Project design document form
(Version 10.1)

Complete this form in accordance with the instructions attached at the end of this form.

BASIC INFORMATION	
Title of the project activity	Micro-hydro Promotion
Scale of the project activity	☐ Large-scale ☒ Small-scale
Version number of the PDD	16
Completion date of the PDD	16/12/2018
Project participants	Nepal • Alternative Energy Promotion Centre (AEPC) Sweden • Swedish Energy Agency Germany • Statkraft Markets GmbH Italy • Enel Global Trading S.p.A. Belgium Electrabel S.A.
Host Party	Nepal
Applied methodologies and standardized baselines	Category I. A. - Electricity Generation by the User (version 16)
Sectoral scopes linked to the applied methodologies	Energy industries (renewable-/non-renewable sources) (1)
Estimated amount of annual average GHG emission reductions	34,336 tCO_2e

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

This project deals with the development and installation of micro-hydro plants (MHPs) of different capacities with a cumulative capacity of 14.970 MW and is being promoted by the Alternative Energy Promotion Centre (AEPC) under the Ministry of Energy, Water Resources and Irrigation of Government of Nepal (GoN). The implementation of these micro-hydro plants is done by AEPC through different programmes and projects namely: Rural Energy Development Program (REDP), Mini-grid Support Program (MGSP) of Energy Sector Assistance Program (ESAP) and National Rural and Renewable Energy Programme (NRREP).

In Nepal, Micro-hydro has been defined as hydro power plants which have a capacity ranging from 5-500 kW. Micro hydro plant generates electricity by using the energy available from the falling water. Therefore the major parameters of a Micro-hydro are the availability of head drop and water flow at the site; and the size of the plant to be installed are determined accordingly.

The project expects to reduce greenhouse gas (GHG) emissions through the replacement of diesel fuel used for lighting and milling.

The project activities are targeted at poor communities across several regions of Nepal. This also supports the Government's objective of improving energy services in rural areas by developing a viable, market-oriented micro-hydro power system by offering support to both demand and supply sides.

The project provides subsidy as per the Subsidy Policy 2016[1] of Government of Nepal – which covers approximately 40% of the total investment for a plant. Aside from the financial subsidy, the project also provides technical training, market information and business development support services to the communities and Micro Hydro Projects (MHP) entrepreneurs. Along with the support to users, capacity building activities are also provided to MHP construction and supply companies.

There are three types of ownership related to Micro hydro plants promoted by AEPC; community ownership, institutional ownership and personal/private ownership. The most popular form is community based ownership wherein the plant is operated, managed and owned by the community; therefore AEPC provides an intensive community mobilization package aside from its technical support to induce sustainability of the plants. Institutional and private ownership lag far behind community ownership but is still being promoted by AEPC. In this type of ownership the plants are owned and managed by an institution or private entrepreneurs, they sell the electricity generated by the plant to the rural areas and generate revenue for themselves.

AEPC provides subsidy to the projects in instalments. Advance payments of 20 percent of the subsidy is made to the project developer on signing the contract against Advanced Payment Bank Guarantee (APBG). First instalments up to 50 percent disburses on delivery of 50 percent equipments to the site and completion of 50 percent works. Second Instalment: up to 80 percent of the contract amount on 80% completion of the work and all equipments delivered to the site. Third instalment: up to 90 percent of contract amount on completion of work and handover to the community. . Final instalment: 10 percent of the contract amount is released after power output test and household verification.

<u>**Contribution to Sustainable Development**</u>

Off- grid power generated by MHPs provide a large number of rural households with electricity and power for lighting, milling and other needs. Such off-grid renewable energy systems not only help in poverty alleviation but also have direct local environmental benefits such as:

- Reduction in diesel consumption by replacing use of diesel power with electric agro-processing mills and household lighting.
- Reduction in use of dry cells used to operate radio, and torchlight (Flashlights), leading to reduced chemical pollution of the local environment and also reducing the health hazard resulting from the exposure and contact with these chemicals.
- Reduction in pollution from Lead Acid Cell Battery, with proper electric supply households need not purchase a battery to supply electricity for lighting. Therefore charging practices will be eliminated

[1] https://www.aepc.gov.np/uploads/docs/2018-06-19_RE%20Subsidy%20Policy,%202073%20(English).pdf

hence eliminating the need for continuous transport of wet lead acid batteries from houses to charging stations.

Aside from environment benefit the MHP benefits other areas of the Sustainable Development Agenda such as:

- Plants constructed under the project are managed and operated by the community, institutions or private entrepreneurs leading to local empowerment.
- Adequate training for operation, repair and maintenance are provided to the people for the smooth operation of plant, which enhances the skill set of local people.
- Electrical end-use enterprises are supported to increase plant factor which leads to different opportunities for self employment at the local level.
- The market of MHP components flourishes due to a large number of installations increasing the number of local manufacturers, suppliers and installers whereby creating jobs for many and at the same time help to lower the cost of MHP components due to a competitive market mechanism.

A.2. Location of project activity

The project has covered all rural hilly areas in Nepal where national grid electricity has not reached and will not in the foreseeable future.

The micro hydro plants are located in rural communities of Nepal where it is feasible to install MHPs to generate electricity for community use. Details of the districts and villages where the plants are installed are provided as an attachment (Attachment-1A) to the bundle form (SSC-CDM-Bundle Version: 03, May 15, 2013).

MHP installations are scattered throughout the country mostly in rural hilly settlements which do not have access to grid electricity or no chance of extension of the national grid in the near future. AEPC keeps a record of the addresses of all the MHPs under its program for monitoring. AEPC has a database for identification of micro hydro plants under the Clean Development Mechanism (CDM) project. Since, the project sites are scattered across the country, the range of geographical coordinates of the country, i.e. 26^o N – 30^o N, 80^o E – 88^o E is provided as the reference for this bundled project activity. Individual MHPs can be uniquely identified by their specific locations such as the district, villages and wards, where they are located. Such details are provided as an attachment in the bundle form (SSC-CDM-Bundle Version: 03, May 15, 2013), and the locations of these MHPs are also shown in the map below.

