**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	Rural Electrification Project for Clean Energy, Better Living and Sustainable Growth in Bhutan
Version number of the PDD	01.0
Completion date of the PDD	21/12/2012
Project participant(s)	Bhutan Power Corporation Limited (BPC)
Host Party(ies)	Bhutan
Sectoral scope(s) and selected methodology(ies)	Sectoral scope 2: Energy Distribution AMS-III.AW. "Electrification of rural communities by grid extension", ver. 01.0
Estimated amount of annual average GHG emission reductions	19,259 tCO_2

SECTION A. Description of project activity
A.1. Purpose and general description of project activity

The CDM project "Rural Electrification Project for Clean Energy, Better Living and Sustainable Growth in Bhutan" (hereafter called the "Project" or "Project Activity") is implemented by the Bhutan Power Corporation Limited ("BPC"), a Royal Government of Bhutan (RGoB) owned corporation who solely manages the transmission and distribution of electric power in the country.

Bhutan is well known for its rich renewable energy potential, especially hydropower. The national grid of Bhutan is supplied by four large HPPs, namely Chhukha HPP (CHP, 4 units x 84 MW), Basochu HPP (BHP, 2 units x 12 MW and 2 units x 20 MW) and Tala HPP (THP, 6 units x 170 MW) in the west of the country and Kurichu HPP (KHP, 4 units x 15 MW) in the east, as well as by six small HPPs[1]. Bhutan has been exporting for many years surplus electricity to neighbouring India, thus contributing to the reduction of GHG emissions of that country. The rural communities in Bhutan, however, have not received the benefits of the Bhutan's vast renewable energy potential. Despite the existence of the grid and several stand alone off-grid facilities, the electrification rate in the country remains as low as 54%. In non-electrified rural areas, conventional fuels such as kerosene, diesel, LPG, and candles, are used for lighting, heating, and other purposes that could be served by electricity.

In order to promote rural electrification, in 2001 the Royal Government of Bhutan (RGoB) requested Japanese Government for assistance in developing a master plan for rural electrification until 2020. The request was granted and in 2005 the master plan was completed. The master plan identified over 33,000 households in 1,716 non-electrified villages as targets for the rural electrification. The master plan also recommended using the CDM for supporting the rural electrification as an integral part of this Project.

The purpose of the Project Activity is to promote electrification of remote rural areas in the Kingdom of Bhutan that are currently supplied by stand-alone fossil fuel fired mini-grids or individual fossil fuel generators, or have no access to electricity at all, and, through the extension of existing low carbon electricity distribution network, replace the fossil fuel-based energy in such rural areas with renewable energy-based grid electricity and reduce the associated GHG emissions.

Scenario existing prior to the implementation of the Project Activity

Prior to the Project implementation, the power plants connected to the Bhutan national grid generate electricity and supply it to existing users or export it to India. The rural households in the villages covered by the Project either have no access to electricity or use fossil-fuel based electricity.

Baseline scenario

The baseline scenario is the GHG emissions from the use of fossil fuels in rural communities not connected to the grid to meet annual electricity demand of approximately 24,074 MWh, as described in equation (1) of AMS-III.AW., ver. 2. Further details on the baseline development are provided in Section B.4.

Project Scenario

The Project Activity will cover the whole territory of Bhutan. Distribution lines will be extended from the existing distribution network to the non-electrified villages. No new power plants will be built as part of

[1] Further information is provided in Appendix 3.

the Project. The extension of the distribution lines will not lead to any leakage due to deforestation, as further explained in Section B.6.1.

The Project Activity aims to achieve 100 % electrification rate in the country by providing electricity to more than 33,000 non-electrified households in rural areas. The Project is expected to result in 19,259 tCO_2e of emission reductions per year or a total of 134,813 tCO_2/yr during the first crediting period. The emission reductions achieved by the Project are additional, as the Project meets the additionality criteria in the "Guidelines for demonstrating additionality of microscale project activities", ver. 04.0., as further described in Section B.5.

The Project is a small-scale CDM project activity Type III: "Other project activities" and belongs to sectoral scope 2 (Energy Distribution). It will apply AMS-III.AW. "Electrification of rural communities by grid extension", ver. 01.0., which was based on a proposed new small-scale methodology SSC-NM0068 developed under the Project case by Mitsubishi UFJ Morgan Stanley Securities Co., Ltd. who is also the CDM advisor to this Project. The Project Activity eligibility is described in detail in Section B.2.

The Project Activity contributes to the sustainable development of Bhutan and improving the level Gross National Happiness as defined in the four strategic areas (the "pillars" of GNH) of the 10th FYP:

1) Sustainable and equitable socio-economic development

The Project significantly contributes to the development of rural areas in Bhutan by providing opportunities for their more equitable development, reducing poverty and narrowing the living standards gab between rural and urban areas.

2) Environmental Conservation

Many of the residents in the rural areas of Bhutan use firewood or fossil fuels for meeting their daily energy needs such as cooking, heating or lighting. The implementation of the Project will contribute to environmental conservation through allowing these needs to be met through use of carbon free renewable electricity, thus reducing deforestation, emissions of CO_2 from fossil fuel and firewood combustion and other negative environmental effects.

3) The preservation and promotion of culture

Bhutan possesses unique culture that has been preserved for many generations. Developing and preserving the traditional culture for the future, while promoting economic development and cushioning some of the negative impacts of modernization, is one of the priorities of Bhutanese government.

The promotion of rural electrification will allow various basic services to be met through the use of electricity. This will help residents in the Project areas to allocate more time engaging in cultural and social activities and preservation of traditional arts and crafts, that would otherwise be used for more time consuming wood collection, traditional cooking and other activities. Additionally, electrification will make rural areas more attractive and will contribute to slowing down the process of migration towards urban areas.

4) Good governance

Availability of electricity will allow Bhutanese households to gain more access to information, especially regarding various political processes within and outside their country, their political freedoms, and their role as citizens in a democratic society. Thus, the Project implementation will also contribute to improvement of good governance.

