



**Monitoring report form
(Version 05.1)**

Complete this form in accordance with the Attachment "Instructions for filling out the monitoring report form" at the end of this form.

MONITORING REPORT

Title of the project activity	Angkor Bio Cogen Rice Husk Power Project	
UNFCCC reference number of the project activity	0363	
Version number of the monitoring report	1.0	
Completion date of the monitoring report	26/12/2016	
Monitoring period number and duration of this monitoring period	Fourth (4 th) monitoring period From 01/08/2015 to 31/10/2016 (458 days)	
Project participant(s)	Angkor Bio Cogen Co., Ltd (Cambodia), Mitsubishi UFJ Morgan Stanley Securities Co., Ltd (Japan), Asian Development Bank as Trustee of the Future Carbon Fund, Swedish Energy Agency (Sweden)	
Host Party	Cambodia	
Sectoral scope(s)	Energy industries (Scope 1), Waste handling and disposal (Scope 13), Agriculture (Scope 15)	
Selected methodology(ies)	AMS-I.A. (Ver.7), AMS-III.E. (Ver.7), AMS-I.D (Ver.18)	
Selected standardized baseline(s)	Not applicable	
Estimated amount of GHG emission reductions or net GHG removals by sinks for this monitoring period in the registered PDD	64,772 tonnes CO ₂ (458 days) ¹	
Total amount of GHG emission reductions or net GHG removals by sinks achieved in this monitoring period	GHG emission reductions or net GHG removals by sinks reported up to 31 December 2012	GHG emission reductions or net GHG removals by sinks reported from 1 January 2013 onwards
	Not applicable	38,354 tonnes CO ₂ (from 01/08/2015 to 31/10/2016)

¹ The annual emission reduction in the registered PDD is 51,620 tCO₂/year. The estimated amount for this monitoring period is 64,772 tCO₂, which is derived from 51,620 tCO₂/365 days*458 days.

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

The purpose of the project activity is to install a 2 MW biomass power plant that utilises rice husk that would otherwise be left to decay as fuel in order to generate electricity and sell it to Angkor Kasekam Roongroeung Rice Mill (Angkor Rice Mill; AKR) in Kandal province in Cambodia. In addition, electricity generation from the project activity supplies electricity to the grid through power utility in Angsnoul District in Cambodia. The Project contributes to GHG emissions reduction by displacing diesel oil currently used for power generation at the rice mill. The Project also avoids methane emissions that would be produced from rice husk left to decay in the absence of the Project. It has been planned that Angkor Rice Mill sells a small amount of surplus electricity to neighbouring factories and community, however, a decision of Angkor Rice Mill to sell the surplus electricity to the community is positioned outside of the project boundary. The Project is the first renewable energy project to utilise rice husk as biomass fuel in Cambodia.

The technology employed for the project activity is the torbed process reactor technology selected after in-depth review of the suitability as well as maintenance and operation support given by manufacturer and supplier. This technology is designed by DGA, A Thailand-based contractor, based on a license from ERK Eckrohrkessel of Germany. The technology's characteristics include; 1) faster and more precise temperature control, 2) handling of irregularly shaped solid feed stocks which minimises feed stock shredding, chipping or mill, 3) low pressure drop allowing process gas recirculation for maximum turndown, 4) simple mechanics to operate, 5) small size with easy installation, 6) rapid start-up and configuration change, 7) no moving parts and 8) durable features in operation and maintenance. In addition, this technology produces amorphous ash with low carbon content (less than 2% carbon) as a by-product instead of the n-crystalline ash which is a carcinogenic substance. This feature contributes to the health and safety conditions to the operators working at the project site and the local residents in the vicinity.

The surplus steam generated by the Project is not used for power generation, but sent to the AKR for drying paddy. The rice paddy is presently placed on the ground and dried through its exposure to the sun. While utilisation of surplus steam does not lead to GHG emission reduction, it contributes to increased efficiency in paddy drying process.

