**PROJECT DESIGN DOCUMENT FORM
FOR SMALL-SCALE CDM PROJECT ACTIVITIES (F-CDM-SSC-PDD)
Version 04.1**

PROJECT DESIGN DOCUMENT (PDD)

Title of the project activity	Brenwe River Mini- Hydropower Project in Malekula, Vanuatu
Version number of the PDD	01
Completion date of the PDD	09/12/2012
Project participant(s)	Vanuatu Department of Energy under the Ministry of Lands and Natural Resources (MLNR)
Host Party(ies)	Vanuatu
Sectoral scope(s) and selected methodology(ies)	Sectoral Scope : 01 (Energy industries (renewable - / non-renewable sources) Methodology: AMS-I.F. - Renewable electricity generation for captive use and mini-grid
Estimated amount of annual average GHG emission reductions	4,508 tCO_{2e}

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

Electricity supply throughout Vanuatu is dominated by diesel generation, resulting in very high tariff[1]. The power supply in Malekula island (second largest island in Vanuatu) where the proposed project is planned is limited, which constraints the economic development on the island. The objective of the proposed project activity is to utilize the hydropower potential which is technically and economically feasible. Prior to the implementation of the project activity, electricity demand in the region is met by diesel fired engines, which constitutes the baseline of the proposed project activity. There is no other hydropower project in the region, the proposed project activity is the first hydropower project planned in the region and is a greenfield project

The proposed project activity will help improve electricity access in the region through the development of grid-connected renewable energy for rural areas. The project is expected to stimulate economic development in the region and support development of local industry like agriculture and fishery.

The Brenwe River Mini- Hydropower Project in Malekula, Vanuatu ('project') hydropower station is proposed at Brenwe River in the North West of the Malekula. The proposed project is a run-of-river hydro power project with an estimated power generating capacity of 1.2 MW and equivalent annual energy production of 5,636,141 kWh.

In the absence of this program the baseline scenario would thus be continued usage of diesel for electricity generation. The project activity is expected to result in 4,508 tCO_{2e} emission reductions per annum and 31,556 tCO_{2e} emission reductions during the first crediting period.

The project activity will also reap following sustainable benefits to the host country:

Social:

- Ø The project will provide cheaper and more reliable power supply to meet the Malekula power demand.
- Ø The project will also reduce demand for imported fuels through renewable energy resources, especially in the rural areas. Hydropower will offset a proportion of the diesel currently used, and so reduce the overall cost of generation.
- Ø The project will lead to increase in electricity supply in the island which will benefit the local industry.

Environment:

- Ø The project will deliver improved air quality, both locally and globally, by eliminating NO_x, SO_x and CO_2 emissions associated with diesel based power generation.
- Ø Hydro power projects produce no by-products in the form of waste (e.g. particulate matter, fly ash, water effluent etc.). This will help in reduction of overall pollution from power generation.
- Ø Being a renewable resource, using hydro energy to generate electricity contributes to conventional (eg. fossil fuel) resource conservation and prevents subsequent degradation of other resources.

[1] Interim Report Promoting Renewable Energy Access in the Pacific

Economy:

- Ø The project will contribute to the economical sustainability around the project area by creating employment and business opportunity, which will help improve local economic structure.
- Ø Use of hydro energy for electricity generation instead of conventional practice, reduces stress on the economy of the country.
- Ø The project contributes to diversification of the national energy supply, which is dominated by conventional fuel based generating units.

Technology:

- Ø The project uses proven and well established technology with efficient turbines and generators. The project activity would effectively encourage power producers to build and operate small hydro power projects in the region. Hence, the project activity contributes to diffusion of the technology in the country.
- Ø The project will also involve technology transfer. The training of local staff for the Project will provide them with new skill profile, enabling them to pursue a career in their chosen field.

A.2. Location of project activity

A.2.1. Host Party(ies)

Vanuatu

A.2.2. Region/State/Province etc.

Brenwe Village

A.2.3. City/Town/Community etc.

Malekula

A.2.4. Physical/ Geographical location

The project is to be located on the Brenwe River. The project coordinates are:
Intake Coordinates: S16º 04’ 40” / E167 º 16’ 47”
Powerhouse Coordinates: S16 º 05’ 34”/ E167º16’ 31”

Figure 1: Brenwe Hydropower Project

A.3. Technologies and/or measures
Technology Description:

The proposed project is a run-of-river hydropower project. The expected net annual gross generation from the project is 5,635 MWh at 53.61% plant load factor. It is envisaged that the technical life time of the project will be 25 years which is in line with the industry standards. As per the pre-feasibility study report for the project, the proposed project activity will consist of a transmission line of 20KV for a distance up to 30 km. The key technical features of the project activity are as follows:

Description	Parameters
Type of Power Plant	Run –of–river
Installed Capacity	1200 kW
Catchment Area at intake site	19km^2
General Hydraulics	
Gross Head	120m
Net Head	108m
Design Flow	1.33m^3/s(@20% flow)
Diversion Weir	
Type	Permanent type, RC Weir
Length	15m
Height	2 m above natural bed
Intake	
Type	Orifice type side intake
Size of opening	1.1 m x 1.05 m
Turbines	Cross Flow Turbo , two units
Generators	1200 kW, AC

Electricity delivered to/imported from the grid will be monitored by a metering device installed at the substation. The electricity sale receipt will be provided by the grid company for the project owner's double check of the amount of electricity delivered to and imported from the proposed power plant. Moreover, a backup metering device will be also installed.
Prior to the implementation of the project activity electricity delivered by the project activity is supplied by diesel based electricity generation. The baseline scenario of the proposed project activity is continuing the same as the existing scenario prior to the proposed project activity.

