CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-PDD)
Version 03 - in effect as of: 28 July 2006

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SECTION A. General description of project activity

A.1. Title of the project activity:

Biomass power plant in Preah Vihear Province, Kingdom of Cambodia

A.2. Description of the project activity:

The proposed project activity introduces biomass power plants to utilize biomass fuel composed of Napier grass from the plantation cultivation and the woods from selective logging under forestry management scheme in the Eco-Village area, Preah Vihear Province. The total capacity of the power plants is almost 50MW. The power plants are co-generation plants to provide heat and power. The electricity generated by the project activity will be supplied the Eco-Village and the surrounding area which are also the unelectrified area with no any grid including transmission lines. The heat will be provided to the biomass storage facility to dry biomass fuel. The simplified schematic of the project activity is shown in Figure 1. The proposed project activity will build a mini-grid system including transmission lines and distribution lines in order to supply electricity.

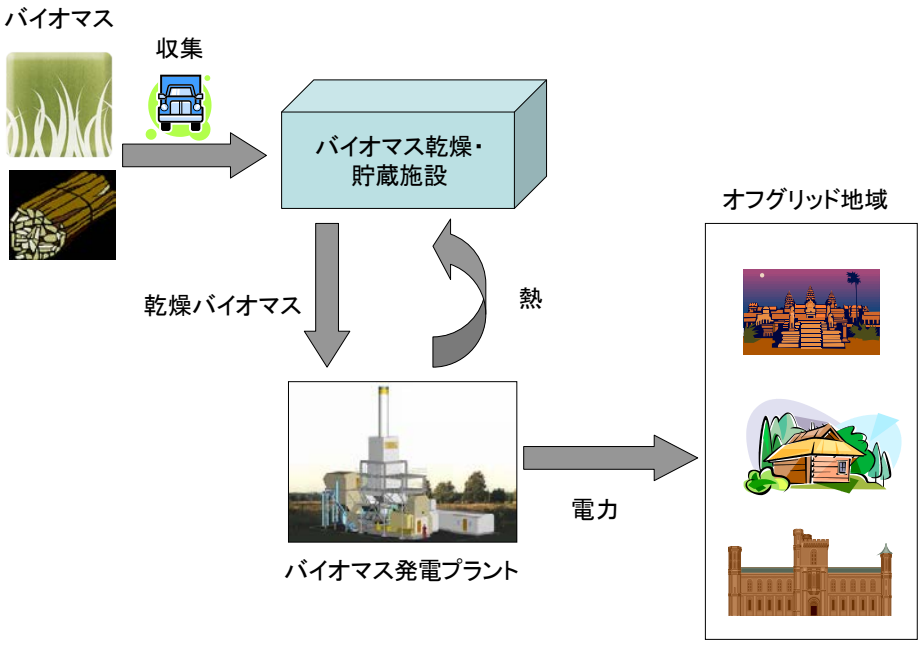


Fig1 Scheme of the proposed biomass power plant in the Eco-Village, Preah Vihear Province, Cambodia

The Preah Vihear Temple near the project site is one of the World Heritage sites. The surrounding area is designated as the specially controlled area to maintain the environment of the World Heritage site. The original inhabitants in the area had to move out of the area because of the management rules of World Heritage site. The Cambodian government assigned a place near the controlled area to move the original inhabitants there. The place was named as the Eco-Village. The Eco-Village and surrounding area are lack of the infrastructure for electricity, gas, water, etc. The electricity is very important to improve the

life of the people living in the Eco-Village, but based on the current Cambodian government plan, the electricity transmission lines and distribution lines will not be build in the area at least next ten years. The poor infrastructure of energy transportation in Cambodia leads to the high price of fossil fuel including diesel, heavy oil, gasoline, etc. There are hardly energy transportation infrastructures in the surrounding area of the project site. Therefore, biomass can be one of the better alternative energy in such an area. Napier grass, which grows naturally in the World Heritage site and was burned for slash-and-burn farming by the original inhabitants, is strong for arid climate and can be harvested a few times a year. Several kinds of broad-leaf trees also grow naturally in the same area without any control. They cause some problems and should be controlled. Selective cutting of those broad-leaf trees is one of the important control methods and generates woods difficult to utilize in high value added manner. To use those two biomass resources as fuel for power generation is the most valuable manner for the Eco-Village area. In the proposed project activity, the plantation of Napier grass and selective cutting of broad leaf trees will be implemented in a controlled manner in accordance with the master plan of the Preah Vihear area management and Eco-Village development. The plantation and selective cutting provide the people living in the Eco-Village with jobs. This activitiy generates a lot of benefits for the environment and society in the Preah Vihear area.

The proposed project activity will build power plants up to the total installed capacity of 50MW in un-electrified area and use the biomass as fuel from the plantation of Napier grass and selective cutting of broad-leaf trees. There are no approved methodologies applicable for such kind of project. Furthermore, there are many un-electrified areas with similar situation to the project site in Cambodia. In order to promote biomass CDM projects in such a area, we decided to develop a Standardized Baseline which can be applicable to similar projects to the proposed project activity. It is developed in accordance with the Guidance issued by UNFCCC and based on the data and information from the survey of electricity utilization in rural areas in Cambodia. Finally the CO2 emission of a diesel generator with installed capacity of 200kW is assumed to be a baseline scenario and the CO2 emission factor based on the scenario is estimated at 0.81 tCO2/MWh.