A.2. Location of project activity
A.2.1. Host Party(ies)

Kingdom of Bhutan

A.2.2. Region/State/Province etc.

The Project region is defined as the non-electrified areas in all the 20 *Dzongkhags* (administrative districts of Bhutan) listed in Table 1 below:

Table 1: List of *Dzongkhags* in Bhutan

	Dzongkhag		***Dzongkhag***
1	Lhuntse	11	Tsirang
2	Pemagatshel	12	Bumthang
3	Samdrup Jongkhar	13	Thimphu
4	Punakha	14	Gasa
5	Sarpang	15	Samtse
6	Trashigang	16	Trongsa
7	Wangdue Phodrang	17	Zhemgang
8	Mongar	18	Paro
9	Dagana	19	Haa
10	Trashiyangste	20	Chukha

A.2.3. City/Town/Community etc.

The non-electrified area in the 20 *Dzongkhags* of the country listed in the previous section.

A.2.4. Physical/ Geographical location

The Kingdom of Bhutan has an area of 38,394 km^2 and lies between 26°45'N to 28°14'N and 88°45'E to 92°10'E measuring about 170 km north to south and stretching roughly around 300 km east to west in dimension. The land rises from an elevation of about 160 m above sea level in the south to more than 7,550 m above sea level in the north.

The physical locations of all *Dzongkhag* are showed in Figure 1.

Figure 1: Physical Location of the Project

A.3. Technologies and/or measures

The Project involves extension of the existing low carbon electricity distribution network (part of the Bhutan national grid) within the Project boundary. Through the implementation of the Project, the low carbon electricity from the existing distribution network will replace fossil fuels that would have been consumed in the absence of the Project Activity to generate the equivalent quantity of energy.

Project Scenario

The Project Activity involves the construction of medium voltage (MV: 11 kV and 33 kV) distribution lines with a total length of approximately 900 km and 1,500 km respectively.

The Project Activity is planned to be implemented in two phases.

Phase I electrification of 17,379 households
Phase II electrification of 16,057 households

The number households targeted by the Project Activity under the master plan in each *Dzongkhag* are shown in table 2 below[2].

Table 2: Number of households planned to be electrified by the Project Activity

No	*Dzongkhag*	Number of Households		
		Phase I	**Phase II**	**Total**
1	Lhuntse	778	646	1,427
2	Pemagatshel	1,064	788	1,852
3	Samdrup Jongkhar	1,871	1,198	3,069
4	Punakha	215	16	231
5	Sarpang	794	946	1,740

[2] The number of households listed is based on the initial planning of the project activity. The actual number of households electrified by the project activity may be different from the numbers stipulated in the table. The actual figure will be reported in the monitoring report.

6	Trashigang	883	812	1,695
7	Wangdue Phodrang	337	683	1,020
8	Mongar	1,007	1,735	2,742
9	Dagana	2,554	1,258	3,812
10	Trashiyangste	847	494	1,341
11	Tsirang	2,591	1,141	3,732
12	Bumthang	591	0	591
13	Thimphu	0	17	17
14	Gasa	0	219	219
15	Samtse	2,223	2,707	4,930
16	Trongsa	1,142	301	1,443
17	Zhemgang	0	1,623	1,623
18	Paro	17	44	61
19	Haa	0	166	166
20	Chukha	465	1,260	1,725
Total		**17,379**	**16,057**	**33,436**

The energy-mass balance after the Project implementation and the sources of GHG emissions are shown in Figure 2 below.

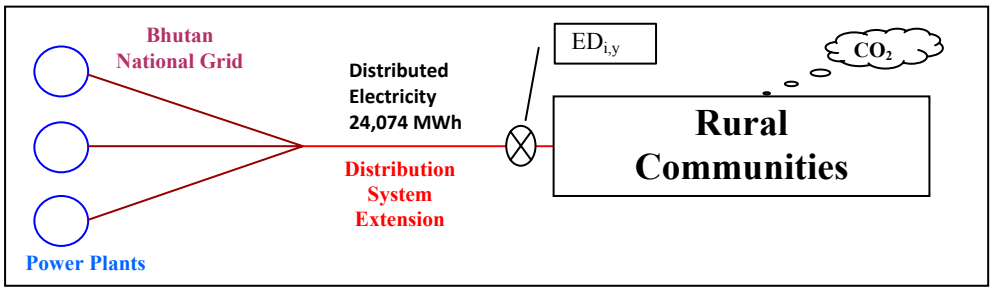

Figure 2: Energy-Mass Balance after the Project Implementation

After the Project implementation approximately 24,074 MWh/yr of renewable electricity will be distributed to more than 33,000 rural households in Bhutan. This will result in the substitution of fossil fuels for electricity generation and CO_2 emission reductions of approximately 19,259 tCO_2/yr during the first crediting period. The amount of distributed electricity $ED_{i,y}$ will be measured at each extension of the distribution system.

Baseline Scenario

In the baseline scenario the rural households targeted by the Project will use fossil fuels such as diesel or kerosene for electricity generation to meet the total annual demand of 24,074 MWh/yr of electricity. The energy mass balance in the baseline scenario is presented in Figure 3 below.

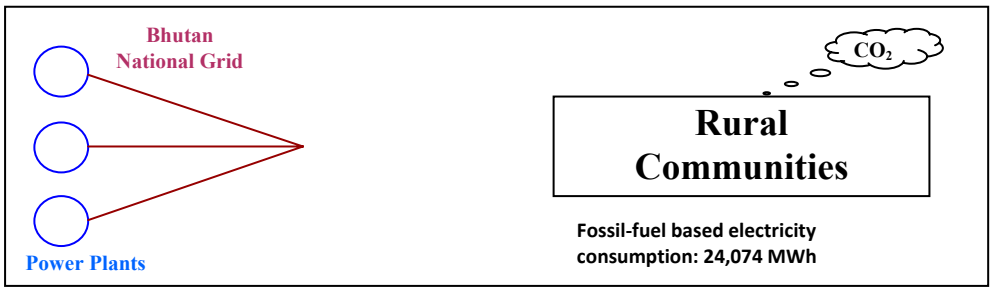

Figure 3: Energy-Mass Balance in the Baseline

In the baseline scenario, rural communities that are not connected to the electricity grid will consume approximately 24,074 MWh/yr of fossil fuel based electricity.