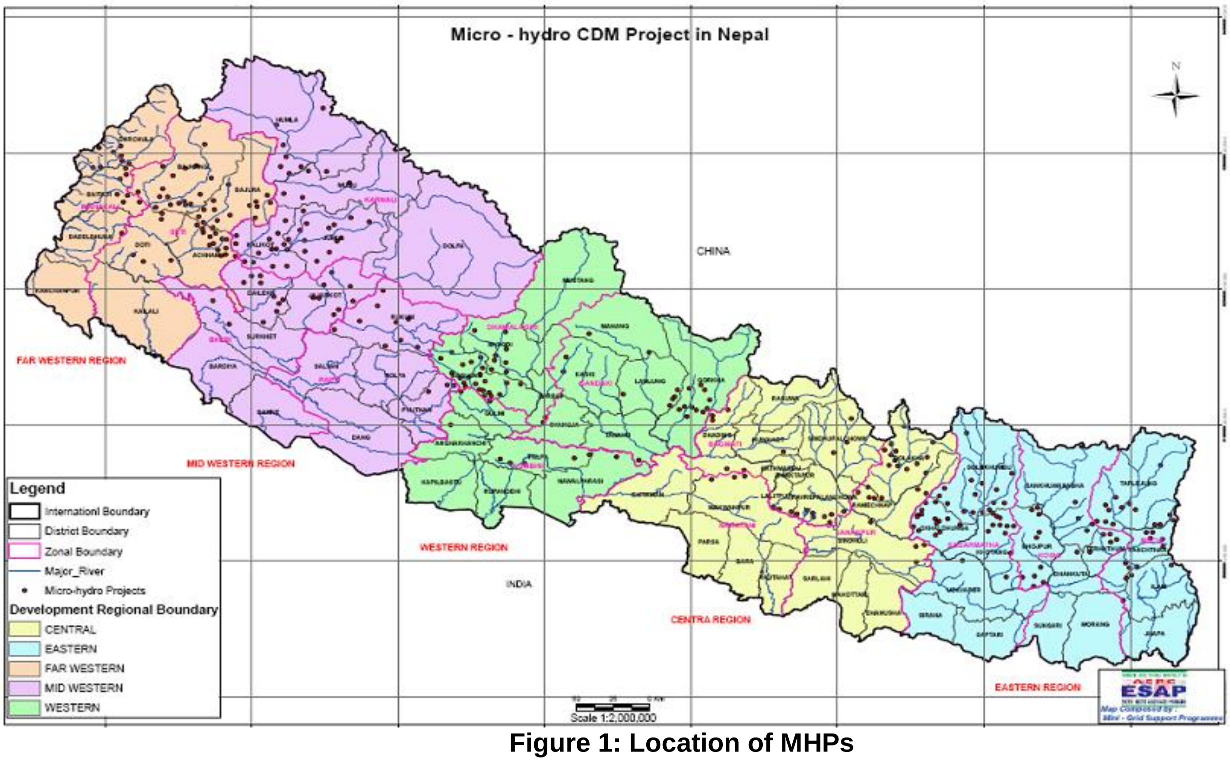


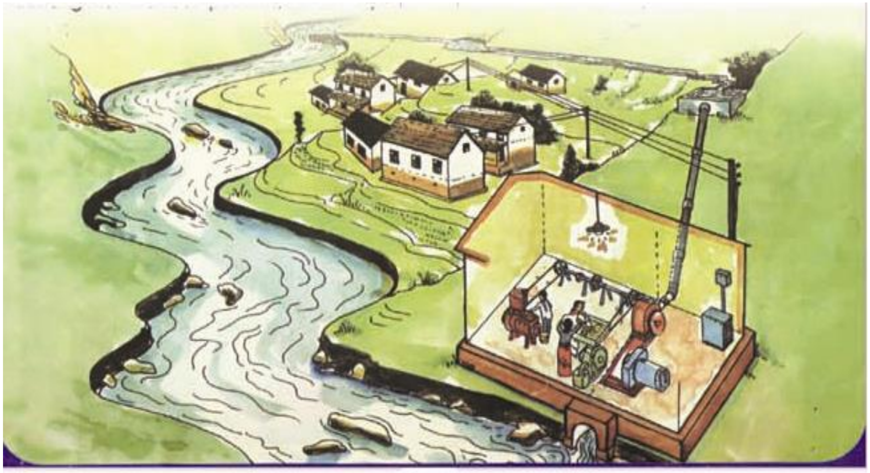
Figure 1: Location of MHPs

A.3. Technologies/measures

Micro hydro technology has been seen as a proven technology in Nepal for supplying electric power to the rural community where there is no access to the national grid. Due to the availability of water resources and the hilly terrain of the country Micro hydro plants have gained popularity as one of the best rural electrification technologies in Nepal

Micro-hydro power systems use potential energy stored in water to supply mechanical energy that can be used directly or be converted to electrical energy, through a generator, for use in lighting, refrigeration, milling or a number of other productive uses. The basic components of a micro-hydro system include:

- Inlet weir for diverting desired amount of water into the system,
- Inlet structure, where the diverted water enters the system,
- Headrace canal for carrying the water from the inlet to the different tanks which may either be the desilting tank and or the forebay tank
- Desilting tank if required is placed before the forebay tank and its main purpose is for the removing of fine grain contaminants in the water. This tank is incorporated with a flushing system so that the settled contaminant are periodically removed from the tank and system
- Forebay tank, this is the end point of the head race structure. The main purpose of this tank is to store enough water so that the there is always enough water flowing to the turbine when the plant is in operation. This tank also acts as a surge tank.
- Penstock to transport the water from forebay tank to turbine,
- Turbine to convert the Kinetic energy of the falling water into mechanical rotational energy,
- Alternator or a generator to convert the rotational mechanical energy to electrical energy
- Electronic Load Controller and ballast tanks inside the power house to control and regulate electricity supply and generation
- Transmission line to transfer power to load center (in most cases transformers are not used in a MHP but in case the settlement is very scattered then set up and set down transformers are used), and
- Tailrace where the water leaves the system and returns to the source or in some cases to irrigation canals.



Source: AEPC/ESAP documentations

Figure 2: Simple sketch of micro-hydro

Hydropower plants ranging between 5 to 500 kW are considered as micro-hydro plants that supply power to participating communities through an isolated mini-grid for the purpose of bundled small scale CDM activity. Micro-hydro plants also supply electrical power to agro-processing units that generally use diesel fuel for operation.

A.4. Parties and project participants

Parties involved	Project participants	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Nepal (host)	Alternative Energy Promotion Centre (AEPC), Nepal	No
Sweden	Swedish Energy Agency	No

Germany	Statkraft Markets GmbH	No
Italy	Enel Global Trading S.p.A.	No
Belgium	Electrabel S.A.	No

AEPC has received legal rights for transfer of ownership of certified emission reductions (CERs) and other relevant rights from the owners of installed MHP.

AEPC, the project proponent, is a government body under the Ministry of Energy, Water Resources and Irrigation (MoEWRI) and oversees the policy design and promotion of the national renewable energy sector. Contact information of the project participants is given in the bundle form.

A.5. Public funding of project activity

In addition to revenues from carbon finance, AEPC required grant funding to cover upfront subsidy to micro-hydro systems. The following parties have provided public funding for this activity:

- Government of Nepal
- United Nations Development Program (UNDP) through REDP
- The World Bank through REDP
- Danish Development Assistance (DANIDA)/ Norwegian Agency for Development Cooperation (NORAD) through ESAP

The above-mentioned donors do not lay any claim on the emissions reductions realized by AEPC in return for their public funding contributions to the project.

A.6. History of project activity

Micro-hydro promotion; a CDM Project Activity is neither a part of other registered project activity nor a CPA of any registered CDM PoA. This project activity is also not a project activity that has been deregistered. This project activity is neither a CPA excluded from any register PoA nor any similar project activities or CPA under any PoA exists in the same geographical location of this project activities. This project activity was registered on 18 October 2010 as a CDM project. The first crediting period of this project is successfully completed on 17 October 2017 and this PDD is prepared for the next crediting period.

A.7. Debundling

The proposed project activity is not a debundled component of a large project activity. According to Appendix C of the Simplified Modalities and Procedures for Small-Scale CDM Project Activities, a proposed small-scale project activity is considered a debundled component of a large scale project activity if there is a registered small-scale CDM project activity or an application to register another small-scale project activity:

- With the same project participants;
- In the same project category and technology/measure; and
- Registered within the previous 2 years; and
- whose project boundary is within 1 km of the project boundary of the proposed small-scale activity at the closest point

Since the above is not true for the proposed CDM project activity, it is not a debundled component of a large project activity.

SECTION B. Application of selected methodologies and standardized baselines

B.1. Reference to methodologies and standardized baselines

Category I. A. - Electricity Generation by the User (version 16)

See also: http://cdm.unfccc.int/methodologies/DB/8FKZFJ7SG551TS2C4MPK78G12LSTW3

B.2. Applicability of methodologies and standardized baselines

The project activity fits into TYPE I – RENEWABLE ENERGY PROJECTS, *Category I.A. Electricity generation by the user.*

According to Appendix B of the Simplified Modalities and Procedures for Small-Scale CDM Project Activities, Category I. A. Electricity generation by the user comprises renewable energy generation units that supply individual households or users or groups of households with electricity. The applicability is limited to households and users that do not have a grid connection, except when a group of households or users are supplied electricity through an isolated mini-grid[2] where the capacity of the generating units does not exceed 15 MW. These units include technologies such as solar power, hydropower, wind power, and other technologies that produce electricity all of which is used on-site by the user, e.g. solar home systems, and wind battery chargers. The renewable generating units may be new or replace existing fossil fuel fired generation. The capacity of these renewable energy generators shall not exceed 15 MW.

The proposed project activity involves hydropower technology to produce electricity (renewable energy) for supply to households and other electrical end-use enterprises. Use of the generated electricity replaces fossil fuels such as diesel used in rural areas of Nepal for lighting and agro-processing needs. The electricity generated by the micro hydro plants is used by households and users that do not have grid connection. The capacities of the individual micro hydro plants are well below 15 MW, and the aggregated capacity of the bundle is also below 15 MW capacity.

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Thus the choice of project category I.A is justified. Accordingly the small scale methodology AMS I.A. Version 16 is used in this PDD.