One of the Local IPP, Green Earth, and EDC (Electricite de Cambodia) are listed as candidate operators for the power plants installed by the proposed project activity. The final decision will be made under close consultation with the National Authority of Preah Vihear, the governing body of Eco-Village. The proposed project activity is aimed at starting in 2013.

A.3. Project participants:

Name of Party involved	Private and/or public project participants	Kindly indicate if the Party involved withes to be considered as project parcitipant
Kingdom of Cambodia (host)	Green Earth	No
Japan	Asuka Green Investment	No

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

A.4.1.1. Host Party(ies):

Kingdom of Cambodia

A.4.1.2. Region/State/Province etc.:

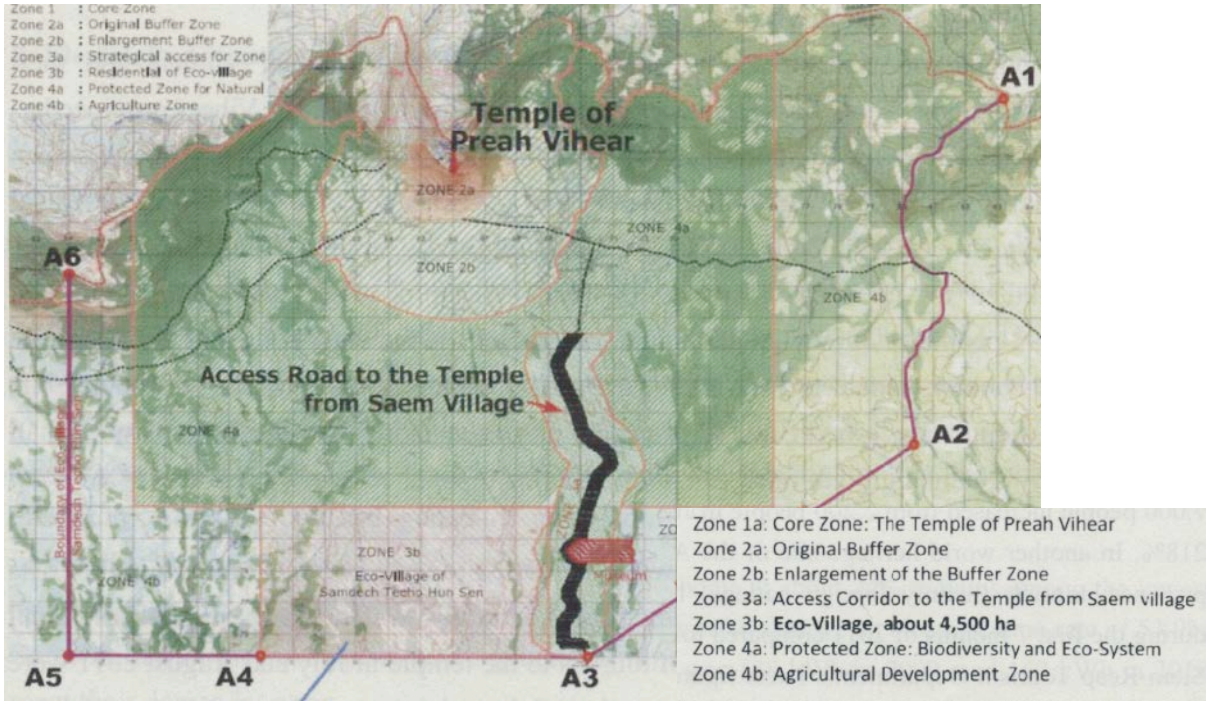
Preah Vihear Province

A.4.1.3. City/Town/Community etc.:

The Eco-Village

A.4.1.4. Details of physical location, including information allowing the unique identification of this project activity (maximum one page):

The project locates in Eco-Village, several kilometres from the World Heritage Site Preah Vihear Temple. The figure below shows the specific location.



A.4.2. Category(ies) of project activity:

The project activity falls into the Sectoral Scope 1:Energy Industry

A.4.3. Technology to be employed by the project activity:

In the proposed project activity, two kinds of technology to generate heat and power using biomass resources as fuel will be introduced. One is the biomass gasification co-generation system manufactured by Yanmar. The other one is the biomass co-generation system with internally circulating fluidized-bed boiler manufactured by Ebara Environment Plant Co., Inc.
The project site has a critical problem to introduce biomass power plants, especially a plant using steam turbine. Cambodia has clear rainy season and dry season. In dry season, all of the rivers and streams in the project site are dried up. Therefore, it is difficult to operate the large-scale power plant with a seam turbine in dry season. A large-scale biomass power plant with steam turbine is more efficient than a small-scale biomass gasification power plant. The biomass gasification co-generation system manufactured by Yanmar has an air cooling system and use only a little water, 15 L/day. But the size of series of the model is small and the maximum size is 320kW model. It is difficult to increase the total installed capacity costly in such a small size. The National Authority of Preah Vihear wants to introduce a large-scale and high-efficient biomass power plant. Therefore, they are going to implement a groundwater survey in Preah Vihear area including the project site to introduce a large-scale biomass power generation system with a steam turbine. The Yanmar biomass gasification co-generation system and Ebara biomass power plant with internally circulating fluidized-bed boiler are outlined below.