The construction of the Project began on 01/07/2006. The project starting date was 22/05/2006 which was the date on which equipment purchase contract was signed and the commercial operation started on 23/10/2011. Besides, the project started to export the electricity to the grid through a power utility, namely Electricity Angsnoul Enterprise (EAE), on 10/07/2013.

The start date of the crediting period is 20/04/2011. The first monitoring report covers the period dating from 20/04/2011 – 31/05/2012 (408 days), second monitoring report covers the period dating from 01/06/2012-31/12/2012 (214 days), and third monitoring report covers the period dating from 01/01/2013-31/07/2015 (944 days). For this monitoring period, it is the fourth (4th) monitoring report and the actual duration of this monitoring period is 01/08/2015 – 31/10/2016 (458 days). Total emission reductions achieved in this monitoring period is 38,354 tonnes CO₂e.

A.2. Location of project activity

The Project is located in Kandal province in Cambodia. It is 23 km away from Phnom Penh, the capital of Cambodia. The geographical coordinates is latitude 11° 30' 46.6" and longitude 104° 43' 7.2" or 390751E and 1216161.4N.

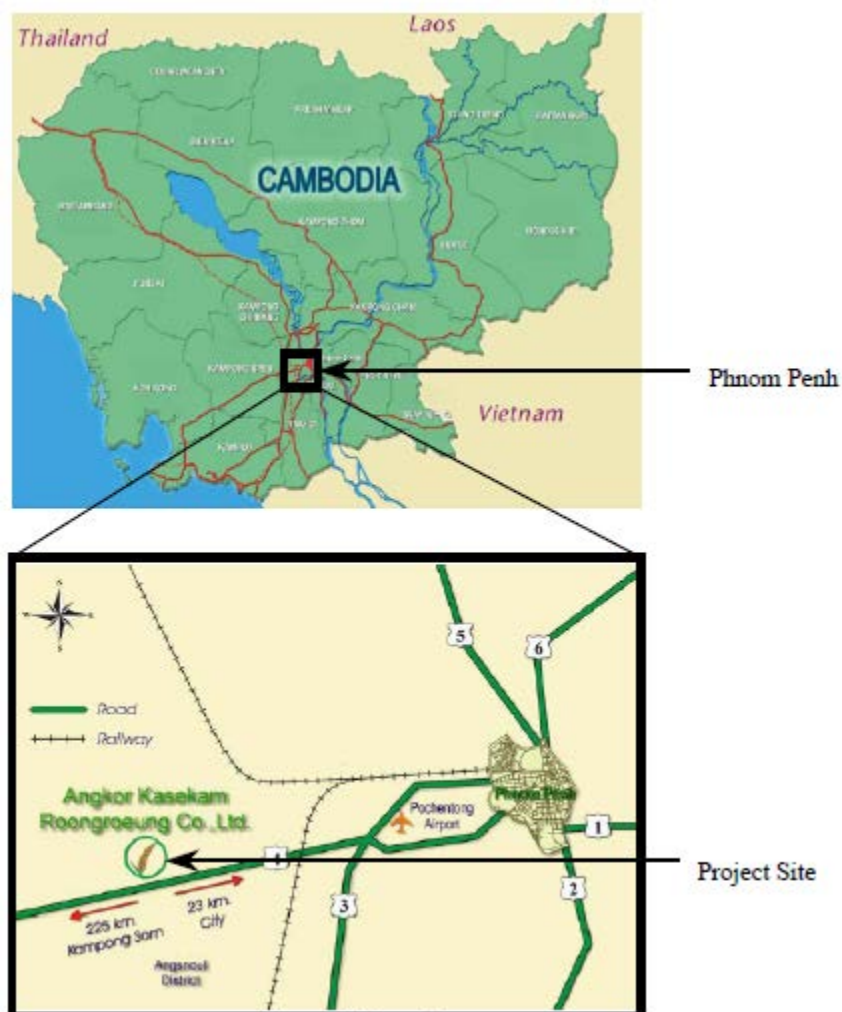


Figure 1. Location of the Project

A.3. Parties and project participant(s)