Situation prior to the Project Implementation

Prior to the Project implementation rural communities will have no access to distributed electricity or will use fossil fuels for electricity generation.

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)
Kingdom of Bhutan (Host)	Bhutan Power Corporation Limited	No

A.5. Public funding of project activity

The Project Activity has received public funding from the following Parties:

1) Japan International Cooperation Agency (JICA), Japan
2) Austrian Development Cooperation (ADC), Republic of Austria

The Project Activity does not result in the diversion of Official Development Assistance (ODA) as confirmed in the affirmations received from the relevant Parties. See Appendix 2 for details.

A.6. Debundling for project activity

The "Guidelines on assessment of debundling for SSC project activities" (ver. 3) are applied to determine that the SSC project activity is not a debundled component of a large scale project activity as follows:

1. Is there a registered SSC PA with the same project participants as the proposed SSC PA? – **No**, this is the first CDM project applying for registration where BPC is a project participant.

Then, as per the guidelines, the proposed SSC PA is not deemed to be a debundled component of a large project Activity and is eligible to use the simplified modalities and procedures for SSC PAs.

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

The baseline and monitoring methodologies applied for the Project is:

AMS-III.AW. "Electrification of rural communities by grid extension", ver. 01.0

B.2. Project activity eligibility

The Project meets all the applicability conditions listed in the methodology as follows:

Applicability conditions	Project
1. This methodology comprises electrification of a rural community through extension of a national grid/regional grid (grid hereafter).	The Project Activity involves the electrification of villages through extension of the existing low carbon electricity distribution network in Kingdom of Bhutan.
2. The applicability is limited to households and users that do not have access to a grid.	The Project is to provide access to electricity to the communities where there is no access to a grid prior to the Project Activity.
3. Emission reductions can only be claimed if the share of electricity generation from renewable energy plants connected to the grid of the host country is greater than or equal to 99% in total electricity generation in the grid of that host country in each year during the crediting period.	The share of electricity generation from renewable energy plants connected to the grid in Bhutan is 100 % which is greater than 99% in total electricity generation in the grid in Bhutan. Supporting data is provided in Appendix 3. Electricity generation data by grid connected power plants will be monitored as per the monitoring plan in Section B.7.
4. Cross border electricity export and import by the host country is quantifiable, and the data on import/export is available to the project developer.	Cross border electricity export and import by the host country is quantifiable as per the BPC statistics, and the data on import/export is available to BPC. Bhutan is a net exporter of electricity, with a total of 5,269.69 GWh of net electricity exported in 2011 to the Assam Electricity Board and West Bengal Electricity Board, both in India. The relevant data for 2001 is provided in Appendix 3. Import and export data will be additionally monitored as per the provisions of the monitoring plan in Section B.7.
5. The project does not involve construction of new power plants/units, but involves only the extension of the existing power distribution network in the host country.	The Project does not involve construction of new power plants/units. Moreover, the Project involves only extension of existing power distribution network to supply electricity to remote rural areas in Bhutan.
6. The project does not displace existing renewable based mini-grid electricity. To ensure compliance with this condition, existing renewable based mini-grid system and their service area shall be identified and it is confirmed that the project does not	There are no renewable based mini-grid systems in Bhutan, therefore, the Project does not provide electricity to areas serviced by renewable based existing mini-grid system. However, there are stand alone HPPs, as described in Appendix 3. In case areas supplied by them are connected to the

provide electricity to the area serviced by the renewable based existing mini-grid system.	grid as part of the Project, adjustments will be made as per paragraph 14 of AMS – III.AW., ver. 01.0.
7. To avoid possible double counting of emission reduction claims from electricity generation companies, transmission companies, distribution companies, either all relevant parties are listed as participants to the project activity, or the project developer shall obtain a written consent from other relevant entities stating voluntary release of their right to develop CDM project activity and to claim emission reductions from the same electrification project activity. End users of the electricity distributed as a result of project activity are not eligible to apply this methodology to claim emission reductions from consumption of electricity distributed by the project activity.	As per its statute, BPC is responsible for generation, transmission and distribution of electricity in Bhutan. There are no other relevant parties who could be listed as participants to the Project Activity. Additionally, end users will not claim emission reductions.
8. Measures are limited to those that result in emission reductions of less than or equal to 60 kt CO_2 equivalent annually.	The expected emission reductions from the Project Activity are approximately 19,259 tCO_2e annually, which is less than the limit of 60 $ktCO_2$ for Type III projects.

B.3. Project boundary

The spatial extent of the Project boundary encompasses the following:

(a) The spatial extent of the Project boundary includes all power plants within the host country physically connected through transmission and distribution lines to the national electricity system to which the CDM project is connected to;

(b) The physical sites of the households, public services and other facilities that are supplied with electricity by the Project Activity (i.e. project region).

An illustration of the Project boundary is provided in Figure 4 below.

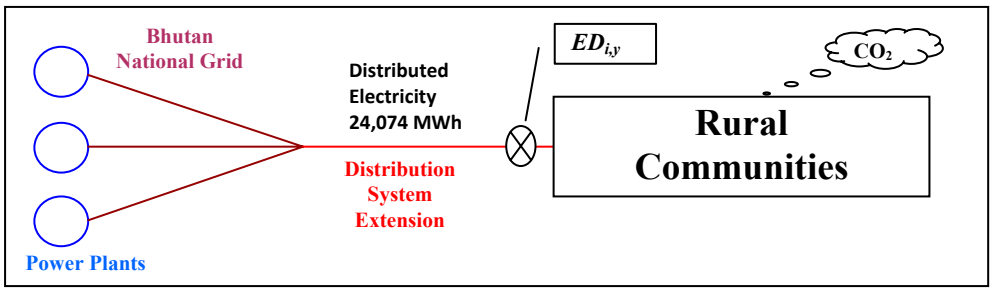

Figure 4: Project Boundary

The GHGs included in the Project boundary are shown in Table 3.