Air-cooling type biomass gasification co-generation system
The schematic of the air-cooling type biomass gasification co-generation system manufactured by Yanmar is shown in the following figure XX.

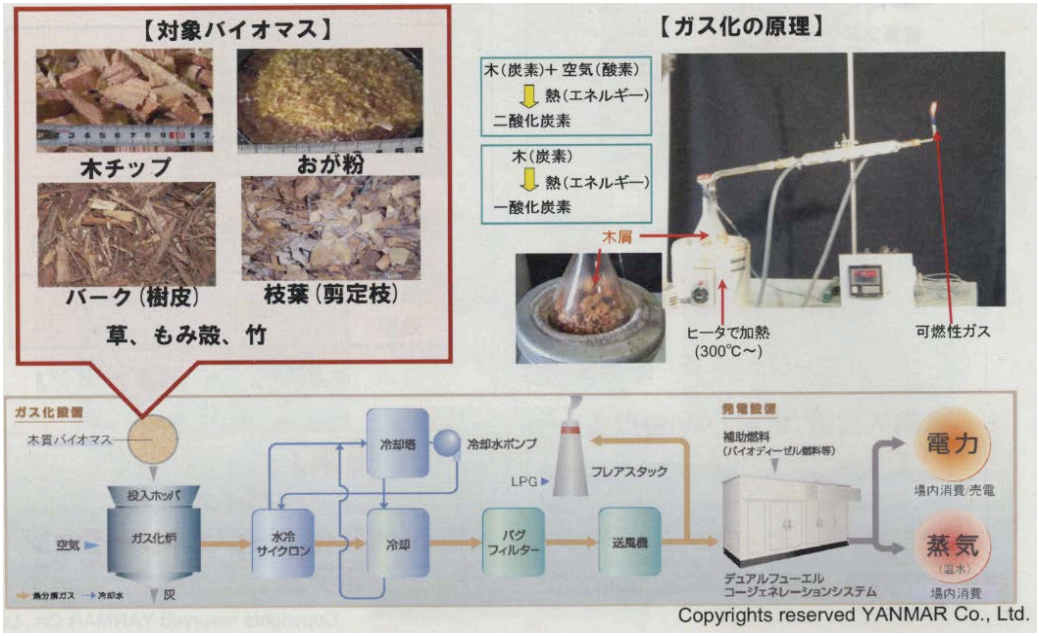


Figure XX Yanmar air-cooling type biomass gasification co-generation system

This system has the following favourable and useful characteristics:
- All of the components are made in Japan and it has a high reliability.
- It can use not only solid biomass fuel but also liquid fuel like a bio-diesel or light diesel oil.
- It is a air-cooling type and uses only a little water. It uses 15 L/day under normal operation and 150 L/day at the maximum under a abnormal situation.

- It is easy to start and stop. It can be started and stopped with only a button. It takes 30 minutes to reach the rated operation after start-up.
- Easy operation and maintenance. It needs maintenance every 6,000 hours. It is maintenance-free usually.
- It is a unit type integrated system for outdoor installation

"air-cooing type", "easy start-up and stop", and "easy operation and maintenance" of the above characteristics are suitable for not only the Eco-Village area (project site) but also the whole of Cambodia. In the local and rural area in Cambodia, there are "electricity shops" to charge a battery using a small diesel generator. This kind of shop operates a diesel generator only in the daytime usually. Because consumers in the project site are accustomed to such a situation, power generating system introduced in the early stage of the proposed project activity will be operated only in the daytime. The project site is lack of water in dry season. It is difficult to find persons with enough skill to operate power plants. Yanmar biomass gasification co-generation system can deal with such a situation in the project site.
The proposed project activity uses woody biomass from the selective cutting of broad-leaf trees. The woody biomass are cut in small pieces and processed into pellets. The incidental facilities of Yanmar system include biomass cutting machine, pelletizer and biomass warehouse. The biomass warehouse stores and dry biomass and use heat from Yanmar co-generation system to dry biomass.

Biomass co-generation system with internally circulating fluidized-bed boiler
If the development of the Eco-Village and surrounding area is progressed, the demand of electricity is increased to some extent, and large-scale ground water resource is discovered, high-efficient large-scale biomass power plant with steam turbine can be introduced. 10MW biomass co-generation system manufactured by Ebara Environment Plant Co.,LTD. is planned to introduce. It has the Internally Circulating Fluidized-Bed Boiler (ICFB) developed by the same company. Figure XX shows the outline of ICFB system.