B.3. Project boundary, sources and greenhouse gases (GHGs)

According to the project category I.A. Electricity generation by the user selected for the proposed project activity, the project boundary is the physical site of each MHP. The geographic project boundary selected for the project activity is the political boundary of Nepal where there is no access to the national grid.

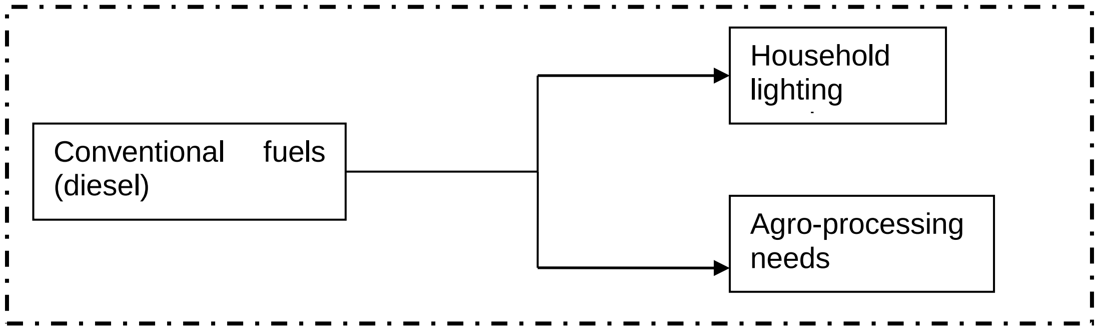

Figure 3: Baseline emissions project boundary

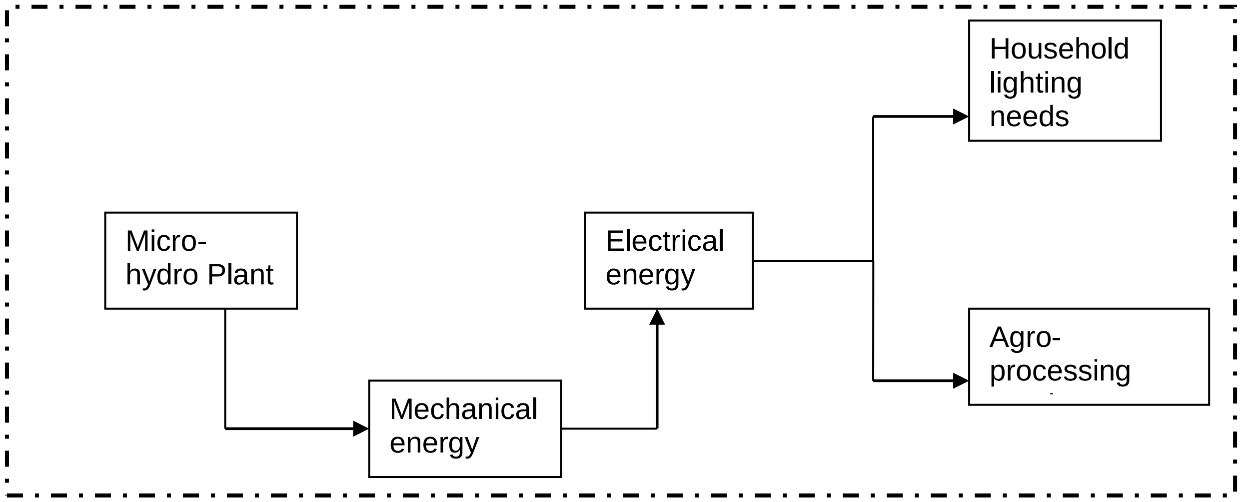

Figure 4: Project boundary

[2] Not connected to the regional or national grids and not exporting and/or importing power from the national/regional grids

The project activity includes the following sources and gases:

Source		GHG	Included?	Justification/Explanation
Baseline	Emission from the use of diesel for lighting and agro-processing	CO_2	Yes	Main Emission Source
		CH_4	No	Excluded for simplification. This is conservative.
		N_2O	No	Excluded for simplification. This is conservative.
Project activity	Emission from electricity generation from hydro	CO_2	No	Not applicable for micro-hydro (not required by AMS I.A
		CH_4	No	Not applicable for micro-hydro (not required by AMS I.A
		N_2O	No	Not applicable for micro-hydro (not required by AMS I.A

B.4. Establishment and description of baseline scenario

Assessment as per the tool 'Assessment of the validity of the original/ current baseline and update of the baseline at the renewal of a crediting period", Version 3.0.1':

Step 1: Assess the validity of the current baseline for the next crediting period

Step 1.1: Assess compliance of the current baseline with relevant mandatory national and/or sectoral policies

Access to affordable and clean energy services remains a concern for Nepal. The Government of Nepal (GoN) and Development Partners (DPs) have supported the renewable energy (RE) sector in Nepal since the 1990s. The government has formulated "National Renewable Energy Framework"[3] in 2017 which aims to continue the integrated approach and coordinate the activities in the sector across all stakeholders. Despite strong policies and delivery achievements, the National Renewable Energy Framework reveals that around 25% of Nepal's population still does not have access to electricity. Nepal is dependent on the import of fossil fuel as it does not have any fossil fuel reserves. So, the government of Nepal has implemented the Renewable Energy Subsidy Policy 2016[4] with the objective to reduce dependence on traditional and imported energy by increasing access to renewable energy for improving the livelihoods of people and create employment opportunities especially in the rural areas. The policy also says that about 18% of the household have the reach to the electricity through renewable energy sources like mini/micro-hydro power and solar energy in Nepal. The remaining (about 57%) has the access to national grid.

Basically, the Mini/Micro-hydros are promoted in the rural areas of Nepal having no access to the national grid. The subsidy policy-2016 has the provision to provide the subsidy to mini/micro hydropower with capacity less than 1000 kW in areas without national grid access. Additionally, The policy has also the provision to provide the equipment subsidy for the productive energy use for the agro-processing from mini/micro-hydro to replace the use of fossil fuel, especially diesel for electricity generation to run productive end uses. So, the current baseline is continued for this crediting period also. If the grid is expanded in the mini/micro hydro area with the possibility of the power supply from the grid, those MHPs will not be counted while calculating the energy baseline.

Step 1.2: Assess the impact of circumstances

The areas where the micro hydro plants are located are still not connected with national grid and therefore, there is no change in the circumstances that would impact the continuation of depending on fossil (diesel) based power generation system in the baseline scenario.

Step 1.3: Assess whether the continuation of use of current baseline equipment(s) or an investment is the most likely scenario for the crediting period for which renewal is requested.

Micro hydro plant has a technical life of minimum 15 years. The first MHP commissioned under the project was on 15/05/2007 and subsequently rest of the MHPs got commissioned in the project. Therefore, most of the MHPs has technical life to operate until the end date of the second crediting period. The MHP which will end its 15 years of technical life shall be taken for renovation to further operate, however conservatively shall not be taken in accounting emission reductions. Therefore, there is no investment needed during the second crediting period and therefore, the identified baseline still valid without any investment.

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[3] https://www.aepc.gov.np/uploads/docs/2018-08-08_National%20RE%20Framework%20_v14_approved%20by%20AEPDB.pdf

[4] https://www.aepc.gov.np/uploads/docs/2018-06-19_RE%20Subsidy%20Policy,%202073%20(English).pdf

Step 1.4: Assessment of the validity of the data and parameter

The only parameter/value which is updated is the default average electricity consumption per household in a month from the registered PDD as explained below:

Parameter/requirement	Existing value in PDD	Updated value	Justification
As a fall back option (to deal with situations where energy meters are either not installed, lately installed, meters not functioning or if the log books are not maintained properly), the energy generation data shall be determined using the following approach, which is in line with the methodology requirements. Energy consumption by the household connected to the functioning MHP schemes shall be determined by multiplying the number of users (households) connected to the functioning MHP schemes with a conservative electricity consumption factor (kWh/month/HH), applicable to rural households in Nepal and adjusted for technical distribution losses of 10%.	27 kWh/HH/month	22.53 kWh/HH/month	The average electricity consumption per month in similar nine micro-hydro power in rural areas of Nepal was estimated by the World Bank as 95,418 kWh[5] for domestic use and 24,433 kWh [6] with total 5301 household served. Based on this data, the electricity consumption per household per month can be estimated as 22.6 kWh. Similarly, AEPC has estimated the electricity consumption based on the data available and verified for "Micro-hydro Promotion (UNFCCC Ref: 3653)". The energy consumption estimated for 7 years (from 2010 to 2016) shows that average electricity consumed by a household (lighting and agro-processing) is 22.53 kWh[7]. Considering the above mentioned sources, a conservative monthly consumption value of 22.53 kWh per household per months has been used for ex-ante estimation of baseline emissions

Outcome: the justification in step 1 demonstrates that the current baseline scenario for electricity generation is still valid for subsequent crediting period. Therefore, all relevant data and parameters can be used for the renewed crediting period.