Table 3: GHGs Included in the Project Boundary

	Source	Gas	Included?	Justification/Explanation

Baseline Scenario	Fossil Fuel Consumption for electricity generation	CO_2	Yes	Main emission source
		CH_4	No	Conservative
		N_2O	No	Conservative
Project Scenario	Grid Electricity Consumption	CO_2	No	The grid is carbon neutral (HPP-based).
		CH_4	No	Negligible
		N_2O	No	Negligible

B.4. Establishment and description of baseline scenario

As prescribed in AMS-III.AW, ver. 01.0, 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 the equivalent quantity of energy.

Prior to the implementation of the Project Activity, communities within the Project region had no access to the electricity distribution network in Bhutan. In these communities, fossil fuels such as kerosene, diesel, LPG, and candles, are used for lighting, heating, and other purposes to meet the total demand of 24,074 MWh/yr of electricity. As the Project does not replace electricity from stand alone renewable energy generation facilities, the default emission factor of 0.8 tCO_2/MWh is used. Baseline GHG emissions are estimated to be 19,259 tCO_2/yr. The methodological choices for establishing the baseline are described in Section B.6.1.

All the data used for the establishment of the baseline scenario are presented in Table 4 below.

Table 4: Data used for Establishment of the Baseline Scenario

ID	Symbols	Data variable	Data Unit	Comment
1.	$EG_{renewable,y}$	Renewable electricity generated from existing stand-alone generation units in the Project region expected to be replaced by the Project Activity	MWh	0 No stand-alone renewable generation facilities are assumed to be connected to the distribution system. All stand alone renewable generation facilities are listed in Appendix 3.
2.	$ED_{i,y}$	Amount of electricity distributed by the extended electricity distribution system to the Project region *i* in year *y*	MWh	24,074 Source: BPC
3.	$EF_{CO_2,y}$	CO_2 emission factor	tCO_2e/MWh	0.8 Default value in AMS-III.AW, ver.01.0

B.5. Demonstration of additionality

Following paragraph 4(a) of the "Guidelines for demonstrating additionality of microscale project activities", Version 04, Type III project activities with emissions reductions not more than 20 $ktCO_2e/yr$ are additional if the geographic location of the project activity is in one of the Least Developed Countries or the Small Island Countries. As Bhutan is recognised by the UNFCCC as a Least Developed Country (LDC) and the estimated emissions reductions of the Project Activity are 19,259 $ktCO_2e$ per year during the first crediting period, which is less than 20 $ktCO_2e/yr$, the Project is considered additional.

Prior consideration of CDM

The start date of the Project is 25/07/2008; therefore, in accordance to paragraph 28 of the CDM-PS, for project activities with a start date before 02/08/2008 and prior to the date of publication of the PDD for global stakeholder's consultation, project participants have to demonstrate that the CDM was considered seriously in the decision to implement the proposed project activity. In order to demonstrate that, the the Project development timeline is provided below. It clearly shows that BPC was fully aware of the CDM and that the CDM was a decisive factor in implementing the Project, as well as those continuing and real actions were taken to secure the CDM status of the Project.

No.	Event	Date
1	Adoption of "Bhutan 2020: A Vision for Peace, Prosperity and Happiness" by the RGoB. The vision places significance on rural electrification in terms of poverty reduction and equalizing the urban and rural divergence.	02/05/1999
2	Request by the RGoB to the Government of Japan for assistance in the formulation of a master plan for rural electrification until 2020.	08/2001
3	Japan International Cooperation Agency ('JICA') dispatches a master plan study team to Bhutan.	12/2003
4	Preparation of the master plan	12/2003 – 11/2005
5	Completion of the final report for the master plan. **Section 9.6 of the master plan emphasizes the benefits from the utilization of the CDM and its application to the Project and recommends its serious consideration in the Project application.**	01/05/2005
6	Request by the RGoB to the Japan Bank for International Cooperation ('JBIC') for a loan to implement the on-grid electrification work in Bhutan's 10th FYP. **(Decision by the RGoB to go ahead with the Project.)**	05/2005
7	Acceptance of the master plan and transfer of its ownership to the Department of Energy, Ministry of Economic Affairs, RGoB	11/2005
8	Signing of a Loan Agreement between the JBIC[3] and the RGoB for implementation of the Project, as defined in the master plan, during the 10th FYP (2007 -2012).	09/05/2007
9	Contract agreement between Bhutan Power Corporation (as an executing agency of the JBIC Loan) and Nippon Koei Co., Ltd. for Project implementation consulting services.	15/01/2008
10	**First disbursement of funds under the JBIC loan. (Start date of the Project)**	**25/07/2008**
11	Loan negotiations with ADB for ADB-4 loan	15-18/09/2008
12	Loan, grant and Project agreements signing for ADB-4	13/02/2009
13	Memorandum of Understanding with JICA (as a loan owner) on receiving support for implementation of the Project as a CDM activity.	26/03/2009
14	Loan negotiations with ADB for ADB-5 loan	20-21/09/2010
15	**JICA hires Mitsubishi UFJ Morgan Stanley Securities Co., Ltd. (MUMSS) as a CDM consultant for the Project**	18/10/2010

[3] As part of the restructuring of the Japanese overseas aid, the loan is subsequently transferred to JICA.

16	Loan, Grants and Project Agreement Signing for ADB-5	13/12/2010
17	MUMSS submits a new draft methodology **SSC-NM0068** based on the Project case	27/06/2011
18	CDM Executive Board approves **AMS-III.AW. based on SSC-NM0068.**	02/03/2012
19	The Project receives support from the Global Environmental Center Foundation (GEC), Japan for the Project validation and registration.	20/06/2012

B.6. Emission reductions

B.6.1. Explanation of methodological choices

Baseline emissions

As stipulated in AMS-III.AW, ver. 01.0., the energy baseline of the Project is the fossil fuel consumption of the technology in use or that would have been used in the absence of the Project Activity to generate the equivalent quantity of energy.