This technology used in the proposed project activity is widely used and environmentally safe as is demonstrated by similar installations around the world. The proposed project activity will involve technology transfer to Vanuatu from developed countries and its implementation by local contractors. During the construction, technology and knowledge transfer will take place from foreign experts to local engineers and plant operators. It is expected that the power plant operators and other relevant staff will be provided at least one training annually from the foreign and local experts. The Project will provide an opportunity for local engineers and plant operators to acquire knowhow for the optimal operation and maintenance of state-of-the-art hydro power plant.

A.4. Parties and project participants

Party involved (host) indicates a host Party	Private and/or public entity(ies) project participants (as applicable)	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Vanuatu (host)	Department of Energy under the Ministry of Lands and Natural Resources (MLNR)	No

A.5. Public funding of project activity

The project activity does not receive any public funding for its financing.

A.6. Debundling for project activity

According to "Guidelines on Assessment of Debundling for SSC Project Activities" paragraph 2, the following results into debundling of large CDM project:

"A proposed small-scale project activity shall be deemed to be a debundled component of a large project activity if there is a registered small-scale CDM project activity or an application to register another small-scale CDM project activity:

- *With the same project participants;*
- *In the same project category and technology/measure;*
- *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."*

The project activity is not a de-bundled component of a large project activity as there is no small scale CDM project activity or an application to register another small-scale CDM project activity by Project Proponent (PP) in the same project category and technology in the last two years within 1 km of the project boundary of the proposed small scale project activity.

SECTION B. Application of selected approved baseline and monitoring methodology
B.1. Reference of methodology

The project activity uses the following approved baseline and monitoring methodology and tools, available at the UNFCC website:

Title	Reference	Version
Renewable Electricity Generation for captive use and mini-grid [2]:	AMS-I.F., EB 61	Version 02
[3]Tool to calculate project or leakage CO2 emissions from fossil fuel combustion, Version 01[4]	EB 41 Annex 11	Version 01

[2] http://cdm.unfccc.int/filestorage/V/9/L/V9LRSXKP24Q7YT6HZDUBO3C0ING8AJ.1/EB61_repan17_Revision_AMS-I.D_ver17.pdf?t=QlV8bTZrdTQ2fDBxrixMDU9A-EHoJXRXBdUg

[3] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v2.pdf

B.2. Project activity eligibility

Para No	Applicability Criteria as per AMS-I.F. version 02	Project Scenario
1	This methodology comprises renewable energy generation units, such as solar, hydro, tidal/wave, wind, geothermal and renewable biomass that supply electricity to user(s).	The project activity comprises renewable hydro energy generation unit which will supply electricity to users.
2	The project activity will displace electricity from an electricity distribution system that is or would have been supplied by at least one fossil fuel fired generating unit i.e., in the absence of the project activity, the users would have been supplied electricity from one or more sources listed below: a) A national or a regional grid (grid hereafter); b) Fossil fuel fired captive power plant; c) A carbon intensive mini-grid.	In the absence of the project activity, the users would have been supplied electricity by the mini grid (Malekulu) which mainly consists of diesel fired generation sets.
3	For the purpose of this methodology, a mini-grid is defined as small-scale power system with a total capacity not exceeding 15 MW (i.e., the sum of installed capacities of all generators connected to the mini-grid is equal to or less than 15 MW) which is not connected to a national or a regional grid.	The current installed capacity in Malekula is 240 KW and it is generated using diesel oil. Hence the power system falls in limit of mini grid and is not connected to a national or regional grid.
4	Hydro power plants with reservoirs that satisfy at least one of the following conditions are eligible to apply this methodology: · The project activity is implemented in an existing reservoir with no change in the volume of reservoir; · The project activity is implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity, as per definitions given in the Project Emissions section, is greater than 4 W/m^2; · The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the Project Emissions section, is greater than $4W/m^2$.	The proposed project is a run-of-river hydropower project. A storage type hydropower project is not considered due to high cost and environmental impacts associated with it. Thus the Project Activity complies with the applicability criteria.
5	For biomass power plants, no other biomass other than renewable biomass is to be used in the project	The project activity does not involve any usage of biomass. Hence the condition is