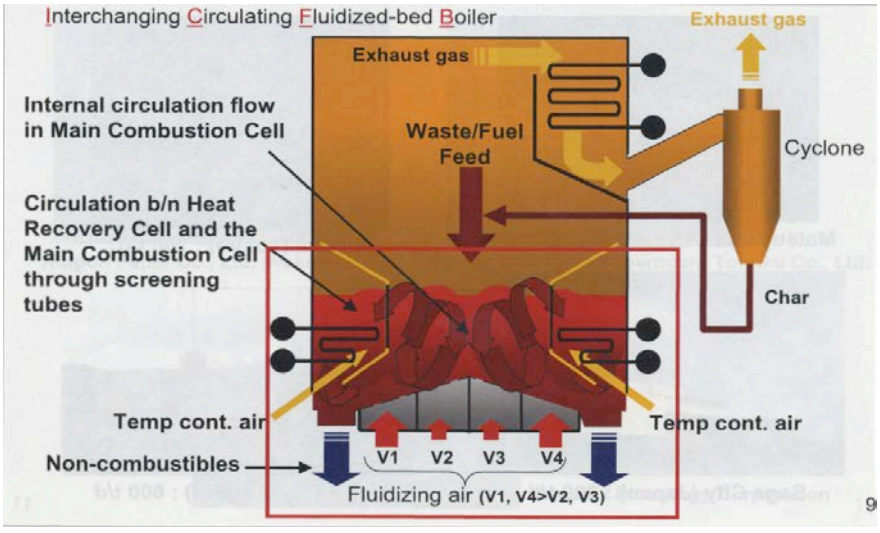


Figure XX Schematic of the Internally Circulating Fluidized-bed Boiler

ICFB has several excellent features as follows:

- It can be used various kind of fuel, including coal, industrial waste, biomass, etc. And also it can combust the mixture of them.
- It is easy to convert fuel type after construction finished.
- It is easy to take out unburnable materials included in industrial waste used as fuel.
- It can control quantity of heat transfer from a main combustion cell to heat recovery cell and regulate load easily because those two cell are separated physically.

The features of ICFB mentioned above are very useful for biomass combustion. In Japan, several biomass dedicated co-generation systems using ICFB have been installed already and show a good performance of annual operating time of 8,000 hours. The schematic of 10MW class biomass dedicated co-generation system is shown in Figure XX.

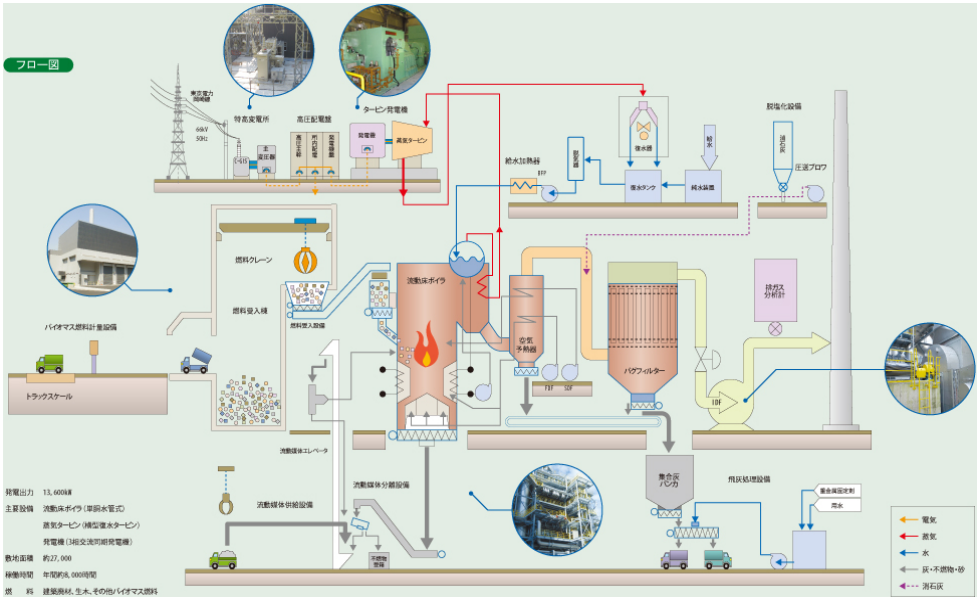


Figure XX Schematic of 10MW class biomass dedicated co-generation system

The system shown in the above figure uses a steam turbine and consumes 700 to 800 t of water per day. The water is consumed in the condenser system mainly. Since it takes the fluidized-bed of ICFB approximately 10 hours to reach a rated temperature, it takes the co-generation system almost 12 hours to reach a rated operation after start-up. Accordingly, it postulates the 24-hour continuous running. Therefore, stable demand of electricity in the project site is required in order to introduce this system. The co-generations system needs a biomass cutting machine and a biomass warehouse as incidental facilities. The warehouse uses the heat from the biomass co-generation system to dry biomass.

A.4.4. Estimated amount of emission reductions over the chosen crediting period:

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In the proposed project activity, two kinds of power plant will be introduced in step-by-step manner. The current plan to install the power plants is as follows:

First year: Three 320kW biomass co-generation systems introduced. (12 hours operation a day)

Second year: The above 320kW system operate 24hours a day
Third year: A 10MW biomass co-generation system introduced
Forth year: A new 10MW biomass co-generation system introduced. Total installed capacity 20MW
Fifth year: A new 10MW biomass co-generation system introduced. Total installed capacity 30MW
Sixth year: A new 10MW biomass co-generation system introduced. Total installed capacity 40MW
Seventh year: A new 10MW biomass co-generation system introduced. Total installed capacity 50MW
Eighth year and after: Total installed capacity 960kW + 50MW

Based on the above power plant installation scenario and the standardized baseline developed for the proposed project activity, the estimation of CO2 emission reductions is shown in the following table.