The emission baseline based on the fuel consumed to generate equivalent quantity of electricity distributed by the Project Activity is calculated as follows:

$$BE_{CO2,y} = \sum_i ED_{i,y} * EF_{CO2} \quad (1)$$

Where:

$EB_{CO2,y}$	Emissions in the baseline in year y, tCO_2e/yr
EF_{CO2}	CO_2 emission factor, tCO_2e/MWh
$\sum_i$	The sum of the group of Project regions *i*
$ED_{i,y}$	Electricity distributed by the extended electricity distribution network to the Project region *i* in year *y*, MWh/yr

The Project Activity does not plan to replace electricity from renewable stand-alone facilities existing in the Project region. Therefore, CO_2 emission factor for the Project Activity is set to the default value (0.8 tCO2e/MWh) stipulated in the methodology.

However, after the Project implementation, the emission factor will be adjusted following the procedures outlined in AMS-III.AW ver. 01.0, in case where the Project replaces electricity from stand-alone renewable sources, as shown in equation (2) and (3):

$$EF_{CO2,y} = (1 - \beta) * 0.8 \quad (2)$$

$$\beta = EG_{renewable,y} / \sum_i ED_{i,y} \quad (3)$$

Where:

$EF_{CO2,y}$	CO_2 emission factor, tCO_2e/MWh
β	Discount fraction for electricity distributed by the Project Activity that replaces

	renewable electricity generated by the existing stand-alone renewable power generation units.
$EG_{renewable,y}$	Renewable electricity generated from existing stand-alone generation units in the Project region expected to be replaced by the Project Activity, MWh/yr
$\sum_i$	The sum over the group of Project regions *i*
$ED_{i,y}$	Electricity distributed by the extended electricity distribution system to the Project region *i* in year *y*, MWh/yr

A list of existing stand-alone renewable power generation facilities in Bhutan is provided in Appendix 3.

For the sake of PDD production,

$$\beta = 0$$

is assumed.

Project emissions

For the period where the host country is a net importer, the project emissions will be calculated for that period at least on a monthly basis using the equation (4) below. Project emissions are zero during the period the host country is net exporter.

$$PE_y = \sum_t^P ED_{i,t} \times EF_{CO2,import,y} \quad (4)$$

And

If $EG_{export,t} > EG_{import,t}$, then $EF_{CO2,import,y} = 0$ (5)

Where:

PE_y	Project emissions in year y, tCO_2e/yr
$EG_{import,t}$	Amount of electricity imported into the grid from other countries and monitored hourly or daily or monthly in a given year y, MWh
$EG_{export,t}$	Amount of electricity exported from the grid to other countries and monitored hourly or daily or monthly in a given year y, MWh
$ED_{i,t}$	Amount of electricity distributed by the extended electricity distribution system to project region *i*, monitored hourly or daily or monthly in a given year y, MWh
$EF_{CO2,import,y}$	CO_2 emission factor for the electricity the host country procured internationally, tCO_2e/MWh (default value of 1.3 tCO_2e/MWh)

As Bhutan has been a net exported of electricity, as shown in Appendix 3, for the sake of PDD production

$$PE_y = 0\ tCO_2e$$

is assumed.

Leakage emissions

As per AMS-III.AW, ver. 01.0, leakage on account of construction of new transmission/distribution lines (e.g. carbon stock loss due to deforestation) shall be calculated using the method indicated in baseline and monitoring methodology AM0045 "Grid connection of isolated electricity systems".

It has to be noted, however, that the constitution of Bhutan mandates that 60 % of forest coverage is maintained in the country. In line of that, Bhutan employs a strict system for forest management and tree distribution quotas. Although some trees will be felled as a result of the Project, these trees will be distributed to households and industries as part of the wood material distribution system in Bhutan. At the same time, other trees that in the absence of the Project would have been felled as part of the tree distribution quota, will not be felled. In this way the project leads to no deforestation and no leakage is accounted for.

Emission reductions

The emission reductions from the Project Activity (ER_y) are calculated as the difference between the baseline emissions ($BE_{CO2,y}$) and the project emissions ($PE_{CO2,y}$).

$$ER_y = BE_{CO2,y} - PE_{CO2,y} \qquad (6)$$

Where:

ER_y	Emission reductions in the year y (tCO_2e)
$BE_{CO2,y}$	Emissions in the baseline in the year y (tCO_2e)
$PE_{CO2,y}$	Project emissions in the year y (tCO_2e)

B.6.2. Data and parameters fixed ex ante

No data and parameters are fixed ex-ante. Therefore, this section is left blank.

B.6.3. Ex-ante calculation of emission reductions

Baseline emissions

As the Project connects the distribution system to no stand-alone renewable grids,

$$\beta = EG_{renewable,y} / \sum_i ED_{i,y}$$
$$= 0\ \text{MWh} / 24{,}074\ \text{MWh}$$
$$= 0$$

Then,

$EF_{CO2,y}$ = (1 - β) x 0.8 tCO_2e/MWh
= (1 - 0) x 0.8 tCO_2e/MWh
= 0.8 tCO_2e/MWh

And,

$BE_{CO2,y}$ = $\sum_i ED_{i,y}$ x EF_{CO2}
= 24,074 MWh x 0.8 tCO_2e/MWh
= 19,259 tCO_2e

Project emissions

As demonstrated using data for 2011 (Appendix 4),

$EG_{export,month} > EG_{import,month}$ (7)

is expected to hold for each month throughout a year *y*, then

$EF_{CO2,import,y}$ = 0 tCO_2e

Then,

$$PE_y = \sum_t^P ED_{i,t} \times EF_{CO2,import,y}$$

= 24,074 MWh x 0 tCO_2e/MWh
= 0 tCO_2e

Emission reductions

$ER_y = BE_{CO2,y} - PE_{CO2,y} = 19{,}259tCO_2 - 0tCO_2 = 19{,}259\ tCO_2$

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)
2013-2014	19,259	0	0	19,259
2014-2015	19,259	0	0	19,259
2015-2016	19,259	0	0	19,259
2016-2017	19,259	0	0	19,259
2017-2018	19,259	0	0	19,259
2018-2019	19,259	0	0	19,259
2019-2020	19,259	0	0	19,259
Total	134,813	0	0	134,813
Total number of crediting years	7			
Annual average over the crediting period	19,259	0	0	19,259