[4] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-05-v1.pdf

	plant.	not applicable to the project activity.
6	This methodology is applicable for project activities that: a) install a new power plant at a site where there was no renewable energy power plant operating prior to the implementation of the project activity (greenfield plant); b) involve a capacity addition c) involve a retrofit of (an) existing plant(s); or d) involve a replacement of (an) existing plant(s).	In the project activity a new hydro power plant will be installed at Brenwe River. There is no other hydro power plant operating at the site prior to the project activity. Hence the project activity meets the applicability criteria.
7	In the case of project activities that involve the capacity addition of renewable energy generation units at an existing renewable power generation facility, the added capacity of the units added by the project should be lower than 15 MW and should be physically distinct from the existing units.	The project activity is a Greenfield plant and does not involve capacity addition of renewable energy generation units at an existing renewable power generation facility. Hence the condition is not applicable to the project activity,
8	In the case of retrofit or replacement, to qualify as a small-scale project, the total output of the retrofitted or replacement unit shall not exceed the limit of 15 MW.	The project activity is a greenfield plant and does not involve retrofit or replacement. Hence the condition is not applicable to the project activity.
9	If the unit added has both renewable and non-renewable components (e.g., a wind/diesel unit), the eligibility limit of 15 MW for a small-scale CDM project activity applies only to the renewable component. If the unit added co-fires fossil fuel, the capacity of the entire unit shall not exceed the limit of 15 MW.	The project activity is a hydro power project and does not involve addition of any non-renewable component. . Hence the condition is not applicable to the project activity.
10	Combined heat and power (co-generation) systems are not eligible under this category.	Combined heat and power(co-generation) systems are not involved in the project activity and hence, the condition is Not Applicable
11	If electricity and/or steam/heat produced by the project activity is delivered to a third party i.e. another facility or facilities within the project boundary, a contract between the supplier and consumer(s) of the energy will have to be entered that ensures that there is no double counting of emission reductions.	Any sale of electricity in the project activity will be done after signing contract/ agreement with the buyer/consumer(s) to ensure that there is no double counting of emission reductions

B.3. Project boundary

According to the paragraph 12 of the small scale methodology AMS-I.F. Version 02 *"The spatial extent of the project boundary includes industrial, commercial facilities consuming energy generated by the system. In the case of electricity generated and supplied to distributed users (e.g. residential users) via mini/isolated grid(s) the project boundary may be confined to physical, geographical site of renewable generating units. The boundary also extends to the project power plant and all power plants connected physically to the electricity system that the CDM project power plant is connected to."*

For the project activity, the generated electricity of the project will be delivered to the Malekulu Mini grid, and the auxiliary internal power consumption of hydropower plant is also contained in the project boundary. A schematic view of the project boundary is shown in figure below:

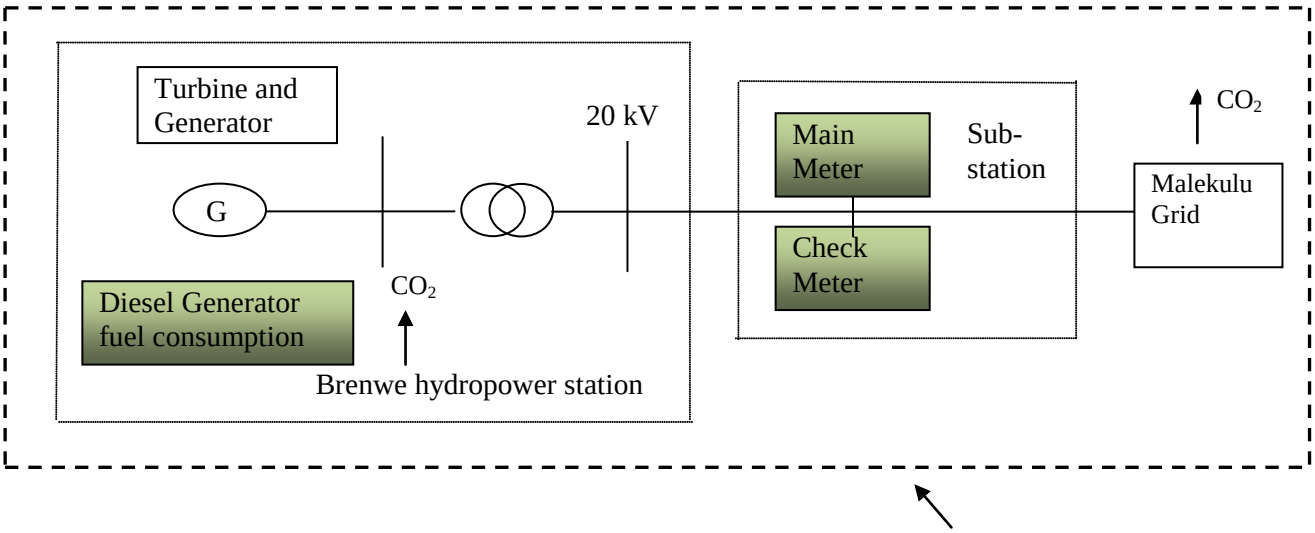

Figure 5: Project Boundary

The GHG emission sources included in or excluded from the project boundary are as follows:

Scenario	Source	Gas	Included/ Excluded	Justification/Explanation
Baseline scenario	Electricity Delivered to the grid by the project activity that otherwise would have been generated by the operation of grid connected power plants and by the addition of new generation sources.	CO_2	Included	Main Emission Source.
		N_2O	Excluded	Not Significant. Excluded for simplification and conservativeness.
		CH_4	Excluded	Not Significant. Excluded for simplification and conservativeness.
Project activity	Emissions from combustion of fossil fuels for electricity generation	CO_2	Included	Main emission source
		N_2O	Excluded	Minor emission source. Excluded for simplification. .
		CH_4	Excluded	Minor emission source. Excluded for simplification. .
	For hydro power plants, emissions of CH_4 from the reservoir	CO_2	Excluded	Minor emission source. Excluded for simplification.

