawa Khola	Ilam	Sakfara	33	292
19	Manpang Khola	Dhading	Mulpani	17	179
20	Chhote Khola	Gorkha	Manbu	100	791



21	Garghatee Khola	Humla	Senda	26	220
22	Simdi Gad	Bajhang	Patadewal	35	377
23	Nadi Khola	Bajhang	Majhigaun	20.5	253
24	Tolka Khola	Kaski	Lumle-8	27	150
25	Madane Khola	Dhading	Aginchowk-1	7	96
	<b>Total</b>			<b>680.85</b>	<b>6287</b>

**Table 23: List of End Uses promoted under ESAP**

S.No.	Name of MHP	kW	Name of End use		Qty	End Use Capacity
1	Gadi Khola MHP, Adhikarichaur -6, Baglung	22	a	Huller/Grinder.	1 Nos	5.6 kW
2	Khani Khola MHP, Adhikarichaur -5, Baglung	20	a	Planer for Furniture	3 sets	1 kW each
			b	Grinder for Blacksmith	3 sets	1 kW each
			c	Television	19 Nos	75 Watt each
3	Patale Khola MHP, Devisthan -1, Baglung	37	a	Huller/Grinder.	2 Nos	7.5 kW each
4	Daram Khola MHP, Kandevas -9, Baglung	35	a	Huller/Grinder	4 Nos	7.5 kW
			b	Cable Network	1 Nos	1 kW
			c	Poultry Farm	1 Nos	1 kW
			d	Computer Institute	2 Nos	1 kW each
5	Nishi Dovan MHP, Burtibang-4, Baglung	32	a	Huller/Grinder	1 Nos	7.5 kW
6	Sahi Khola MHP, Adhikarichaur- 3, Baglung	40	a	Poultry farm	2 Nos	1 kW
			b	Photo studio	1 Nos	1 kW
			c	Electronic shop	2 Nos	1 kW
			d	Cable TV Network	1 Nos	1 kW
7	Darkato Khola MHP, Argal -2, Baglung	23	a	Huller/Grinder	1 Nos	7.5 kW
			b	Furniture mill	1 Nos	3 kW
8	Pangraghari Khola MHP, Adhikarichaur-6, Baglung	12.5	a	Huller/Grinder	1 Nos	12.5 kW (Mechanical)
9	Mangmaya Khola MHP, Sanghu-1, Taplejung	27	a	Huller/Grinder	1 Nos	5 kW
			b	Fax & Photocopy center	1 Nos	1 kW
10	Tiringe Khola MHP, Tiringe-7 Taplejung, Taplejung	29	a	Computer education center at Secondary school	4 Nos Computer	1 kW
11	Fakfok Khola II MHP, Falfok-7, Kolbote, Illam	20	a	Computer education center at school	1 Nos	1 kW
12	Siwa Khola MHP, Tharpu 6, Panchtar	18	a	Huller/Grinder	1 Nos	5 kW
			b	Rural carpentry	1 Nos	1 kW
			c	Computer institute	1 Nos	1 kW

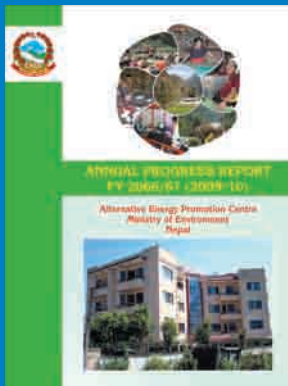
S.No.	Name of MHP	kW		Name of End use	Qty	End Use Capacity
13	Koya Khola MHP, Thoklung-2, Terhathum	56	a	Huller/Grinder	1 Nos	7.5 kW
14	Sobuwa Khola MHP, Chage-5, Taplejung	35	a	Computer Education at local high school	1 Nos	1 kW
15	Nangkuwa Khola MHP, Hasanpur-1, Taplejung	12	a	Bell Juice producer mill	1 Nos	
16	Tumia Khola MHP, Yamphudin-6, Bhojpur	8	a	STM phone tower operation	1 Nos	
17	Muling Khola MHP, Nalbu-3, Taplejung	16	a	Carpentry Udhdyog	1 Nos	1 kW
18	Arkhet Khola II, Aruarbang VDC, Oyak, Gorkha	17.5	a	Agro-Processing	2 Nos	5 kW each
19	Devsat Khola, Bullingtar-1, Nawalparasi	21	a	Film Hall (overhead projector)	1 Nos	1 kW
20	Ghatte Khola, Taghring-1, Chyamche, Lamjung	25	a	Cyber café	1 Nos	1 kW
			b	Hotel	1 Nos	1 kW
21	Madane Khola, Aginchowk, Bhumensthan, Dhading	7.5	a	Agro-Processing	1 Nos	4 kW
22	Manapang Khola, Mulpani VDC, Siureni, Dhading	17.5	a	Agro-Processing	1 Nos	4 kW
			b	Rural Carpentry	1 Nos	2 kW
23	Khani Khola Chharini Chaga Dimpokhari-2, Ramechhap	10	a	Computer Institute	1 Nos	1 kW
24	Suthi Khola Koldada-8, Palpa	16	a	Huller/Grinder	1 Nos	7.5 kW
25	Putpute Khola, Magyamchisapani, Syangjya	44	a	Cyber	1 Nos	1 kW
26	Daram Khola, Wami Tucksar, Nuvar, Gulmi	70	a	Saw Mill	1 Nos	16 Ampere
			b	Bakery	1 Nos	5 kW
27	Nisdi Khola II, Galdha VDC-8, Palpa	15	a	Cyber	1 Nos	1 kW
28	Nisti Khola Dohali, Kotkateri, Gulmi	22.5	a	Huller/Grinder	2 Nos	<b>1.5 KW EACH</b>

**Table 24: Study / Research conducted by REDP**

S.No.	Study	Objectives	Remarks
1	Gender Audit	Gender tracking of the programme at the institutional level as well as in the field level for making recommendations for modifying the policy, strategy and actions to further enhancing the gender mainstreaming in the rural energy sector of Nepal.	REDP/UNDP
2	Study on market based micro hydro promotion incentive mechanism	A design a market based micro hydro promotion incentive mechanism to develop MHs as a small profit making enterprise and socially beneficial.	REDP/UNDP
3	Study on Comparative Analysis	To identify, analyze and compare the best practices in expanding energy access for the poor in a sustainable manner practiced in the region.	REDP/UNDP
4	Study on MH long term sustainability	To assess the sustainability of micro hydro power systems in Nepal that have been in operation for five years or more.	The World Bank
5	Study on biomass gasification based rural electrification	piloting the initiative to help access the electricity services by villagers from the locally available biomass such as rice husk, saw dust, forest products and agricultural residues.	REDP/UNDP
6	TNA and Management Capacity Assessment of REDP		REDP/UNDP
7	Study on effect of Climate Change on Micro Hydro	To identify the possible effects of climate change on the micro hydro system development in the future and suggesting possible measures for adaptation.	
8	Community Ownership and private management of MHS		REDP/UNDP
9	Study on Gender Mainstreaming in Malekhu Khola Micro Hydro Project Dhading		ENERGIA
10	Study on pro-poor smart subsidy		REDP/UNDP
11	Standard and Guideline developed for environment and energy planning at local level		







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