Table. XX GHG emission reductions by the proposed project activity

Year	GHG emission reductions (tCO2e)
1	2,711
2	5,422
3	59,538
4	113,655
5	167,771
6	221,887
7	276,004
8	276,004
9	276,004
10	276,004
Total for 10 years	1,674,998
Annual average for 10years	167,500
Total for first 7 years	846,988
Annual average for first 7 years	120,998

The amount of GHG emission reductions in the first crediting period of 7 years is estimated at 846,988 tCO2e and the annual average in the same period is 120,998 tCO2e/year.

A.4.5. Public funding of the project activity:

No ODA from Parties included Annex 1 will be involved in the project activities.

SECTION B. Application of a baseline and monitoring methodology

B.1. Title and reference of the approved baseline and monitoring methodology applied to the project activity:

NM00XX: “Electricity generation using biomass from dedicated plantation in isolated grids in Cambodia”

B.2. Justification of the choice of the methodology and why it is applicable to the project activity:

The application of the baseline methodology NM00XX to the proposed project is justified by satisfying the following conditions and the project:

- Project activities is installation of a greenfield renewable energy power plant and/or the establishment of an isolated grid and/or additions of renewable energy capacity;
- Biomass used by the project facility is not stored for more than one year;
- The dedicated plantation must be newly established as part of the project activity for the purpose of supplying biomass exclusively to the project;
- The biomass from the plantation is not chemically processed (e.g. esterification to produce biodiesel, production of alcohols from biomass, etc) prior to combustion in the project plant but it may be processed mechanically or be dried;
- The site preparation does not cause longer-term net emissions from soil carbon. Carbon stocks in soil organic matter, litter and deadwood can be expected to decrease more due to soil erosion and human intervention or increase less in the absence of the project activity;
- The land area of the dedicated plantation will be planted by direct planting and/or seeding;
- After harvest, regeneration will occur either by direct planting or natural sprouting;
- Grazing will not occur within the plantation;
- No irrigation is undertaken for the biomass plantations;
- The land area where the dedicated plantation will be established is, prior to project implementation, severely degraded and in absence of the project activity would have not been used for any other agricultural or forestry activity. The land degradation can be demonstrated using one or more of the following indicators:

  (a) Vegetation degradation, e.g.

  - *Crown cover of pre-existing trees has decreased in the recent past for reasons other than sustainable harvesting activities;*

  (b) Soil degradation, e.g.

  - *Soil erosion has increased in the recent past;*
  - *Soil organic matter content has decreased in the recent past.*

  (c) Anthropogenic influences, e.g.

  - *There is a recent history of loss of soil and vegetation due to anthropogenic actions; and*
  - *Demonstration that there exist anthropogenic actions/activities that prevent possible occurrence of natural regeneration.*

Furthermore, this methodology is only applicable if the most plausible baseline scenarios meet the proposed standardized baseline "Standardized baseline for off-grid biomass electricity generation in Cambodia".

In contrast with the condition of the project, it satisfies with all the requirements as follows:

Applicability	Proposed project activity
Project activities is installation of a greenfield renewable energy power plant and/or the establishment of an isolated grid and/or additions of renewable energy capacity;	The project is installation of a greenfield renewable energy power plant
Biomass used by the project facility is not stored for more than one year;	Biomass used is stored not more than one month even rainy season
The dedicated plantation must be newly established as part of the project activity for the purpose of supplying biomass exclusively to the project;	Plantation is newly established only for the project
The biomass from the plantation is not chemically processed (e.g. esterification to produce biodiesel, production of alcohols from biomass, etc) prior to combustion in the project plant but it may be processed mechanically or be dried;	Biomass from the plantation is not chemically processed.
The site preparation does not cause longer-term net emissions from soil carbon.	The site preparation does not cause longer-term net emissions from soil carbon.
The land area of the dedicated plantation will be planted by direct planting and/or seeding;	The land area of the dedicated plantation will be planted by seeding
After harvest, regeneration will occur either by direct planting or natural sprouting;	After harvest, regeneration will occur by direct planting
Grazing will not occur within the plantation;	Grazing will not occur within the plantation
No irrigation is undertaken for the biomass plantations;	No irrigation is undertaken for the biomass plantations
The land area where the dedicated plantation will be established is, prior to project implementation, severely degraded and in absence of the project activity would have not been used for any other agricultural or forestry activity. The land degradation can be demonstrated using one or more of the following indicators: *Vegetation degradation, e.g.* *Crown cover of pre-existing trees has decreased in the recent past for reasons other than sustainable harvesting activities;* *Soil degradation, e.g.* *Soil erosion has increased in the recent past;* *Soil organic matter content has decreased in the recent past.* *Anthropogenic influences, e.g.*	The land area where the dedicated plantation will be established is, prior to project implementation, severely degraded and in absence of the project activity would have not been used for any other agricultural or forestry activity in this project area.

There is a recent history of loss of soil and vegetation due to anthropogenic actions; and Demonstration that there exist anthropogenic actions/activities that prevent possible occurrence of natural regeneration.	

Therefore, the proposed project can be concluded that the methodology is applicable to the proposed project activity.