		N_2O	Excluded	Minor emission source. Excluded for simplification.
		CH_4	Excluded	Excluded as the project is a run of the river hydro power plant.

B.4. Establishment and description of baseline scenario

According to the paragraph 12 of the small scale methodology AMS-I.F. Version 02:

For a mini-grid system where all generators use exclusively fuel oil and/or diesel fuel, the baseline emissions is the annual electricity generated by the renewable energy unit times an emission factor for a modern diesel generating unit of the relevant capacity operating at optimal load as given in Table I.F.1.

Like other small island countries in the Pacific, Vanuatu relies on imported fuels for electricity production. Vanuatu also faces challenges in the development of the energy sector to satisfy the increasing electricity demand and growing fuel import. Vanuatu's grid power supply in Port Vila is operated at a high reliability level but on other islands such as Santo, Malekula and Tanna, electricity supply is less reliable. Old and inefficient diesel generators are still used on these islands, requiring high maintenance and consuming more imported fossil fuel for each kWh of electricity generation.

The existing power supply in Malekula is limited and is managed and generated by Union Electrique du Vanuatu (UNELCO). The current capacity is only 240kW and is based on diesel. To enhance local economic development, it is necessary to increase electricity access of local households and meet the electricity demand increase of agriculture and fishing industry and a growing population due to the decentralization of the government offices to Malekula.

In the absence of this program the baseline scenario would be continued usage of diesel based electricity generation

Data used to determine the baseline emissions:
"Tool to calculate the emission factor for an electricity system" provides procedures to determine parameters considered in the baseline calculation as presented in table below:

Parameter	Unit	Description	Source of data to be used
$EG_{BL,y}$	MWh	Net electricity supplied to the grid	Electricity meter
EF	tCO_2/MWh	Combined margin CO_2 emission factor for grid connected power generation in year y	AMS-I.F. Table I.F.1

B.5. Demonstration of additionality

Project additionally can be demonstrated using "Guidelines for Demonstrating Additionally of Micro-Scale Project Activities" (EB 68, version 04)**.**

As per the paragraph 2 of the guidelines:

Project activities up to 5 MW that employ renewable energy technology are additional if any one of the below conditions are satisfied:

(a) The geographic location of the project activity is in one of the least developed countries or the small island developing States (LDCs/SIDS) or in a special underdeveloped zone (SUZ)of the host country

(i) SUZ is a region in the host country (zone, municipality or any other designated official administrative unit) identified by the Government in official notifications for development assistance including for planning, management, and investment satisfying any one of the following conditions using most recent available data:

- The proportion of population with income less than USD 2 per day (PPP) in the region is greater than 50%;
- The GNI per capita in the country is less than USD 3000 and the population of the region is among the poorest 20% in the poverty ranking of the host country as per the applicable national policies and procedures;

(ii) In cases where, based on the recommendation of the designated national authority of the host country, the SUZ in the host country has been approved by Executive Board (hereinafter referred to as the Board) of the clean development mechanism (CDM), the list of such SUZ shall be maintained on the UNFCCC website (e.g. at <http://cdm.unfccc.int/DNA/submissions/index.html>). In the case of these SUZ listed on the CDM website there is no need for the project proponents to provide proofs as indicated in paragraph (a) above.

(b) The geographic location of the project activity is in one of the least developed countries or the small island developing States (LDCs/SIDS) or in a special underdeveloped zone of the host country identified by the government before 28 May 2010;

(c) The project activity is an off-grid activity supplying energy to households/communities (less than 12 hours grid availability per 24 hrs is also considered off-grid for this assessment);

(d) The project activity is designed for distributed energy generation (not connected to a national or regional grid) with both conditions (i) and (ii) satisfied;

(i) Each of the independent subsystems/measures in the project activity is smaller than or equal to 1500kW electrical installed capacity;

(ii) End users of the subsystems or measures are households/communities/small and medium enterprises (SMEs). (e) The project activity employs specific renewable energy technologies/measures recommended by the host country designated national authority (DNA) and approved by the Board to be additional in the host country.