Party involved (host) indicates a host Party)	Private and/or public entity(ies) project participants (as applicable)	Indicate whether the Party involved wishes to be considered as project participant (yes/no)
Cambodia (host)	Angkor Bio Cogen Co., Ltd (ABC) (Private entity)	No
Japan	Clean Energy Finance Committee, Mitsubishi UFJ Morgan Stanley Securities Co., Ltd (MUMSS) (Private entity)	No
Sweden	Asian Development Bank, as Trustee of the Future Carbon Fund; Swedish Energy Agency (Public entity)	No

A.4. Reference of applied methodology and standardized baseline

In accordance with Appendix B of the simplified modalities and procedures for small-scale CDM project activities ("SSC M&P"), the proposed Project falls under the following types and categories:

AMS-I.A

Type I

: Renewable energy projects

Category A : Electricity generation by the user
Reference : Version 7, Scope 1, valid from Reference 27/11/2005 onwards

AMS-I.D

Type I : Renewable energy projects
Category D : Grid connected renewable electricity generation
Reference : Version 18, Scope 1, valid from Reference 28/11/2014 onwards

AMS-III.E

Type III : Other project activities
Category E : Avoidance of methane production from biomass decay through controlled combustion
Reference : Version 7, Scope 13 and 15, valid from Reference 27/11/2005 onwards

It is also included 'Tool to calculate project or leakage CO₂ emissions from fossil fuel combustion' (Version 02), 'Tool to calculate the emission factor for an electricity system' (Version 04), and 'Tool to calculate baseline, project and/or leakage emissions from electricity consumption (Version 01).

A.5. Crediting period of project activity

The starting date of the crediting period is 20/04/2011 and the end date of the crediting period is 19/04/2018. A renewable 7 year-crediting period is chosen for the project activity.

A.6. Contact information of responsible persons/entities

This monitoring report is prepared and completed by Mitsubishi UFJ Morgan Stanley Securities Co., Ltd. and it is one of project participants as detailed in Appendix 1.

SECTION B. Implementation of project activity**B.1. Description of implemented registered project activity**

A summary of the implementation status of the project activity covering this monitoring period is described below:

(1) Main equipment installed and operated at the Project

The technology employed at the project site is a torbed reactor designed by DGA, Thailand-based contractor, based on a license from ERK Eckrohrkessel of Germany. The capacities of the turbine and generator are 17 t/h and 2MW, respectively.

(2) The starting date of the project activity: 22/05/2006

(3) Project commercial operation starting date: 23/10/2011

(4) Project exporting electricity to the grid through the power utility: 10/07/2013

(5) Project does not involve with phased implementation and the project activities consist of only one site at the project site mentioned in section A.3.

(6) Actual operation of the project activity during this monitoring period

The details of actual operation during this monitoring period are as follows:-

List	Amount	Source/Remark
Gross Generation	8,587.034 MWh	-

Electricity Export to AKR	4,492.609 MWh	-
Electricity Export to the grid through the power utility	3,059.941 MWh	The facility to export electricity to the grid and imported electricity from the grid has been installed by the two-way electricity meter since 10 July 2013.
Electricity Import from the grid	379.027 MWh	
Parasitic load	1,413.511 MWh	-
Operating hours	7,680 hours	-
Outage hours	3,312 hours	-

The power plant's shut-downs occurred due to holidays (commonly, it continuously operates 12 days and has 4 days for holiday) and maintenance of power plant.

(7) Brief description of events or situations that occurred during the monitoring period, which may impact the applicability of the methodology and how the issues resulting from these events or situations are being addressed

The facilities for supplying electricity to neighbouring factories and community have not yet been installed. Therefore, electricity exported from the Project to neighbouring factories and community during this monitoring period is zero.