Step 2: Update the current baseline and the data and parameters

As per the outcome of step 1, this step is not applicable as the current baseline is still valid.

Compliance of methodology requirements:

According to the methodology AMS I.A Version 16, the energy baseline is the fuel consumption of the technology in use or that would have been used in the absence of the project activity to generate equivalent quantity of energy. The methodology provides three different options to estimate the energy baseline. Out of the three options, Option-2 is most suitable for the project as there are provisions to monitor the power outputs of the individual MHPs included in the project. Therefore, Option-2 has been selected for the purpose of estimating the energy baseline.

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[5] Table 14 of "World Bank Group; Mini and Micro Hydropower Applications":

http://documents.worldbank.org/curated/en/650931468288599171/pdf/96844-REVISED-v1-Micro-Hydro-Report-0625-2015-Final.pdf

[6] ibid

[7] AEPC, 2018: Energy Consumption Analysis of Nepal Village Micro-hydro Project".

Energy Baseline

Option-2 estimates the energy baseline in the following manner.

$E_{BL,y} = \Sigma_i EG_{i,y} /(1 - l)$

Where
$E_{BL,y}$ = Annual energy baseline; kWh/y
Σ_i **=** The sum over the group of i renewable energy technologies (e.g. renewable energy technologies for solar home systems, solar pumps) implemented as part of the project activity
$EG_{i,y}$ = The estimated annual output of the renewable energy technologies of the group of *i* renewable energy technologies installed; kWh/y
l = Average technical distribution losses that would have been observed in diesel powered mini-grids installed by public programs or distribution companies in isolated areas, expressed as a fraction

For the proposed project activity,

$EG_{i,y}$ is taken as the estimated annual energy output of the micro-hydropower plants (in kWh) obtained from the annual meter reading of each MHP.

The average electricity consumption per month in similar nine micro-hydro power in rural areas of Nepal was estimated by the World Bank as 95,418 kWh[8] for domestic use and 24,433 kWh[9] with total 5301 household served. Based on this data, the electricity consumption per household per month can be estimated as 22.6 kWh. Similarly, AEPC has estimated the electricity consumption based on the data available and verified for "Micro-hydro Promotion (UNFCCC Ref: 3653)". The energy consumption estimated for 7 years (from 2010 to 2016) shows that average electricity consumed by a household (lighting and agro-processing) is 22.53 kWh[10].

Considering the above mentioned sources, a conservative monthly consumption value of 22.53 kWh per household per months has been used for ex-ante estimation of baseline emissions.

Average technical distribution losses (l), is taken as 10% for calculations since this is the average limit for losses in diesel plants, hydro power plants and micro-hydro power plant as well.

Emission baseline

The emissions baseline is the energy baseline calculated as described above times a default emission factor.

$BE_{CO2,y} = E_{BL,y} * EF_{CO2}$

Where:

$BE_{CO2,y}$ = Emissions in the baseline in year y ; tCO_2
$E_{BL,y}$ = Annual energy baseline in year y; MWh
EF_{CO2} = CO_2 emission factor; tCO_2/MWh

As per the guidance provided in the methodology AMS I.A. Version 16, for EF_{CO2}, a default value of 0.8 kg CO_2-e/kWh, which is derived from diesel generation, is used.

[8] Table 14 of "World Bank Group; Mini and Micro Hydropower Applications":

http://documents.worldbank.org/curated/en/650931468288599171/pdf/96844-REVISED-v1-Micro-Hydro-Report-0625-2015-Final.pdf

[9] ibid

[10] AEPC, 2018: Energy Consumption Analysis of Nepal Village Micro-hydro Project".

B.5. Demonstration of additionality

There are accesses to finance and technology related barriers to the proposed project activity which otherwise present obstacles to the development of such projects. This project reduces emissions beyond those that would have occurred had it not considered carbon finance; these barriers and how they are overcome are explained below.

a) Access to Finance Barrier:

The proposed project activity faces access to finance barriers at two levels (at plant level and at the program level) that hinder the promotion and installation of MHPs that can lead to reduced emissions.

Access to finance barrier at the level of individual plant:

The proposed micro hydro activity is demand driven with communities making the final decision on whether or not to invest in a Micro Hydro Scheme. The construction of a MHP requires a considerable amount of upfront capital and investment in addition to the subsidy provision from the Government of Nepal. The high upfront investment cost of a MHP is thus a barrier for the adoption of the MHP technology by rural communities in the country. Consequently, the communities have to, in addition to their cash and in-kind contribution, raise money through commercial loans from the local banks, the magnitude of which differ across the MHP schemes, depending upon the sizes of the schemes and paying capacities of the communities. Size of MHPs range from 5-500 kW however most common plant size in practice is 15 and 30 kW. Each kW of installed micro-hydro capacity can serve at most 10 households. The installation cost per kW of MHP ranges from US$ 1,900 to US$3,521 depending on the size of the plant, geographic remoteness and specific characteristics of the plant & its design. The government subsidy at $141 per household but not exceeding $1,197/kW covers 35% to 55% of the installation cost and the community has to invest the remaining amount. An additional transport subsidy of upto $423/kW is provided to very remote locations to cover the high transport cost of MHPs parts during construction period. In addition, the annual project operation and maintenance costs are estimated to be 3% of the total capital cost. Communities therefore have to manage the remaining 45% to 65% of the installation cost through their own contribution and/or through loans from banks/financial institutions.

The substantial upfront capital requirement puts heavy burden on the communities. Low purchasing power and lack of availability of easy credits in rural areas have been well documented to be the main barriers that have limited rural communities' access to modern energy services in Nepal. Commercial banks, though mandated by the Government to extend services to rural areas, have generally restricted operations to district head quarters. The risk of financing small scale renewable energy projects is perceived to be very high by the banks. The administrative costs are considered high and the repayment rates are considered poor. The communities' access to finance is thus very limited in the rural areas. (Source: "Energy and Poverty in Nepal – Challenges and the Way Forward" by United Nations Development Programme[11]. Refer to Box 3 in page 7 and Box 6 in page 11 of the above reference).

Before communities start investing in micro-hydro projects, a substantial community mobilization effort is necessary to generate solidarity of the communities. If this community mobilization cost were to be borne by the community, it would be more difficult for the community to install micro-hydro plants.

Barrier at the Program level: AEPC has been promoting micro-hydro technology in order to increase the access of rural communities in Nepal to distributed forms of renewable energy. The proposed CDM activity aims to expand micro-hydro installations nation-wide up to a maximum capacity of 14.970 MW with the integration of CDM revenues.

The implementation of the proposed activity required a considerable amount of upfront capital for which a basket funding approach has been adopted. In order to install 14.970 MW by 2013, the AEPC MHP program will require total funds of $59.344 million. This includes the costs of management of the AEPC program, grant subsidies to communities to buy down capital cost, and investments in plants made by users, local government entities (District Development Committee (DDC), and Village Development Committee (VDC)) and financing institutions.