The following conditions shall apply for DNA recommendations:

(i) Specific renewable energy technologies/measures refers to grid connected renewable energy technologies of installed capacity equal to or smaller than 5 MW;

(ii) The ratio of installed capacity of the specific grid connected renewable energy technology in the total installed grid connected power generation capacity in the host country shall be equal to or less than 3 per cent;

(iii) Most recent available data on the percentage of contributions of specific renewable energy technologies shall be provided to demonstrate compliance with the 3 per cent threshold. In no case shall data older than three years from the date of submission be used;

(iv) Technologies/measures recommended by DNAs and approved by the Board to be additional in the host country remain valid for three years from the date of approval. However, additionality of eligible project activities applying the guidelines remains valid for the entire crediting period;

(v) DNA submissions shall include the specific grid connected renewable electricity generation technologies that are being recommended and provide the required data as indicated above (e.g. wind power, biomass power, geothermal power, hydropower).

According to the United Nations, Vanuatu is classified both as a Least Developed Country (LDC) and Small Island Developing State (SIDS)[5]. Hence proposed project activity, which has an installed capacity of 1.2 MW, is considered to be automatically additional as per the above EB guidelines.

B.6. Emission reductions

B.6.1. Explanation of methodological choices

Emission Reductions

The Emission Reductions are calculated by using the following algorithm:

$ER_y = BE_y – PE_y - LE_y$

Where,
ER_y : Emission Reductions in the year y (tones of CO_2e)
BE_y : Baseline emissions in the year y (tones of CO_2e)
PE_y : Project emission in year y (tones of CO_2e)
LE_y : Leakage Emissions in year y (tones of CO_2e)

Baseline emissions:

$BE_y = EG_{BL,y} \times EF_{CO2,y}$

Where,
$EG_{BL,,y}$: Quantity of net electricity displaced as a result of the implementation of the CDM project activity in year *y* (MWh)
$EF_{CO2,mini\text{-}grid,y}$: Emission factor (tCO_2/MWh)

As per AMS-I.F. version 02, paragraph 13:

'For a mini-grid system where all generators use exclusively fuel oil and/or diesel fuel, the baseline emissions is the annual electricity generated by the renewable energy unit times an emission factor for a modern diesel generating unit of the relevant capacity operating at optimal load as given in Table I.F.1'.

[5] http://www.un.org/special-rep/ohrlls/sid/list.htm

Project Emissions:

As per paragraph 19 of methodology AMS-I.F. version 02

"*For most renewable energy project activities, PEy = 0. However, for the following categories of project activities, project emissions including relevant definitions have to be considered following the procedure described in the most recent version of ACM0002:*

- *Emissions related to the operation of geothermal power plants (e.g. noncondensable gases, electricity/fossil fuel consumption);*
- *Emissions from water reservoirs of hydro power plants.*

Since project activity is run off river hydropower project emission from water reservoirs is 0.

Emission from electricity consumption

CO_2 emissions from on-site consumption of fossil fuels due to the project activity shall be calculated using the latest version of the 'Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion'
As per the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion"
(Version 2) paragraph II under Baseline Methodology Procedure.

CO_2 emissions from fossil fuel combustion in process j are calculated based on the quantity of fuels combusted and the CO_2 emission coefficient of those fuels, as follows:

$$PE_{FC,j,y} = \Sigma FC_{i,j,y} * COEF_{i,y}$$

$PE_{FC,j,y}$	=	*CO_2 emissions from fossil fuel combustion in process j during the year y(tCO_2/yr);*
$FC_{i,j,y}$	=	*quantity of fuel type i combusted in process j during the year y (mass or volume unit/yr);*
$COEF_{i,y}$	=	*CO_2 emission coefficient of fuel type i in year y (tCO_2/mass or volume unit)*
I	=	*fuel types combusted in process j during the year y*

The CO_2 emission coefficient $COEF_{i,y}$ will be calculated as per option B below
Option B: The CO_2 emission coefficient COEFi,y is calculated based on net calorific value and CO_2 emission factor of the fuel type i, as follows:

$$COEF_{i,y} = NCV_{i,y} * EF_{CO2,i,y}$$

Where:

$COEF_{i,y}$	=	*Is the CO_2 emission coefficient of fuel type i (tCO_2/mass or volume unit);*
$NCV_{i,y}$	=	*Is the weighted average net calorific value of the fuel type i in year y (GJ/mass or volume unit)*
$EF_{CO2,i,y}$	=	*Is the weighted average CO_2 emission factor of fuel type I in year y (tCO_2/GJ)*
I	=	*Are the fuel types combusted in process j during the year y*

For the purpose of ex-ante calculation of emission reductions, use of fossil fuels is not considered. However the usage of any fossil fuel will be monitored during crediting period and emissions from the same will be accounted annually on ex-post basis. Hence, no project emissions from fossil fuel combustion have been taken into account.

Hence, PEy = 0

Leakage Emissions:

For project activity not transferring energy generating equipment from another activity, the leakage is considered as zero.

B.6.2. Data and parameters fixed ex ante

(Copy this table for each piece of data and parameter.)