B.7. Monitoring plan

B.7.1. Data and parameters to be monitored

Data / Parameter	$ED_{i,y}$
Unit	MWh/yr
Description	Amount of electricity distributed by the extended electricity distribution system to the Project region *i* in year *y*
Source of data	BPC
Value(s) applied	24,074
Measurement methods and procedures	Measured with multiple electricity meters that are installed by BPC for monitoring of electricity distributed by the Project Activity (i.e. meters are installed for each household). The meters will be the same as the meters used for billing each household and the information will be collected by the billing department of BPC. All meters will belong to class 2 (accuracy of +/－2%). Applicable standards: IEC 60521, IEC 62053 No sampling will be used for determining the value of this data, as it will be based on the electricity sales records of BPC for each household. Validity of information source will be verified by DOE at the time of verification. Calibration record of electricity meters will be checked for a sample of meters selected using simple random sampling method or through the BPC calibration records for the meters.
Monitoring frequency	Measured continuously by energy meters, recorded at least monthly. Recorded data is aggregated and maintained by BPC
QA/QC procedures	Measured using calibrated electricity meter. Electricity meter will undergo calibration in accordance with and at frequency as specified in the requirements for the power sector in Bhutan.
Purpose of data	Calculation of baseline emissions and project emissions
Additional comment	-

Data / Parameter	$EG_{import,month}$
Unit	MWh/yr
Description	The amount of electricity the host country imported from other countries in year *y*
Source of data	BPC/DRE
Value(s) applied	3,408.020
Measurement methods and procedures	Data sourced from BPC/DRE
Monitoring frequency	Monthly
QA/QC procedures	-
Purpose of data	Calculation of project emissions
Additional comment	-

Data / Parameter	$EG_{export,month}$
Unit	MWh/y
Description	The amount of electricity the host country exported to other countries in year y
Source of data	BPC/DRE
Value(s) applied	5,273,100.043
Measurement methods and procedures	Data sourced from DRE/BPC
Monitoring frequency	Monthly
QA/QC procedures	-
Purpose of data	Calculation of project emissions
Additional comment	-

Data / Parameter	-
Unit	MWh/y
Description	Electricity generation in year y from all the power plants (renewable and others), that are within the host country, and are physically connected to the grid to which the CDM Project is connected to.
Source of data	BPC/DRE
Value(s) applied	7,066,447.115
Measurement methods and procedures	Data sourced from BPC/DRE
Monitoring frequency	Monthly
QA/QC procedures	-
Purpose of data	Confirmation of the methodology eligibility.
Additional comment	-

Data / Parameter	$EG_{renewable,y}$
Unit	MWh/yr
Description	Renewable electricity generated from existing stand-alone generation units in the Project region expected to be replaced by the Project Activity
Source of data	Power data issued by Department of Renewable Energy (DRE) or BPC
Value(s) applied	0
Measurement methods and procedures	Confirmation of the Project implementation data and grid connections. All meters will belong to class 2 (accuracy of +/－2%). Applicable standards: IEC 60521, IEC 62053
Monitoring frequency	Annually
QA/QC procedures	-
Purpose of data	Calculation of baseline emissions
Additional comment	-

B.7.2. Sampling plan

No sampling plan will be applied as part of the monitoring process.

B.7.3. Other elements of monitoring plan

Management structure of CDM project

In order to meet the CDM monitoring and reporting requirements, BPC will implement the following monitoring scheme.

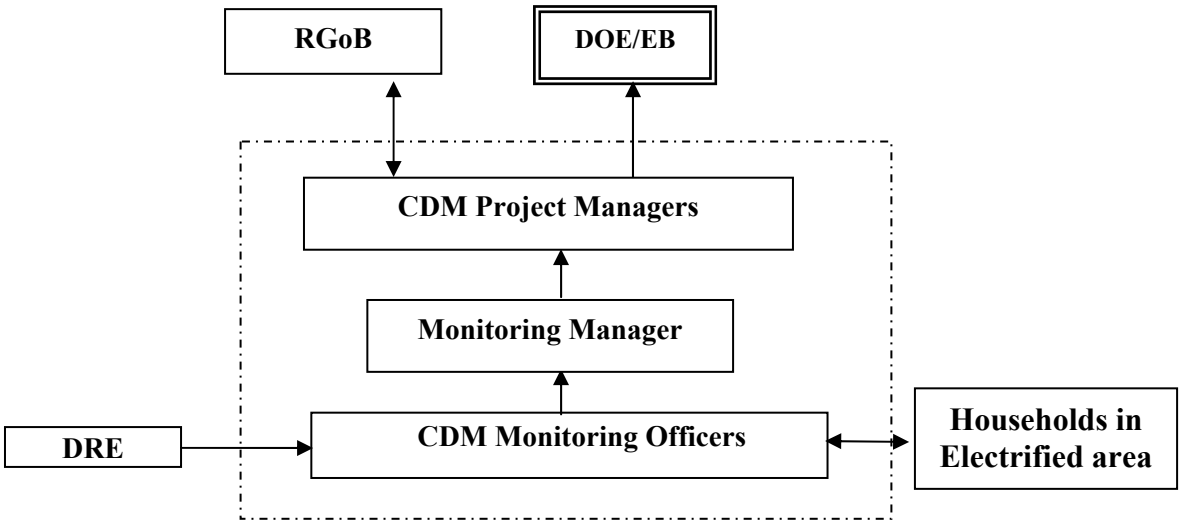

Figure 5: Monitoring, Operation and Management Scheme

1. Monitoring Officers (MO): The Monitoring Officers (MO) located in the field shall manage the daily operation and maintenance of the Project. Electricity meters for monitoring $ED_{i,y}$ will be installed at each household's premise. MO will be in charge of carrying out meter reading, issuing bills, and collecting the revenue based on the actual consumption of electricity. Therefore, MO will collect the data for $ED_{i,y}$ from the Project sites periodically and submit them to the Monitoring Manager through the

Electricity Services Divisions (ESD) of BPC or other department in charge of billing within BPC, together with information on the number of meters installed (N_{meter}).