Table B.3.2: Project costs and source of financing

Project Cost	In US$ million	Status of Commitment
Development cost (subsidy, technical assistance)	28.609	

[11] http://regionalcentrebangkok.undp.or.th/practices/energy_env/rep-por/documents/GAP_Reports/Nepal.pdf

Installed costs (plant investment, etc)	26.933	
Other costs (contingency)	3.801	
Total	**59.344**	
Project Financing		
The World Bank UNDP Government of Nepal DANIDA & NORAD	5.513 1.573 2.265 14.314	Committed
World Bank additional funding till 2009 UNDP for REDP III after 2006	4.000 2.000	This is an approximate figure. On the final stage of conformation
Farmers DDC VDC	25.057 0.938 0.938	
Total	**56.598**	Committed plus final stage of conformation
Gap (Project cost minus total financing)	2.746	
Carbon Financing	2.245	Approximate figure

Subsidy to users totals $20.619 million, which equals $1,383 per kW of installations on an average. Without subsidies, users would not be able to afford the MHP installations. Plant investment contributed by farmers through their labor and in kind contribution, loans from banks; and interest-free equity investment from DDCs and VDCs amount to $26.933 million. The rest of approximately $11.792 million is AEPC's operational expenses for managing and monitoring the program.

Through the basket funding approach, the World Bank and UNDP have contributed a total of US $7.086 million through REDP of the AEPC MHP program. GoN has confirmed a contribution of $2.265 million. DANIDA and NORAD are together providing an additional contribution of US$14.314 million through ESAP. In addition to these additional funding of US$ 4 million from World Bank and US$ 2 million from UNDP for REDP is expected and the negotiation is in the final stage. Financing gap of US$ 2.746 still remains for the proposed activity.

At prices of approximately $9 per tCO2eq, CDM is expected to bring total carbon revenues of approximately $2.245 million in the first crediting period of 7 years; this will fill a majority portion of the financing gap (approx. 93% of the financing gap).

The development of the program under the CDM would contribute to the program sustainability by fulfilling the financing gap for developing and installing 14.970 MW of micro-hydro projects providing electricity to about 146,500 rural household and enhance the overall quality of the sector. All the donors have recognized the CDM potential of this project and have considered providing grants to cover the unfilled gap if the project is approved by the CDM Board.

b) Technology barrier:

Although micro-hydro technology was introduced in Nepal in the early '60's, it still remains a non-commercial activity. During the period of 1960 and 1990 only few schemes were built and those that were built were built with full aid of foreign agencies and to some extent from loans from the Agricultural Development Bank.

To better support the successful installation of MHPs, communities will have to have a strong monitoring, repair and maintenance mechanism, vital for the uninterrupted operation of the micro-hydro schemes throughout its life. This aspect of technology promotion was absent during the technology transfer. The plants were handed over to the community without proper training to the operator and there wasn't any accountability from the installer once the site had been electrified. Therefore due to these aspects the MHP built in this time generally had a life of three to five years, where in a small defect or a minor maintenance problem could shut down the plant.

Due to this unreliability of rural electrification, the communities were not motivated towards installing MHPs, they were content with using traditional means of lighting (kerosene lamps) and milling (mechanical milling).

From the 1990s, the government saw the need of rural electrification with a sustainable approach and at the same time different programs started supporting the installation of micro hydro schemes as well. Unlike before the major thrust of the programs were not to only build and install MHPs but to make it sustainable both technically and financially, for this different programs used different methods.

Among the different programs dealing with MHPs, REDP, ESAP and NRREP were two major programs for the sectoral development under AEPC. REDP adopted a successful decentralized approach, whereas ESAP adopted a successful sector approach, both of which include outreach and awareness programs, quality control, subsidy, etc.

Among the different programs dealing with MHPs, REDP and ESAP are two major programs for the sectoral development under AEPC. REDP has adopted a successful decentralized approach, whereas ESAP has adopted a successful sector approach, both of which include outreach and awareness programs, quality control, subsidy, etc.

The present project activity has a strong quality control and assurance framework whereby only high quality products are delivered to investing communities. Since rural communities cannot discern the quality of the technology on their own, AEPC undertakes technical reviews of all plants to be constructed before approving them for subsidy and will also allow only pre-qualified companies to undertake design, manufacture, installation and supply of the MHP in the villages. Aside for technical assurance AEPC within its programs provides technical trainings to the operators and managers of the MHP.

Also, with the support of CDM, community will get technical support for operation of its MHP for the whole duration of the crediting period. Previously, the plants were only getting support for one year after installation. Thereby, adding weight to the sustainability aspect of the system.

In the face of the investment and technological barriers described above, communities would likely continue using traditional lighting and milling technology if it were not for the CDM project activity.

The Project sponsors have considered CDM early in the process of project development. The process started in early 2003. Involvement of the World Bank in preparing the project as a CDM project dates back to November 6, 2003.

Some of the important milestones of the project are summarized below.

•November 6, 2003: Micro-hydro promotion and Biogas sector are identified as two important GHG mitigation programs by Govt. of Nepal.
•January 28, 2004: Govt. of Nepal seeks official cooperation from the World Bank to develop Micro hydro as a CDM project
•2004-2005: Extensive Project preparation activities with carbon credits as an important element
•August 4, 2006: Letter of Intent signed between the World Bank and the Govt. of Nepal for Sale and Purchase of Emission Reductions from Micro-hydro project
•December 2006: Start of Validation, PDD webhosted
•March 2007: Letter of Approval received from the DNA in Nepal
•March 15, 2007 : Financial Commitments to ESAP confirmed
•June 30, 2007: Emission Reduction Purchase Agreement signed between the World Bank and the Govt. of Nepal
•July, 2007: LoA received from the Annex-I Country
•August 10,2007: Financial Commitments to REDP confirmed
•December 11, 2007: ODA non-diversion letter from Denmark
•May 14,2008: ODA non-diversion letter received from Norway
•May 17, 2008: Second webhosting of the PDD

B.6. Estimation of emission reductions

B.6.1. Explanation of methodological choices

As the MHPs produce electricity from renewable sources with zero emissions and there are no leakages to be considered as per the methodology, the emission reductions are virtually the same as the baseline emissions, which is calculated by multiplying the energy baseline with the emission factor of the fuel used in the baseline, as explained in section B.4 of the PDD.

B.6.2. Data and parameters fixed ex ante

Data/Parameter	Default emission factor
Data unit	tCO_2eq/MWh
Description	Emission factor for a MWh electricity generated by diesel generator
Source of data	IPCC default emission factor
Value(s) applied	0.8
Choice of data or measurement methods and procedures	IPCC default value mentioned in the small scale methodology I. A.
Purpose of data	To calculate baseline emission
Additional comment	The emission factor is fixed ex-ante

B.6.3. Ex ante calculation of emission reductions

The formula, following paragraph 8 (b) of AMS 1.A Version 16, has been used to calculate energy baseline. The calculation of GHG emissions reduction has been presented below.

$E_{BL,y} = \Sigma_i EG_{i,y} / (1-l)$

Where
$E_{BL,y}$ = Annual energy baseline in kWh per year
Σ_i **=** the sum over the group of "i" renewable energy technologies (e.g. renewable energy technologies for solar home systems, solar pumps) implemented as part of the project activity
$EG_{i,y}$ = Annual output of the renewable energy technologies of the group of "i" renewable energy technologies installed (in kWh per year)
l = average technical distribution losses that would have been observed in diesel powered mini-grids installed by public programs or distribution companies in isolated areas, expressed as a fraction

For the purpose of ex-ante estimations, the energy baseline is calculated from the data on capacity addition plans for the MHPs in the following manner.

- The data on annual capacity addition of MHPs (no. of plants and aggregated capacity), and the number of Households connected to the total capacity added is compiled.
- Electricity consumed in a particular year is estimated by multiplying the number of households (HHs) with the empirical electricity consumption data (22.53 kWh/month/HH), as explained in section B.4.
- The energy baseline is then calculated by adjusting for transmission loss as per the formulae presented above using a value of 0.1 for l.
- Finally an emission coefficient of 0.8 kg CO_2/kWh is used (fixed ex-ante) to calculate the baseline emissions, and the emission reductions. (Please refer to the ER calculation Excel Sheet provided along with the submission)

The above steps have been followed for the purpose of ex-ante estimations of emission reductions only.