Data / Parameter	$EF_{CO2,mini-grid,y}$
Unit	tCO_2e/MWh
Description	Emission factor of the mini-grid where the hydropower is exporting (or would have exported) its electricity to.
Source of data	As per AMS-I.F., version 2, Table I F.1
Value(s) applied	0.8 (ex-ante)
Choice of data or Measurement methods and procedures	Default values for diesel generator systems as per AMS-I.F., version 1, Table I F.1
Purpose of data	Calculation of baseline emissions
Additional comment	The data of the year in which project generation occurs must be used

B.6.3. Ex-ante calculation of emission reductions

Baseline Emissions:

$BE_y = EG_y \times EF_{CO2,mini-grid,y}$
$= (1.2*8760*53.61\%)MWh * 0.8\ (tCO_2/MWh)$
$= 5635\ MWh * 0.8\ tCO_{2e}/MWh$
$= 4508\ tCO_{2e}$

Project Emissions:

$PE_y = 0$

Leakage Emissions:

$LE_y = 0$

Emission Reductions

$ER_y = BE_y – PE_y - LE_y$
$= 4508 – 0 – 0$
$= 4508\ tCO_2\ e$

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

Year	Baseline emissions (tCO_2 e)	Project emissions (tCO_2 e)	Leakage (tCO_2 e)	Emission reductions (tCO_2 e)
Year 1	4,508	0	0	4,508
Year 2	4,508	0	0	4,508
Year 3	4,508	0	0	4,508
Year 4	4,508	0	0	4,508
Year 5	4,508	0	0	4,508
Year 6	4,508	0	0	4,508
Year 7	4,508	0	0	4,508
Total	31,556	0	0	31,556
Total number of crediting years	7			
Annual average over the crediting period	4,508	0	0	4,508

B.7. Monitoring plan

B.7.1. Data and parameters to be monitored

(Copy this table for each data and parameter.)

Data / Parameter	EG_y
Unit	MWh/year
Description	Quantity of net electricity supplied to the grid in year y
Source of data	Electric meter readings located at the project site
Value(s) applied	5635
Measurement methods and procedures	Measurement will be undertaken using electricity meter.
Monitoring frequency	Continuous monitoring, hourly measurement and monthly recording
QA/QC procedures	The meter(s) will be subject to maintenance and calibration according to manufacturer standard. On site staff will receive training in CDM monitoring and the maintenance requirements of the electricity meters. Data measured by the meter(s) will be cross checked using electricity sales receipts. The accuracy of the measurement is ensured through annually calibration by a qualified party as per appropriate national/international standard.
Purpose of data	Calculation of baseline emissions
Additional comment	Data will be archived at least for two years after the end of the crediting period, or the last issuance of CERs, whichever occurs later.

Data / Parameter	**$EC_{PJ,j,y}$**
Unit	MWh/y
Description	Quantity of electricity consumed by the project electricity consumption source j in year y
Source of data	Electric meter readings located at the project site
Value(s) applied	0
Measurement methods and procedures	Measurement will be undertaken using electricity meter.
Monitoring frequency	Continuous monitoring, hourly measurement and monthly recording
QA/QC procedures	The meter(s) will be subject to maintenance and calibration according to manufacturer standard. On site staff will receive training in CDM monitoring and the maintenance requirements of the electricity meters. The accuracy of the measurement is ensured through annually calibration by a qualified party as per appropriate national/international standard.
Purpose of data	Calculation of baseline emissions
Additional comment	Data will be archived at least for two years after the end of the crediting period, or the last issuance of CERs, whichever occurs later.

Data / Parameter	$FC_{i,j,y}$
Unit	Mass or volume unit/y
Description	Quantity of fossil fuel type *i* (diesel) fired in the captive power plant (*j*) in the year y
Source of data	On-site measurements
Value(s) applied	0
Measurement methods and procedures	As small tanks will be used, rulers will be used to determine mass or volume of the fuel consumed, with the following conditions: The ruler gauge will be calibrated at least once a year and have a book of control for recording the measurements (on a daily basis or per shift). Data archiving would be done both electronically and on paper records The Data will be stored for at least 2 years after last crediting period. -
Monitoring frequency	Measuring equipment will be calibrated annually at appropriate intervals according to manufacturer specifications.
QA/QC procedures	The consistency of measured fuel consumption quantities will be cross-checked by an annual energy balance that is based on purchased quantities and stock change. The calibrations would be done as per manufacturer's specifications.
Purpose of data	Calculation of project emissions
Additional comment	-

Data / Parameter	NCV_i
Unit	GJ/tonne
Description	Average net calorific value of fossil fuel type *i* (diesel) used in the period *t*
Source of data	The following data sources to be used a) Supplier data b) If a) is not available, measurement by PP c) If a) is not available, regional or national default values will be taken for liquid fuels d) If a) is not available, IPCC default values at the upper limit of the uncertainty at a 95% confidence interval.
Value(s) applied	43.3 (IPCC default value)
Measurement methods and procedures	For (a) and (b) Measurements to be undertaken in line with national or international fuel standards and at each fuel delivery. In case of (c), appropriateness of the values will be reviewed annually. In case of (d), any revisions of the IPCC Guidelines will be taken into account. Data archiving would be done both electronically and on paper records. The Data will be stored for at least 2 years after last crediting period
Monitoring frequency	For a) and b) at each fuel delivery For c) annually For d) whenever revision takes place.
QA/QC procedures	Verify if the values under a), b) and c) are within the uncertainty range of the IPCC default values as provided in Table 1.2, Vol. 2 of the 2006 IPCC Guidelines. If the values fall below this range collect additional information from the testing laboratory to justify the outcome or conduct additional measurements. The laboratories in a), b) or c) should have ISO17025 accreditation or justify that they can comply with similar quality standards
Purpose of data	Calculation of project emissions
Additional comment	-