B.3. Description of the sources and gases included in the project boundary:

The greenhouse gases included in or excluded from the project boundary are shown in below table:

Source		Gas	Included ?	Justification / Explanation
Baseline	CO2 emissions from electricity generation in 200kW diesel oil power generator (in accordance with standardized baseline)	CO_2	Yes	The project substitutes for the electricity defined in standardized baseline.
		CH_4	No	Excluded for simplification. This emission source is assumed to be small
		N_2O	No	Excluded for simplification. This emission source is assumed to be small
Project activity	Off-site fossil fuel combustion for transportation of biomass to the project plant	CO_2	Yes	The project uses a lot of tracks to transport biomass from the plantation site and broad-leaf forest
		CH_4	No	Excluded for simplification. This emission source is assumed to be small
		N_2O	No	Excluded for simplification. This emission source is assumed to be small

B.4. Description of how the baseline scenario is identified and description of the identified baseline scenario:

According to NM00XX, baseline scenario is identified by applying to the standardized baseline "Standardized baseline for off-grid biomass electricity generation in Cambodia", which is electricity generation by ICE (Internal Combustion Engine) from diesel oil fuel with the installed capacity of 200kW.

B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered CDM project activity (assessment and demonstration of additionality):

The proposed project activity supplies electricity to the household in the Eco-Village and surrounding area, and tourist facilities such as museums and hotels which will be constructed near the area. The proposed project activity is carried out in un-electrified areas. The power plant introduced by the project has the installed capacity of 50MW and use biomass as fuel from the plantations of Nepier grass and selective cutting of broad-leaf trees.

According to NM00XX, the additionality of the project activity will be demonstrated through meeting the positive list in the standardized baseline "Standardized baseline for off-grid biomass electricity generation in Cambodia" as follows:

☐ Fuels and technologies are in the list:

- ✓ Fuels: woody biomass, grass, mix of woody biomass and grass
- ✓ Technologies: gas engine combustion, gas turbine combustion, direct combustion

Fuels are woody and grass biomass, and the technologies are direct combustion;

☐ The "Investment Analysis" of the project as indicated in "Tool for the demonstration and assessment of additionality" concludes that the project is not economically or financially feasible, without the revenue from the sale of certified emission reductions (CERs).

Economic data are summarized in the table below, including expenses related to biomass harvesting.

Item	Data	Remarks
Woody biomass purchases	2,050 USD / ha	quoted from the report of Associate Professor Sasaki
Herbaceous biomass purchases	380 USD / ha	quoted from the report of Associate Professor Sasaki
Labor cost	57 USD /mon	Cambodia Chamber of Commerce voluntary minimum wage
Transportation costs of biomass	10 USD / t	Estimates

Data are shown in below table economic 320kW cogeneration system for biomass gasification.

Item	Data	Remarks
Price of a cogeneration system	250,000,000 yen	Based on interviews with manufacturers
Pellet manufacturing equipment and shearing equipment	30,000,000 yen	Based on interviews with manufacturers

Fuel storage warehouse	20,000,000 yen	Based on interviews with local
Low-voltage power transmission	1 km	
Cost distribution line	620,000 yen	1USD = 80 and use the circle 1km = 7,750USD
Woody Biomass Unit	1,025 yen /t	Yield 160t 1ha, use a circle 1USD = 80
The amount of woody biomass per year	1,460t	
Fuel transportation costs	1,168,000 yen	Use of 1USD = 80 yen
Fuel procurement personnel	20	Five per 1t, 4t raising day, dry weight
Operating personnel	1 person	Based on interviews with manufacturers
Annual O & M expenses	10,000,000	Detailed annual overhaul, price discounts by manufacturers information
Annual operating hours	4,380 hours	12 hours a day, 365 days driving
Annual energy production	1,401,600 kWh	
Rate-house	20%	Mainly used for processing the biomass fuel
Annual energy sales	1,121,280 kWh	
Power price	48yen / kWh	0.6 USD / kWh

Economic data of 10MW biomass cogeneration system are shown in table below at the end.

Item	Data	Remarks
Price of a cogeneration system	4,000,000,000 yen	Based on interviews with manufacturers
Pellet manufacturing equipment and shearing equipment	1,000,000,000 yen	Based on interviews with manufacturers
Fuel storage warehouse	200,000,000 yen	Based on interviews with local
Transmission medium pressure	30km	
Transmission costs	24,000,000 yen	1km = 10000USD, use of 1USD = 80 yen
Low-voltage power transmission	30km	
Cost distribution line	1,860,000 yen	1USD = 80 and use the circle 1km = 7,750USD
Herbaceous Biomass Unit	760 yen / t	Yield 160t 1ha, use a circle 1USD = 80
The amount of woody biomass per year	264,000 t	
Fuel transportation costs	116,800,000	Use of 1USD = 80 yen

	yen	
Fuel procurement personnel	2,000	Five per 1t, 4t raising day, dry weight
Operating personnel	4 people	Based on interviews with manufacturers
Annual O & M expenses	100,000,000	Detailed annual overhaul, price discounts by manufacturers information
Annual operating hours	7,920 hours	12 hours a day, 365 days driving
Annual energy production	79,200,000 kWh	
Rate-house	15%	Mainly used for processing the biomass fuel
Annual energy sales	67,320,000 kWh	
Power price	24yen / kWh	0.6 USD / kWh

Based on the data described above, for both of 10MW co-generation system and 320kW biomass gasification co-generation system, internal rate of return in the year 20 (IRR: Internal Rate of Return) shows 13% in a unit. If you could sell the CER, (CER = 5EUR/tCO2, 1EUR = 100JPY), IRR is increased by 2% and rise up to 15%, which reaches the benchmark of Cambodia 15%. Without the CER revenue, this project is not economically feasible;

☐ There is no national or local enforced regulation mandating use of the technologies.