2. Monitoring Manager (MM): The MM receives the report from the MO based on the monitoring plan. The Monitoring Manager (MM) will prepare regular monitoring reports (at tri-monthly) based on the information submitted by the MO and submit them to the CDM Project Manager.

3. CDM Project Manager (PM): The PM receives periodical reports from the Monitoring Manager and organizes it in the form of a "CDM Project Monitoring Report" to be submitted to the Designated Operation Entity (DOE). Also, the PM will manage the CDM Project coordination with the Bhutan Government and other stakeholders. Additionally, the PM will receive from the Department of Renewable Energy, MEA and generation departments of BPC monthly data on total electricity generation as well as on Bhutan's electricity export and import.

All collected data will be kept and archived electronically for two years after the end of each crediting period or after last CER issuance, whichever is later.

SECTION C. Duration and crediting period

C.1. Duration of project activity

C.1.1. Start date of project activity

25/07/2008

This is the date of the first disbursement of funds from then-JBIC (currently JICA) loan for the Project.

C.1.2. Expected operational lifetime of project activity

30 years

This is the maximum lifetime period for distribution projects as specified in Ar. 31. 1 of the Electricity Act of Bhutan (2001).

C.2. Crediting period of project activity

C.2.1. Type of crediting period

Renewable crediting period

C.2.2. Start date of crediting period

01/07/2013 or the date of registration whichever is later

C.2.3. Length of crediting period

7 years

SECTION D. Environmental impacts

D.1. Analysis of environmental impacts

The "Environmental Assessment (EA) Act 2000", together with the "Regulation for the Environmental Clearance of Projects" and "Regulation in Strategic Environmental Assessment" comprises the legislation

relating to environmental impact assessment (EIA) in Bhutan. The "Sectoral Guideline for Transmission and Distribution Lines" in its 2003 version defines the necessary information and shows the format to be used in applications for environmental clearance. Thus, for each site where rural electrification will occur, the Project should prepare applications for environmental clearance and submit them to the National Environment Commission of Bhutan (NEC) and receive the clearance of NEC. Additionally, whenever tree felling is involved, the particular site should receive forestry clearance, that specifies the exact number of trees that are allowed to be felled.

The Project has successfully obtained Environmental Clearances including Forest Clearances from NEC for the planned sites, concluding that the Project can satisfy the conditions defined in the Environmental Assessment Act 2000 and that negative environmental impacts will be mitigated and acceptable. Among others, the environmental clearances require that:

1) There is no change in the alignment of the distribution line from the one proposed in the environmental clearance application;
2) The holder is required to obtain minimum ground clearance;
3) Excavated materials are used for back-filling of the poles or are dumped at predesigned sites;
4) The holder should ensure that there is no spillage or roll-over of excavated materials.

Additionally, *Dzongkhag* environmental officer is put in charge with supervising the process.

Copies of environmental clearances are available to the DOE for review.

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

Comments from stakeholders were solicited as part of an extensive process from the preparation of the master plan to the start of construction.

Stage 1: Preparation of the Master Plan (2003 – 2005)

During the preparation of the master plan, a series of consultations in the form of workshops were conducted with relevant government officials, *dzongkhag* officers, BPC staff and other stakeholders. The workshops were conducted in Thimphu as well as in other cities. The first workshop series involved presentation on the approach on the preparation of the master plan and allowed stakeholders to receive information about the project implementation and the benefits that it will bring. The second series of workshops were targeted at the discussion on the progress of the development of the master plan. Finally, the last series of the workshops were conducted to present the results of the master plan to a wide range of stakeholders in all *dzongkhags* in Bhutan.

For all workshops the stakeholders were invites through personal invitations as well as through public announcements made by the then-Department of Energy (DOE). Additionally, information on the Project and the preparation of the master plan was regularly provided to the media.

Stage 2: Project implementation (from 2008 onwards)

Under Bhutan law, as part of the Project implementation, BPC had to obtain public clearance from the residents of all sites where the electrification took place. For that purpose, public hearing is organized in all villages, where the villagers are informed about the Project, its benefits and risks. At the end of the public consultation, public clearance signed by representatives of all households is issued.

Additionally, BPC organized a public awareness campaign throughout all dzongkhags. Information on the public meeting's date and time was spread through the local media, as well as banners and posters. And example of such banners in English and *Dzongkha* (Bhutan national language) is shown in Figure 6.

Figure 6: Public Awareness Campaign (Banners in English and *Dzongkha*)

The following points were discussed at each meeting:

- BPC's Vision & Mission ;
- Benefits from Rural Electricity scheme;
- The present responsibilities in achieving the RGoB target of providing Electricity to all by 2013;
- Cooperation from the Gups & participations from the beneficiaries during the entire implementation of RE works;
- Payment issues in case of labor contributions;
- Safety issues;
- Issues related to Right of Way;
- Safe handling of all RE- materials during implementation;
- Application of the CDM;
- Taking good ownership of the RE-infrastructures;
- Use of Electricity.

Figure 7: Photos from the Meeting in Khamdang Gewog

During the meetings, participants could express their views on and concerns about the Project. Attendance sheets were also kept and can be presented to the DOE upon request.

E.2. Summary of comments received

All the participants were supportive and no negative comments were received. Some participants wished to know how their livelihood will improve and what benefits electricity will bring. Other participants wished to learn more how the process of electrification will affect the traditional lifestyles of the local people.

E.3. Report on consideration of comments received

No negative comments or comments requiring further consideration were received.

SECTION F. Approval and authorization

The letter of approval from the DNA of Bhutan is not available at the time of submitting the PDD to the validating DOE.