Data / Parameter	$EF_{CO2\ i,y}$
Unit	tCO_2/GJ
Description	CO_2 emission factor of fossil fuel type *i* used in the period *t*
Source of data	The following data sources to be used a) Supplier data b) If a) is not available, measurement by PP c) If a)is not available, regional or national default values will be taken for liquid fuels d) If a) is not available, IPCC default values at the upper limit of the uncertainty at a 95% confidence interval.
Value(s) applied	Diesel 0.0748 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2, table 1.4 (Upper limit of the uncertainty at a 95% confidence interval)
Measurement methods and procedures	For a) and b): The CO_2 emission factor should be obtained for each fuel delivery, from which weighted average values for the period t should be calculated In case of c), appropriateness of the values will be reviewed annually. In case of d), any revisions of the IPCC Guidelines will be taken into account. Data archiving would be done both electronically and on paper records. The Data will be stored for at least 2 years after last crediting period

Monitoring frequency	For (a) and (b) at each fuel delivery
	For (c) annually
	For (d) whenever revision takes place.

QA/QC procedures	For a) and b): Measurements should be undertaken in line with national or international fuel standards. For a): If the fuel supplier does provide the NCV value and the CO_2 emission factor on the invoice and these two values are based on measurements for this specific fuel, this CO_2 factor should be used. If another source for the CO_2 emission factor is used or no CO_2 emission factor is provided, options b), c) or d) should be used.
Purpose of data	Calculation of project emissions
Additional comment	-

B.7.2. Sampling plan

Project activity does not involve any sampling for the determination of parameter values for calculating GHG emissions.

B.7.3. Other elements of monitoring plan

Purpose: The Monitoring set up for this project has been developed to ensure that from the start, the Project is well organised in terms of the collection and archiving of complete and reliable data.
The monitoring of this type of project consists of metering the electricity generated by the renewable technology. Below is the description of monitoring procedures for data measurement, quality assurance and quality control.

Metering of Electricity Supplied to the Grid

The main electricity meter for establishing the electricity delivered to UNELCO will be installed at the project site using a Metering System that is mutually agreed between UNELCO and project developer(s). This electricity meter provides the main data for CER measurement, thus it will be the key part of the verification process. To check the amount of electricity delivered to the grid, official data will be used. A backup metering system will also be used to monitor the electricity exported to and imported from the grid by the project.

Quality Control and Quality Assurance

Quality control and quality assurance procedures will guarantee the quality of data collected. The electricity meter(s) will undergo periodic calibration as prescribed by manufacturer throughout the lifetime of the Project Activity. Documents of these procedures will be available during the verification.

Data Archiving

The monitoring data will be stored in a retrievable storage format on a periodic e.g. weekly basis. Calibration records may be archived by scanning and storage in an accessible electronic format. These data will be stored until 2 years after the end of the crediting period.

Prior to the start of the crediting period, the organisation of the monitoring team will be established. Clear roles and responsibilities will be assigned to all staff involved in the CDM project and the prospect of nominating a CDM Manager will be considered. The CDM Manager will have the overall responsibility for the monitoring system on this project. The monitoring will be performed according to internal procedure that will be available at the verification

SECTION C. Duration and crediting period

C.1. Duration of project activity

C.1.1. Start date of project activity
>>
December 2014

C.1.2. Expected operational lifetime of project activity

25 years

C.2. Crediting period of project activity
C.2.1. Type of crediting period

Renewal Crediting Period (first)

C.2.2. Start date of crediting period

2016

C.2.3. Length of crediting period

7 years * 3

SECTION D. Environmental impacts
D.1. Analysis of environmental impacts

Any developmental project in Vanuatu should meet the criteria's set out in Government of Republic of Vanuatu, Priority and Action Agenda 2006-2015 and Planning Long, Acting Short agenda (2009-2012). For environment conservation the two documents set out following policy priorities for Government of Vanuatu:

"Equitable and Sustainable development of land while ensuring the heritage of future generation". A key performance indicator for implementation of this policy is "Environment Impact Assessment (EIA) should be conducted for all development related projects".

"*Promote sound and sustainable environmental management practices; Implement the Environmental Protection and Conservation Act and the regulation of related activities*"

An Initial Environmental Examination (IEE) has been carried out in compliance with the Asian Development Bank Safeguard Policy Statement for the Brenwe small hydro project. The main purpose of the IEE is to environmentally assess the location, construction and operation of the Plant.