There is no enforced regulation mandating use of the biomass electricity generation in Cambodia;

☐ There is no national or local enforced regulation prohibiting use of the biomass as fuel.

There is no regulation prohibiting use of the biomass as fuel in Cambodia.

Therefore, it demonstrates the project is additional.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

Emissions reductions from the proposed project activity can be calculated based on the NM00XX: "Electricity generation using biomass from dedicated plantation in isolated grids in Cambodia". To calculate the emission reductions the equation below should be applied:

$$ER_y = BE_{,y} - PE_y$$

Where:

ER_y = Emissions reduction in year y (t CO_{2e})
BE_y = Emissions in the baseline scenario in year y (t CO_{2e})
PE_y = Emissions in the project scenario in year y (t CO_{2e})

In NM00XX, it is assumed that there is no leakage in the same kind of the proposed project activity.

B.6.2. Data and parameters that are available at validation:

Data / Parameter:	**EF_{sb}**
Data unit:	tCO_2/MWh
Description:	CO_2 emission factor in year y
Source of data used:	Standardized baseline
Value applied:	0.81
Justification of the choice of data or description of measurement methods and procedures actually applied :	Standardized baseline is applied.
Any comment:	-

B.6.3. Ex-ante calculation of emission reductions:

Greenhouse gas (GHG) emission reductions by the proposed project activity are calculated by subtracting Project emissions and Leakage from Baseline emissions. Baseline emissions are estimated based on the Standardized Baseline proposed by this project activity. Project emissions include CO2 emissions from the transportation for biomass collection. The leakage is not expected in the proposed project activity.

Currently, the scenario assumes the introduction of the generator is as follows:

- Year 1: Introduction of three 320kW class biomass gasification cogeneration systems, and they are operated for 12 hours a day
- Second year: Those cogeneration systems are for 24 hours a day
- Year 3: Additional introduction of 10MW class biomass co-generation systems. It is implemented 24-hour operation for 330 days
- Year 4: Add one unit of the same 10MW class system. Total capacity is 20MW
- Year 5: Add one 10MW unit as well. Total capacity is 30MW
- Year 6: Add one 10MW unit as well. Total capacity is 40MW
- Year 7: Add one 10MW unit as well. Total capacity is 50MW
- Eight years later: 960kW + 50MW total capacity in operation

Basic information is summarized in table below 320kW cogeneration system for biomass gasification.

Item	Data	Remarks
Installed capacity	320 kW	
Fuel consumption	8 t / day	Operation 12 hours a day, 4t dry weight

Rate-house	20%	Primarily used to fuel power production
Annual operating hours	4,380 hours	Operation 12 hours a day
Total annual power generation	1,401,600 kWh	
Annual energy sales	1,121,280 kWh	

Table below summarized basic information 10MW biomass cogeneration system.

Item	Data	Remarks
Installed capacity	10,000 kW	
Fuel consumption	800 t / day	Operation 24 hours a day, 4t dry weight
Rate-house	15%	Primarily used to fuel power production
Annual operating hours	7,920 hours	24 hours a day, 330 days of operation
Total annual power generation	79,200,000 kWh	
Annual energy sales	67,320,000 kWh	

Table below shows basic information about the truck to transport the biomass fuel.

Item	Data	Remarks
Carrying capacity	8 t / one truck	Quoted from the report of Sasaki Associate Professor
Fuel consumption	5 km / liter	Quoted from the report of Sasaki Associate Professor
Average travel distance	20km	Transport of biomass 8t, a conservative assumption
CO2 emissions per unit fuel	0.003128 tCO2/liter	Quoted from the report of Sasaki Associate Professor

Annual emissions of greenhouse gas emissions from biomass fuel truck when operated in accordance with the specifications of 320kW machine is

8 (t / day) / 8 (t /one) × 20 (km / unit) / 5 (km / liter) × 0.003128 (tCO2/liter) × 365 (day) = 4.6 tCO2

Annual emissions of greenhouse gas emissions from biomass fuel truck when operated in accordance with the specifications of 10MW machine is

800 (t / day) / 8 (t /one) × 20 (km / units) / 5 (km / liter) × 0.003128 (tCO2/liter) × 330 (day) = 412.9 tCO2

In addition to these values, off-grid power supply unit of CO2 emissions of the baseline standards that are proposed in this study using 0.81 tCO2/MWh, emission reduction projects if conducted in accordance with the above equipment deployment scenarios do the calculation. Calculation results are 4,435,034 t CO2e in 20 years.