In reality, the total CO_2 reductions shall be calculated from the annual energy supply of the micro-hydro systems and multiplying by a CO_2 emission co-efficient. A default value of 0.8 kg CO_2eq/kWh has been assumed (fixed ex-ante) for calculations. Based on the monitoring figures, the annual baseline emissions and emission reduction shall be calculated as shown below:

Baseline Emissions (tCO_2/yr) = E_B (kWh) * 0.8 kg CO_2eq/kWh * 1/1000

B.6.4. Summary of ex ante estimates of emission reductions

Year	**Baseline emissions (t CO_2e)**	**Project emissions (t CO_2e)**	**Leakage (t CO_2e)**	**Emission reductions (t CO_2e)**
Year 1	32213	0	0	32213
Year 2	34691	0	0	34691
Year 3	34691	0	0	34691
Year 4	34691	0	0	34691

Year 5	34691	0	0	34691
Year 6	34691	0	0	34691
Year 7	34691	0	0	34691
Total	240397	0	0	240397
Total number of crediting years	7			
Annual average over the crediting period	34,336	0	0	34336

B.7. Monitoring plan

B.7.1. Data and parameters to be monitored

Data/Parameter	**EGy**
Data unit	kWh
Description	Quantity of energy supplied by the project to users
Source of data	Given the dispersed nature of the project activity, the inaccessible terrain, and the low capacity of the remotely located communities, following cost effective and practical approaches have been proposed to monitor the energy generation data from the micro hydro plants. Electricity meters installed in the plants would serve as the main source of data. The data would be recorded either in the Meter reading logbook by the operators or in the Centralized Data Center using Remote Meter Reading Systems wherever installed. As a fall back option (to deal with situations where energy meters are either not installed, lately installed, meters not functioning or if the log books are not maintained properly), the energy generation data shall be determined using the following approach, which is in line with the methodology requirements. Energy consumption by the HHs connected to the functioning MHP schemes shall be determined by multiplying the number of users (households) connected to the functioning MHP schemes with a conservative electricity consumption factor of 22.53 kWh/month/HH, applicable to rural households in Nepal as mentioned in the PDD and adjusted for technical distribution losses of 10%. The operation of the MHPs throughout the monitoring period in the fall back option will be checked in MHP operator's logbook and cross-checked in MHP user's committee records. The number of households connected to the functioning MHP schemes shall be taken from the commissioning reports and cross-checked in MHP user's committee records.
Value(s) applied	To be monitored
Measurement methods and procedures	The best way to monitor electricity supply is through the energy meters. However, installing energy meters in all the plants is a costly provision because of which the original design of the MHPs did not have provision for energy meters. Further considering low education level of the operators, meter reading data may not be recorded regularly. In order to meet the requirements of the CDM, project entity has subsequently decided to install energy meters at all MHPs and has plans to implement remote meter reading arrangements. However, in rare cases, if meters are not installed, fall back procedures have been proposed to determine electricity supply, which are in line with guidance provided in the methodology.
Monitoring frequency	Electricity meter, where ever installed, would monitor electricity generation continuously. This data will be recorded either in the Meter reading logbook by the operator on a daily basis or in the Centralized Data Center using Remote Meter Reading Systems wherever installed, from where daily data can be compiled.

QA/QC procedures	The following QA/QC procedures will be implemented once the energy meters are installed: 1. A work plan will be drawn up so that all the meters in all the plants are checked and recalibrated as specified by the supplier/manufacturer of the meters. 2. At least 10% of the plants installed in each province will be visited by province office officers or Regional Technical Service Provider (RTSP) representatives at least once a year, on a rotational basis, mainly to improve documentation and disseminate good practices. 3. If the meter malfunctions or stops working for some period (which will be recorded in a daily log book), in addition to the fall back procedures mentioned above, the following option may also be considered for determining the energy generation during the meter non operational/malfunction period: a. Electricity generation calculated (on pro-rata basis) using the average electricity generation of 60 days (30 days prior and 30 days after the non operational/malfunction period) Non compliance of frequency of calibration, if observed, will be addressed following the EB guidelines on the same.
Purpose of data	Used for calculation of baseline emission
Additional comment	NA

Data/Parameter	i
Unit	Name and Capacity in kW
Description	Annual capacity addition of MHPs (no. of plants and their aggregated capacity)
Source of data	AEPC Database which is updated continuously as and when plant commissioning reports are received.
Value(s) applied	450 plants with an aggregated capacity 14,970 MW
Measurement methods and procedures	Technical information of the MHPs are recorded in the Plant Commissioning Reports (Power Output Test).
Monitoring frequency	Continuous
QA/QC procedures	The name plate, capacity rating of these units can be cross checked with supplier records, wherever available.
Purpose of data	For calculation of baseline emissions
Additional comment	The exact name, capacity and location of the MHPs may partly vary as outlined in the Form for Submission of Bundled Small Scale Project Activities due to actual implementation circumstances. The total installed capacity of the project will be below 15.00 MW.

B.7.2. Sampling plan

Energy consumption monitoring of all MHPs will be done to estimate the energy supplied from the MHPs to calculate the baseline emission reduction. Monitoring will be done through province offices, RTSPs or other applicable agencies hired for the particular purpose.

B.7.3. Other elements of monitoring plan

Metering all micro-hydro systems – Energy Meter installed in a micro-hydro will be the main source to monitor the electricity generated. This data will be recorded either in the Meter reading logbook by the operator or in the centralized Data Center using Remote Meter Reading Systems wherever installed.

- Wherever data is recorded in the log book, the user committee of the MHP will set up a procedure to record and maintain a log wherein the daily kWh readings are maintained. Data on generation of electricity will be reported on a monthly basis. For a more systematic approach to the data keeping and logbook keeping AEPC shall make a log book and distribute it to all the MHP, it shall also provide training to the operators of the MHP for proper method of maintaining the log book and meter reading.

- Wherever data is recorded in the centralized data center using remote meter reading systems, the data will be stored electronically in the computer.
- As a fall back option (to deal with situations where energy meters are either not installed, lately installed, meters not functioning or if the log books are not maintained properly), the energy generation data shall be determined using the following approach, which is in line with the methodology requirements :

  Energy consumption by the HHs connected to the functioning MHP schemes shall be determined by multiplying the number of users (households) connected to the functioning MHP schemes with a conservative electricity consumption factor of 22.53 kWh/month/HH, applicable to rural households in Nepal as mentioned in the PDD and adjusted for technical distribution losses of 10%. The operation of the MHPs throughout the monitoring period in the fall back option will be checked in MHP operator's logbook and cross-checked in MHP user's committee records. The number of households connected to the functioning MHP schemes shall be taken from the commissioning reports and cross-checked in MHP user's committee records.
- If the meter malfunctions or stops working for some period (which will be recorded in a daily log book), in addition to the fall back procedures mentioned above, the following option may also be considered for determining the energy generation during the meter non-operational/malfunction period:
  - Electricity generation calculated (on pro-rata basis) using the average electricity generation of 60 days (30 days prior and 30 days after the non-operational/malfunction period)

Monitoring of the performance of the system -
<u>I. A. Electricity Generation by the User version 16 states that the monitoring should include:</u>

"An annual check of all systems or a sample thereof to ensure that they are still operating (other evidence of continuing operation, such as on-going rental/lease payments could be a substitute).

OR

Metering the electricity generated by all systems or in a sample thereof."

Looking at the nature of the technology, its use, and other local conditions/practices, *the second option of metering the electricity generated has been proposed for all micro-hydro systems to be installed under the project activity.* Detailed justification of the choice of the approved methodology, taking into account the existing national monitoring methodology has been presented below.

Project Implementation:
AEPC is responsible for ensuring the overall implementation of the proposed project activity. Under the supervision of the Technical Review Committee, AEPC will ensure the management and operation of the MHPs installed as part of the proposed project activity.

Execution of Monitoring Plan
AEPC carry out the above-mentioned monitoring of quality control and quality assurance procedures through different programmes and projects implemented under AEPC (eg. ESAP, REDP, NRREP).

Organizational Structure of Micro-Hydro Implementation
The figure below illustrates the management structure for REDP and ESAP under AEPC for the dissemination of the MHPs targeted for the proposed project activity.