The aquatic study showed that all of the fish are very small and are commonly found in these watercourses. None of the fish had any specific migration needs. While habitats may be affected in the section where the flow will be reduced this is not expected to cause significant changes in fish diversity and populations as these fish are shown to rapidly recover from perturbations in the aquatic system. Construction will require some forest to be removed to allow for the pipeline/access road to the intake to

be located. Otherwise all other construction impacts are relatively minor and can be addressed by the usual range of mitigation measures provided by the Environmental Management Plan (EMP). No resettlement will be required but about 40 ha of land will need to be acquired. During operation there will be changes to the flow in the section below the weir to the powerhouse due to the diverted flow.

The IEE report has reviewed the environmental impacts associated with the subproject and has developed a comprehensive Environment Management Plan (EMP) to address these activities. Overall there are few impacts associated with the development of the power station.

The project activity will fulfil the above criteria's and a detailed Environment Impact Analysis (EIA) for the project will be carried out in accordance with The Environmental Protection and Conservation Act No. 12 of 2002 (amended in 2010).

SECTION E. Local stakeholder consultation
E.1. Solicitation of comments from local stakeholders

The stakeholder consultation process is not required by regulations or laws in the host country. Letters of invitation were mailed a week before the meeting to relevant stakeholders from the Department of Energy under the Ministry of Lands and Natural Resources (MLNR) and Climate Change unit under Ministry of Infrastructure to Environment department, stakeholder government ministries and departments, electricity utility companies, community representatives and non-governmental organisations. There was also constant communication between the MLNR and the invited organizations for confirmation of participation to the meeting.

A local stakeholder consultation was organised for the proposed CDM project- Brenwe River Mini-Hydropower Project in Malekula, Vanuatu at the conference room, Climate Change unit on 5th September 2012. The energy officer, MLNR detailed the purpose and reasons for the proposed Brenwe small hydro scheme under CDM and made an open invitation to the stakeholders to express themselves, in terms of their views, opinions, and issues associated with the Brenwe project development.

E.2. Summary of comments received

Overall, very positive comments and observations were provided by participants of the consultation. The following list includes general comments and observations about the project from the participants.

Comment: What would be the extent of the project development impact on the directly affected people? Are there any immediate plans to resettle the present village site to another location?

Response: The project is a run-of-river small hydro project and there will be no need for displacement or resettlement of the village community to another location.

Comment: Whether the priority in employment and training during the construction phase will be given to the individuals from local village community?

Response: The local individuals would be preferred for any appropriate employment suitable to the local individuals depending on their skills and expertise.

The local NGO encouraged the people to contrast former way of life they had lived and the anticipated change that are likely to be brought on by the intervention and stressed the need for the people to raise their level of understanding in line with government's development aspirations.

Two women representatives strongly emphasised the need for a change, and see this project as a means for change, where in women's core household activities are to improve, in terms of the provision of readily available electricity and water supply.

All the participants agreed and welcomed the development of the hydro power scheme as it would create social and economic benefits, including employment opportunities for the local project area youths.

E.3. Report on consideration of comments received

As a whole, the stakeholders were very supportive for the proposed CDM project activity and no negative comments and no critical issues were raised for implementing the project.

SECTION F. Approval and authorization

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Letter of Approval from each Party to be involved in the project activity will be made available at the time of submitting the PDD to the validating DOE.

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Appendix 1: Contact information of project participants

Organization	Department of Energy under the Ministry of Lands and Natural Resources (MLNR)
Street/P.O. Box	Vanuatu
Building	Department of Energy
City	Port Vila
State/Region	
Postcode	PMB 9067
Country	Vanuatu
Telephone	+678 25201
Fax	+678 5333840
E-mail	lmoli@vanuatu.com.vu
Website	
Contact person	
Title	Mr
Salutation	
Last name	Moli
Middle name	
First name	Leo
Department	Department of Energy under the Ministry of Lands and Natural Resources (MLNR)
Mobile	
Direct fax	
Direct tel.	
Personal e-mail	

Appendix 2: Affirmation regarding public funding

The project activity does not involve any public funding. Declaration fro same will provided at time of validation

Appendix 3: Applicability of selected methodology

Applicability of selected methodology is discussed in section B.2 of PDD. The project activity meets the applicability criteria of the methodology.

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

Not Applicable

Appendix 5: Further background information on monitoring plan

The monitoring information for the project has been included in section B.7.2 of the document

Appendix 6: Summary of post registration changes

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History of the document

Version	Date	Nature of revision
04.1	11 April 2012	Editorial revision to change history box by adding EB meeting and annex numbers in the Date column.
04.0	EB 66 13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the project design document form for small-scale CDM project activities" (EB 66, Annex 9).
03	EB 28, Annex 34 15 December 2006	· The Board agreed to revise the CDM project design document for small-scale activities (CDM-SSC-PDD), taking into account CDM-PDD and CDM-NM.
02	EB 20, Annex 14 08 July 2005	· The Board agreed to revise the CDM SSC PDD to reflect guidance and clarifications provided by the Board since version 01 of this document. · As a consequence, the guidelines for completing CDM SSC PDD have been revised accordingly to version 2. The latest version can be found at <http://cdm.unfccc.int/Reference/Documents>.
01	EB 07, Annex 05 21 January 2003	Initial adoption.
Decision Class: Regulatory **Document Type:** Form **Business Function:** Registration		