B.6.4 Summary of the ex-ante estimation of emission reductions:

Year	GHG emission reductions（tCO2e）
Year 1	2,711
Year 2	5,422
Year 3	59,538
Year 4	113,655
Year 5	167,771
Year 6	221,887
Year 7	276,004
Year 8	276,004
Year 9	276,004
Year 10	276,004
20 year total	4,435,034
20 year average	167,500
First 7 years total	846,988
First average 7 years	120,998

B.7. Application of the monitoring methodology and description of the monitoring plan:

B.7.1 Data and parameters monitored:

Data / Parameter:	EG_y
Data unit:	kWh/y
Description:	Annual Net Electricity Generation
Source of data to be used:	Project Site
Value of data applied for the purpose of calculating expected emission reductions in section B.5	
Description of measurement methods and procedures to be applied:	Electricity Meters
QA/QC procedures to be applied:	
Any comment:	

Data / Parameter:	FC_y
Data unit:	L/kWh
Description:	Standardized Baseline Electricity Generation Fuel Consumption Rate
Source of data to be	Standardized Baseline

used:	
Value of data applied for the purpose of calculating expected emission reductions in section B.5	
Description of measurement methods and procedures to be applied:	Check the Latest Standardized Baseline Update Information
QA/QC procedures to be applied:	
Any comment:	Standardized Baseline is expected to be updated every 3 years.

B.7.2. Description of the monitoring plan:

The amount of electricity generated by the proposed project activity, the amount of electricity used for pre-treatment of biomass including cutting and pelletization, the amount of fossil fuel used for the transportation of biomass, and the global warming potential of the fossil fuel should be monitored by the project participants. In the proposed project activity, the amount of electricity supplied to consumers and the amount of biomass collected and consumed by category are also monitored.
Green Earth CO.,LTD or Electricite de Cambodia (EDC), which is a operator of the co-generation systems introduced by the project activity, is responsible for monitoring all of the data primarily. The National Authority of Preah Vihear (NAPV) is also responsible for the management of the project and project site.

B.8. Date of completion of the application of the baseline study and monitoring methodology and the name of the responsible person(s)/entity(ies):

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SECTION C. Duration of the project activity / crediting period

C.1. Duration of the project activity:

C.1.1. Starting date of the project activity:

The project is expected to start on 1/1/2013.

C.1.2. Expected operational lifetime of the project activity:

The project is expected to operate for 20 years.

C.2. Choice of the crediting period and related information:

C.2.1. Renewable crediting period:

C.2.1.1. Starting date of the first crediting period:

1/1/2013 or the date of registration, whichever is later.

C.2.1.2. Length of the first crediting period:

7 years

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

N/A

C.2.2.2. Length:

N/A

SECTION D. Environmental impacts

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D.1. Documentation on the analysis of the environmental impacts, including transboundary impacts:

The rules & regulations of Cambodia relevant to Environment Impact Assessment (EIA) mandate an EIA for power plants project with the installed capacity larger than 5MW. Therefore, it is a legal requirement to conduct an EIA for the proposed project activity. The procedure and timing of performing the EIA will be decided in close collaboration with the expected project owner Green Earth or EDC. In current stage, the major environmental impacts and other indirect impacts by the proposed project activity are considered as follows.

Exhausted gas from generators: Since the sulphur contents in biomass is regarded as very low, it is assumed that no sulphur oxides will discharge into air. In the meantime, due to the fact that there is no super high temperature burning in biomass power generation technology to be adopted in this project, no Nitrogen oxides are expected. Therefore, the environmental impact from exhausted gas is considered to be extremely low.

Biomass residue: landfill treatment using fertilizer, etc, are planned. Hence, no considerable environmental impact will be incurred.

Energy consumption by biomass drying process: Co-Generation technology is expected to be adopted and the heat it generates will be used to dry raw biomass. No extra energy is needed from external sources.

Water use: The electricity generator with the installed capacity of more than 10MW usually uses a steam turbine because of high-efficiency. Steam turbine system need a condenser which consumes a lot of

water to cool steam into water. Therefore, large amount of water is necessary for the plant to operate properly. Since there are no water resources like lakes or rivers to supply a lot of water in the project site and surrounding area in dry season. The proposed project activity is planning to use ground water for the power plant and to perform ground water survey in the near future. If the propose project activity use ground water, the project participants shall demonstrate that no impact on the surrounding environment by consumption of ground water.

Anyway, all of the activities for the project shall be implemented complied with the rules, regulation, and policies to manage the Preah Vihear Temple World Heritage area.

D.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

Based on the preliminary qualitative analyses, there expect to be no considerable environmental impact from this project.

SECTION E. Stakeholders' comments

E.1. Brief description how comments by local stakeholders have been invited and compiled:

The site visit in August 2011 for 10 residents living near the power plant construction site, and gather comments on the proposed project activity in an interview. Six of the respondents are farmers, two housewives, one policeman, and one soldier.

E.2. Summary of the comments received:

All of the respondents were in favour of power generation project and were willing to pay for electricity use. Many of respondents expected to save time and labour by the electricity use. Nine respondents expected that the proposed project activity contribute to local employment as other benefits. Main concern to all respondent is matter about the price of electricity.

E.3. Report on how due account was taken of any comments received:

The cost of power generation needs to be determined, taking into account the local market situation.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	
Street/P.O.Box:	
Building:	
City:	
State/Region:	
Postcode/ZIP:	
Country:	
Telephone:	
FAX:	
E-Mail:	
URL:	
Represented by:	
Title:	
Salutation:	
Last name:	
Middle name:	
First name:	
Department:	
Mobile:	
Direct FAX:	
Direct tel:	
Personal e-mail:	

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

Annex 3

BASELINE INFORMATION

Annex 4

MONITORING INFORMATION

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