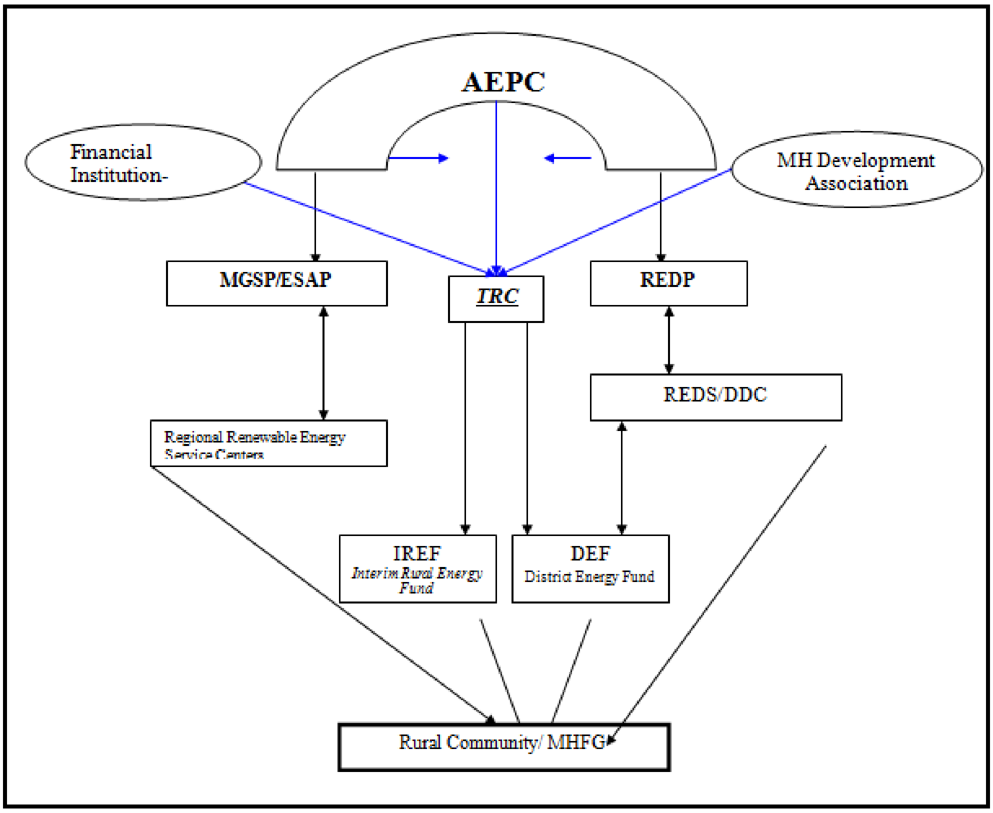

Figure 5: Management Structure of ESAP and REDP under AEPC

AEPC: AEPC is the apex body for the implementation of Micro-hydro. As a government entity it is responsible for the overall planning, implementation and monitoring of the Renewable Energy technologies (RETs) sector in the country. In the case of Micro hydro, AEPC had two major programs under its wings for the implementation of micro-hydro in the country; they were REDP and MGSP-ESAP.

REDP: REDP was a program funded by UNDP and World Bank for the implementation of micro-hydro to enhance the livelihood of rural communities. REDP was working in 40 remote hilly districts of the country. The main thrust of REDP program was to support community owned Micro-hydro schemes and bring about a holistic change within the community.

Mini Grid Support Program (MGSP)/ESAP: MGSP had no restriction for its support, as it supported micro-hydro plant throughout the country. Unlike REDP, ESAP had also assisted private entrepreneurs to set up a micro-hydro along with community owned plants.

TRC: The Technical Review Committee (TRC) is the formal quality control for design and is based within AEPC. The members of the TRC consists of people from AEPC, related programmes under AEPC . Aside from in house members there are members from the financial institutions providing loans to micro-hydro and a member from the Micro-hydro Development Association, which is an association of manufacturers pre-qualified by AEPC to fabricate and install micro-hydro plant.

It is the responsibility of the TRC to check the technical, socio-economic, environmental and financial portion of the Detail Project report submitted for implementation. The TRC has the authority to either approve or disapprove any schemes that does not match or conform to the standards laid out by the Micro-Hydro Design Guideline and the Micro hydro Quality Standards. If the scheme is approved then the TRC sends a formal letter to release the subsidy to respective funds (eg. REF, DEF, CREF).

Sales registration - Micro-hydro installed by pre-qualified companies bundled in this project activities become eligible as soon as they are registered in the AEPC database after receiving the power output test report or official information from the respective agencies.

SECTION C. Start date, crediting period type and duration

C.1. Start date of project activity

15/03/2007 (The date on which financial commitments were confirmed) as per the registered PDD

C.2. Expected operational lifetime of project activity

The operational lifetime of the MHPs is 15 years. After the operational life time is over, the MHPs will be re-habilitated/renovated by replacing the parts and equipments. If there is delay in renovation/rehabilitation, the particular MHPs will not be considered for the emission reduction calculation after the lifetime is over.

C.3. Crediting period of project activity

C.3.1. Type of crediting period

Renewable

C.3.2. Start date of crediting period

The project activity was registered on 18 October 2010 and the first crediting period is ended on 17 October 2017. The crediting period start date for the second crediting period is 18 October 2017.

C.3.3. Duration of crediting period

7 years

SECTION D. Environmental impacts

D.1. Analysis of environmental impacts

The penetration of micro-hydro power reduces the consumption of diesel for household lighting and milling, and dry-cell batteries at the household level. This reduces GHG emissions and improves air quality indoors and reduces health and odour problems associated with indoor air pollution.

AEPC has recognized the importance of Environmental Assessment to identify possible impacts due to the implementation of micro-hydro and recommend appropriate mitigation measures to make the project more sustainable and improve the environment of the surroundings. Under REDP, an Environmental Assessment (EA) was undertaken for all micro hydro projects that were proposed for implementation in its program areas. For this purpose, AEPC/REDP developed Environment Assessment Guidelines for MH Schemes. An assessment of the Environment and Social Safeguard was done by AEPC in 2014 for Nepal Village Micro-hydro Project (Micro-hydro Promotion) and it was also found that there is no significant negative impact on environment and social aspects by this project activities.

D.2. Environmental impact assessment

According to the National Environment Protection Act and Rule, Initial Environmental Examination is required for Hydro projects ranging from 1 to 6 MW and Environmental Impact Assessment is required for all Hydro projects larger than 6 MW. The Act and the Rule do not have any provision for environment assessment for Hydropower projects less than 1 MW, which includes micro-hydro.

SECTION E. Local stakeholder consultation

E.1. Modalities for local stakeholder consultation

AEPC conducts regular users' survey, field visits, and training by which comments by local stakeholders have been invited and compiled. Aside from this AEPC in coordination with the Designated National Authority (DNA) also organized a Stakeholders consultation meeting at the DNA on 23 February 2007 to get comments from the various stakeholders in the Micro-hydro field as well as Rural Energy field. Also two consultative meeting were conducted to receive the comment and feedback of the micro hydro users. 36 users from different micro hydro projects installed in the 13 districts of all development regions participated in the said two meetings.

E.2. Summary of comments received

The following comments and issues were raised from the consultation with stakeholders:

1. Benefit from Micro hydro Project

Most of the users viewed that 2-3 people have received direct employment from the project. In addition, diesel mills are replaced after the installation of the project, which has been used for household lighting and milling. They also noticed a positive difference in social, environmental and economic benefits from the electricity generated by the plant. More that 95% participants reported that the plants have been functioning well while the other 5% mentioned that regular repair and maintenance was needed.

2. More Data gathering:

According to the users there is no real disadvantage of their plant being included in the CDM project. Some think that with the CDM will come more hassle, particularly in terms of additional book-keeping (log book maintenance, meter checks, and overall monitoring of household users). This will increase the burden on the operator and manager and the same will not be receiving any direct benefit in terms of salary or other compensation from the management.

3. Technical Backstopping:

The present operational modality of Micro-hydro implementation has been to provide technical support and backstopping for the first year of operation only. After the first year there is hardly any technical backstopping and the plant is the full responsibility of the users. According to the users, there is very little problem during the first year, but after a couple of year some problems may arise and this is not being dealt with by the developers, e.g. AEPC/ESAP, REDP. Users expect backstopping support from AEPC at least during the project crediting period in terms of operation and management training/refresher training, project rehabilitation support, support for sick plants etc.