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Appendix 1: Contact information of project participants

Organization	Bhutan Power Corporation Limited (BPC)
Street/P.O. Box	P.O.Box 580, Yarden Lam Road
Building	BPC Head Office
City	Thimphu
State/Region	
Postcode	
Country	Bhutan
Telephone	+975-2-325-095
Fax	+975-2-322-279
E-mail	
Website	www.bpc.bt
Contact person	
Title	Managing Director
Salutation	Dasho
Last name	Tamang
Middle name	
First name	Bharat
Department	
Mobile	
Direct fax	
Direct tel.	
Personal e-mail	

Appendix 2: Affirmation regarding public funding

Austrian
Development Agency

No. 2116-00/2011/1-LR/2012

Desk Officer: Gertrude Leibrecht
Extension: 2534

Royal Government of Bhutan
Ministry of Economic Affairs
Department of Renewable Energy
Post Box No. 266
THIMPHU; BHUTAN

Vienna, 5 November 2012

Confirmation on Non-diversion of Official Development Assistance

Dear Sir / Madam,

With this letter the Austrian Development Agency (ADA), the operational unit of the Austrian Development Cooperation, would like to confirm that is has provided financial assistance to the "Rural Electrification Project for Clean Energy, Better Living and Sustainable Growth in Bhutan".

However, the provided assistance does not constitute diversion of official development assistance and is to be separated from and not counted towards the financial obligations as a Party included in Annex I of the UNFCCC.

Yours sincerely,

Ambassador Brigitte Öppinger-Walchshofer
Managing Director

Department of Renewable Energy
Received on 7/11/12
Letter No. 366
Ministry of Economic Affairs

Austrian Development Agency,
the operational unit of the Austrian Development Cooperation
Zelinkagasse 2 • 1010 Vienna • Austria
phone: +43 (0)1 90399-0 • fax: +43 (0)1 90399-1290 • office@ada.gv.at • www.entwicklung.at
GmbH (company with limited liability) • FN 243529g • Commercial Court Vienna

Appendix 3: Applicability of selected methodology

1. Grid connected power plants in Bhutan

No.	Name of the Plant	Type	Total Installed Capacity (MW)	Annual Generation in 2011 (GWh)
1.	Chukha HPP (CHP)	hydro	336	1,774.43
2.	Kurichu HPP (KHP)	hydro	60	361.80
3.	Basochu HPP (BHP)	hydro	64	322.27
4.	Tala HPP (THP)	hydro	1,020	4,588.07
5.	Chumney mini HPP	hydro	1.50	2.738
6.	Rongchu mini HPP	hydro	0.20	0.482
7.	Thimphu mini HPP	hydro	0.36	1.470
8.	Gidakom mini HPP	hydro	1.25	6.006
9.	Rangjung mini HPP	hydro	2.20	8.809
10.	Hesothangkha mini HPP	hydro	0.30	0.372

2. Electricity Export and Import in Bhutan (2011)

Power Plant	Electricity Export (GWh)	Source	Electricity Import (GWh)	Net Electricity Export (GWh)
Chukha HPP (CHP)	1,709.61	Assam Electricity Board (AEB)	0.557	5,117.91
Tala HPP (THP)	3,408.85			
Kurichu HPP (KHP)	154.65	West Bengal Electricity Board	2.851	151.80
TOTAL	5,273.10		3.408	5,269.69

3. Stand-Alone Renewable Generation Facilities (HPP, 2011)

Dzongkhag Name	Plant Name	Installed Capacity (MW)	Operating Conditions
Bumthang	Ura	0.10	Operational
	Tamshing	0.06	Operational
Danga	Darachu	0.20	Under repair
Gelephu	Jigmecholing	-	Decommissioned
Lhuntse	Gangzur	0.12	Operational
Mongar	Khalanzi	0.39	Under repair
	Sengor	0.10	Operational (under DRE)
Trongsa	Sherubling	0.10	Operational
	Tangsibji	0.06	Operational
	Kuengarabten	0.06	Under repair
	Chendebji	0.07	Operational (under DRE)
Trashigang	Chenary	0.75	Under repair
Tsirang	Changchey	0.20	Operational
Wangdue	Rukubji	0.08	Operational
Zhemang	Tingtibi	0.20	Operational
	Kekhar	0.04	Operational

Source: BPC Power Data Book 2011

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

Monthly Electricity Export and Import in Bhutan in 2011

Table 5: Electricity Export in 2011

Energy Wheeled to Gencos in MU.				
CHP	THP	KHP	Total	
45.345826	46.224355	0.000000	91.570181	Jan
39.119488	24.763047	0.041573	63.924108	Feb
38.448198	23.466305	0.002139	61.916642	Mar
54.982925	49.605895	4.640862	109.229682	Apr
111.908970	167.274400	17.802110	296.985480	May
197.311794	400.359548	26.395246	624.066588	June
292.585590	720.620580	23.750774	1036.956944	July
283.245649	714.766616	26.169021	1024.181286	Aug
240.361487	633.461437	26.375056	900.197980	Sept.
217.841075	381.687322	20.797637	620.326034	Oct
115.988926	160.724363	8.611810	285.325099	Nov
72.467033	85.891252	0.061735	158.420020	Dec.
1709.606961	**3408.845119**	**154.647963**	**5273.100043**	Total

Table 6: Electricity Import 2011

Month	Energy purchased from ASEB kWh	Energy purchase from WBSEB (kWh)	Total Import (kWh)
Jan-11	46,510.00	0.00	46,510.00
Feb-11	44,820.00	335,460.00	380,280.00
Mar-11	46,010.00	213,450.00	259,460.00
Apr-11	45,020.00	253,640.00	298,660.00
May-11	42,850.00	193,500.00	236,350.00
Jun-11	40,470.00	286,345.00	326,815.00
Jul-11	46,200.00	270,450.00	316,650.00
Aug-11	53,070.00	169,635.00	222,705.00
Sep-11	41,020.00	390,495.00	431,515.00
Oct-11	51,970.00	230,915.00	282,885.00
Nov-11	54,520.00	233,980.00	288,500.00
Dec-11	45,030.00	272,660.00	317,690.00
Total:	**557,490.00**	**2,850,530.00**	**3,408,020.00**

Appendix 5: Further background information on monitoring plan

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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		