4. Enterprise development

CERs will be claimed from the total energy (kWh) supplied by the plants. This includes both lighting as well as other uses. But due to the lack of facilities and finances, management has not been able to introduce or convince people to use the daytime energy for productive use. Therefore to maximize the CERs developers will need to help the plants to set up new ventures in the areas, which will lead to better income generation, and livelihood enhancement in the plant areas.

5. Rehabilitation of Sick Plants

As mentioned before after the first year the plant is in total control of the users. Therefore if a sudden natural calamity strikes the plant and destroys some of its major components then it will be up to the users to come up with a solution and rectify it. The major hurdle for the users will be to organize the finances for the rectification. As per the present subsidy policy a plant will only be eligible for rehabilitation subsidy after five years of operations, therefore if major rehab is needed before this period then the users have to finance it themselves. Therefore the plant will need assistance for this rehab and the CDM revenue needs to be channeled in this direction as well.

E.3. Consideration of comments received

Relevant comments received were integrated in consecutive implementation and policy formulation by AEPC to incorporate the comments received into overall project management plans.

SECTION F. Approval and authorization

The host country DNA (Ministry of Environment, Science and Technology) on 28 March 2007 has approved the Micro-Hydro Promotion as CDM project confirming Nepal’s voluntary participation in the project and confirming that the project would contribute to sustainable development in Nepal. Further, the DNA has authorized the participation of AEPC as project participant.

Appendix 1. Contact information of project participants

Organization name	Alternative Energy Promotion Centre (AEPC)
Country	Nepal
Address	Khumaltar Height, Lalitpur, Nepal
Telephone	+977 1 5539390 / 5539391
Fax	+977 1 5539392
E-mail	nawa.dhakal@aepc.gov.np
Website	www.aepc.gov.np
Contact person	Mr. Nawa Raj Dhakal, Acting Executive Director

Appendix 2. Affirmation regarding public funding

See the appendix 2 of the registered PDD

http://cdm.unfccc.int/filestorage/F/Y/K/FYKP14NMRVH8BXUD2Q07JZC9LGTW6O/Revised%20PDD_MHP%20V14_Clean.pdf?t=MFZ8cGY0eXNvfDAKCAbl3S-Os8VQwTdKo0sY

Appendix 3. Applicability of methodologies and standardized baselines

See section B.2 of this document

Appendix 4. Further background information on ex ante calculation of emission reductions

See section B.6.3 of this document

Appendix 5. Further background information on monitoring plan

QC/QA at the Centre: AEPC is the apex/executing organisation for renewable energy promotion in the country, therefore if a micro hydro plant wants government subsidy for the construction of the plant then it has to be registered and follow the processes laid out by AEPC, which are stated below:

AEPC implements a strict quality assurance system to enhance the quality of micro-hydro schemes. A separate set of standards is prepared and implemented for the micro- hydro plants.. Procedural guidelines for carrying out preliminary and feasibility studies are available for practical use.. The guidelines include standard design aids with a built-in expert system. Furthermore, standard bidding and contract agreement formats are also prepared as part of the quality assurance system.

Therefore, all engineers and designers of micro-hydro plant under the AEPC will have to strictly follow the Quality Standard (QS) and Design guidelines while designing the system. The adherence to these standards and guidelines are checked by Technical Review Committee at AEPC, which has the authority to reject the design if it varies from the standards. Due to this monitoring at the central level, all micro-hydro plants approved by the TRC will comply with the standards set by AEPC.

Power output test is done in each scheme to check the power output as designed. The supplier can be penalized for providing reduced amount based on the reduced kW.
There is also system for qualifying manufacturers, installers and surveying companies based on their performance indicators. A pool of quality inspectors for power output testing is maintained by AEPC.

QC/QA at local level:
Regular monitoring of the schemes are carried out during and after construction by the province staffs or Regional Technical Service (RTSC) or third party hired for that particular purpose to ensure construction as per design and sustainable operation of the schemes.

QC/QA at the Community or Plant Level:
Metering: All the plants under the project will be fitted with energy meters to monitor the amount of energy (kWh) generated by the micro hydro plants. As the emission reduction (ER) is directly related to the energy generated by the plants, metering the energy output will be the prime basis for the ER report to be prepared by AEPC.

Meter monitoring:
The first set of data will be prepared at the plant by the operator. The operator will be responsible for maintaining a standard logbook prepared by AEPC and sending the data to the concerned offices at local level. Each log entry has to be signed by the operator. This log entry will be done on a daily basis.

Meter reading data will be collected by the concerned offices (province office, RTSP or third party hired to collect data). Then, it is the responsibility of those offices to enter the data into the database and report the data to AEPC (both electronic as well as the original paper while keeping a copy of the paper log as reference in the district/local/province level.
All the meter reading data that comes to AEPC will be entered into the main database and this data will be the basis for preparing the Annual ER report for the purpose of verification by a Designated Operational Entity (DoE).

Ensuring Proper Data Recording:
Local office (province, RTSP or selected firm) are responsible for promoting good data recording practices at the plant level. It is not feasible to cover every plant every year thus a minimum of 10% of the plants under a province will be visited, on a rotational basis, for the purpose of checking the data recording practices and to verify no tampering has been done to the meter, log or the data base at local level.

Capacity Building;
To make the above monitoring activities work, all the operators have to be trained in the process of meter reading and logbook maintenance. This aspect has already been included in the curriculum for Operators training. In the local level, the staffs are trained in meter monitoring, database management and reporting.

Appendix 6. Summary report of comments received from local stakeholders

See section E.2 of this document

Appendix 7. Summary of post-registration changes

Post registration changes have been approved by the board prior to the submission of this monitoring report. The PRC included revision in specifications including the name of few plants included in the bundle. (Effective approval date: 18 Nov 13 and Reference: PRC-3653-001)

The approved post-registration changes to the design of the registered project activity include an amendment in the number of micro hydro plants (MHPs) from 448 to 450 and the total installed capacity is also changed from 14.965 MW to 14.970 MW, but remained below 15 MW which is the threshold limit. For further details on PRC, please refer:
https://cdm.unfccc.int/PRCContainer/DB/prcp425421616/view

The post registration changes for revising the calibration frequency of the energy meter was also approved during this monitoring period on 16 March 2016 (PRC reference: PRC-3653-002). The approved post registration changes include an amendment in the frequency of calibration of energy meter as per the manufacturer's specifications (i.e. once in a seven years).

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Document information

Version	*Date*	*Description*
10.1	28 June 2017	Revision to make editorial improvement.
10.0	7 June 2017	Revision to: • Improve consistency with the "CDM project standard for project activities" and with the PoA-DD and CPA-DD forms; • Make editorial improvement.
09.0	24 May 2017	Revision to: • Ensure consistency with the "CDM project standard for project activities" (CDM-EB93-A04-STAN) (version 01.0); • Incorporate the "Project design document form for small-scale CDM project activities" (CDM-SSC-PDD-FORM); • Make editorial improvement.
08.0	22 July 2016	EB 90, Annex 1 Revision to include provisions related to automatically additional project activities.
07.0	15 April 2016	Revision to ensure consistency with the "Standard: Applicability of sectoral scopes" (CDM-EB88-A04-STAN) (version 01.0).
06.0	9 March 2015	Revision to: • Include provisions related to statement on erroneous inclusion of a CPA; • Include provisions related to delayed submission of a monitoring plan; • Provisions related to local stakeholder consultation; • Provisions related to the Host Party; • Make editorial improvement.
05.0	25 June 2014	Revision to: • Include the Attachment: Instructions for filling out the project design document form for CDM project activities (these instructions supersede the "Guidelines for completing the project design document form" (Version 01.0)); • Include provisions related to standardized baselines; • Add contact information on a responsible person(s)/ entity(ies) for the application of the methodology (ies) to the project activity in B.7.4 and Appendix 1; • Change the reference number from F-CDM-PDD to CDM-PDD-FORM; • Make editorial improvement.
04.1	11 April 2012	Editorial revision to change version 02 line in history box from Annex 06 to Annex 06b.
04.0	13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the project design document form for CDM project activities" (EB 66, Annex 8).

Version	*Date*	*Description*
03.0	26 July 2006	EB 25, Annex 15
02.0	14 June 2004	EB 14, Annex 06b
01.0	03 August 2002	EB 05, Paragraph 12 Initial adoption.

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