B.2. Post-registration changes

B.2.1. Temporary deviations from registered monitoring plan, applied methodology or applied standardized baseline

There was a temporary deviation of content of biomass analysis from 04 July 2012 until 18 February 2013. A request for deviation of energy content of biomass was requested to the CDM UNFCCC to apply the default Net Calorific Value (NCV) from the Table 1.2 of Chapter 1 of Vol.2 (Energy) of the 2006 IPCC Guidelines for National Greenhouse Gas Inventories default values as a conservative value, which it is in line with para 268-270 of Project Standard (Ver 07). This temporary deviation was approved on 08 September 2014 as per PRC ref No. PRC-0363-003.

B.2.2. Corrections

As per the approved PRC ref No. PRC-0363-003 dated 08 September 2014, the default Net Calorific Value (NCV) from the Table 1.2 of Chapter 1 of Vol.2 (Energy) of the 2006 IPCC Guidelines for National Greenhouse Gas Inventories default values has been conservatively chosen. The 'upper' limit of the uncertainty at a 95% confidence interval of 'other primary solid biomass', which falls under the fuel type of 'solid biofuels', is selected and the default value is 23 TJ/Gg or 23 MJ/kg. The default NCV value from IPCC 2006 was found appropriate and conservative since higher NCV results in higher project emission and less emission reductions. The temporary deviation for the registered monitoring plan (applying 23 TJ/Gg or 23 MJ/kg from IPCC default value) has been sought for the period from 04 July 2012 to 31 December 2012 for the approved 2nd issuance and additionally for the period from 01 January 2013 to 18 February 2013 of the 3rd monitoring period.

B.2.3. Changes to start date of crediting period

The start date of crediting period has been changed twice as follows.

- (1) The change to the start date of the crediting period from 21 Apr 2007 to 19 Apr 2009 was approved on 03/11/2009. A reference number was not made available by UNFCCC Secretariat.

- (2) The change to the start date of the crediting period from 19 April 2009 to 20 April 2011 was approved on 16 August 2012 as per PRC ref No. PRC-0363-001.

B.2.4. Inclusion of a monitoring plan to the registered PDD that was not included at registration

Due to small electricity requirement of AKR, the Project supplies surplus electricity generated from project activity to the grid. Surplus electricity after electricity generation from the project activity is supplied to AKR is exported to the grid through the power utility. The starting date of electricity supply to the grid through the power utility was on 10 July 2013. As a result of this, the permanent change to apply the methodology related to the grid connected renewable electricity generation and relevant tools as well as to include the monitoring of electricity generation supplied to/imported from the grid through the power utility has been incorporated in the registered PDD version 3.0 dated as of 11 August 2015.

The request for permanent change of registered PDD version 3.0 dated as of 11 August 2015 was approved on 25 January 2016 as per PRC ref No. PRC-0363-004, in order to include applied methodology AMS-I.D (Ver. 18) and monitoring parameters related to amount of electricity supplied to the grid and electricity imported from the grid in the registered PDD version 3.0.

B.2.5. Permanent changes from registered monitoring plan, applied methodology or applied standardized baseline

Permanent change from registered monitoring plan or applied methodology was requested to include the use of fossil fuel i.e. LPG for start-up operations at the project site. The permanent change was approved on 27 January 2014 by the UNFCCC as per PRC ref No. PRC-0363-002. In doing this, emissions due to fossil fuel consumption from the project activity are deducted from total emission reductions. This approach will result in accurate and conservative emission reductions during the crediting period.

B.2.6. Changes to project design of registered project activity

Not applicable

B.2.7. Types of changes specific to afforestation or reforestation project activity

Not applicable

SECTION C. Description of monitoring system

The boundary and overview of the Project is demonstrated in the Figure 2.

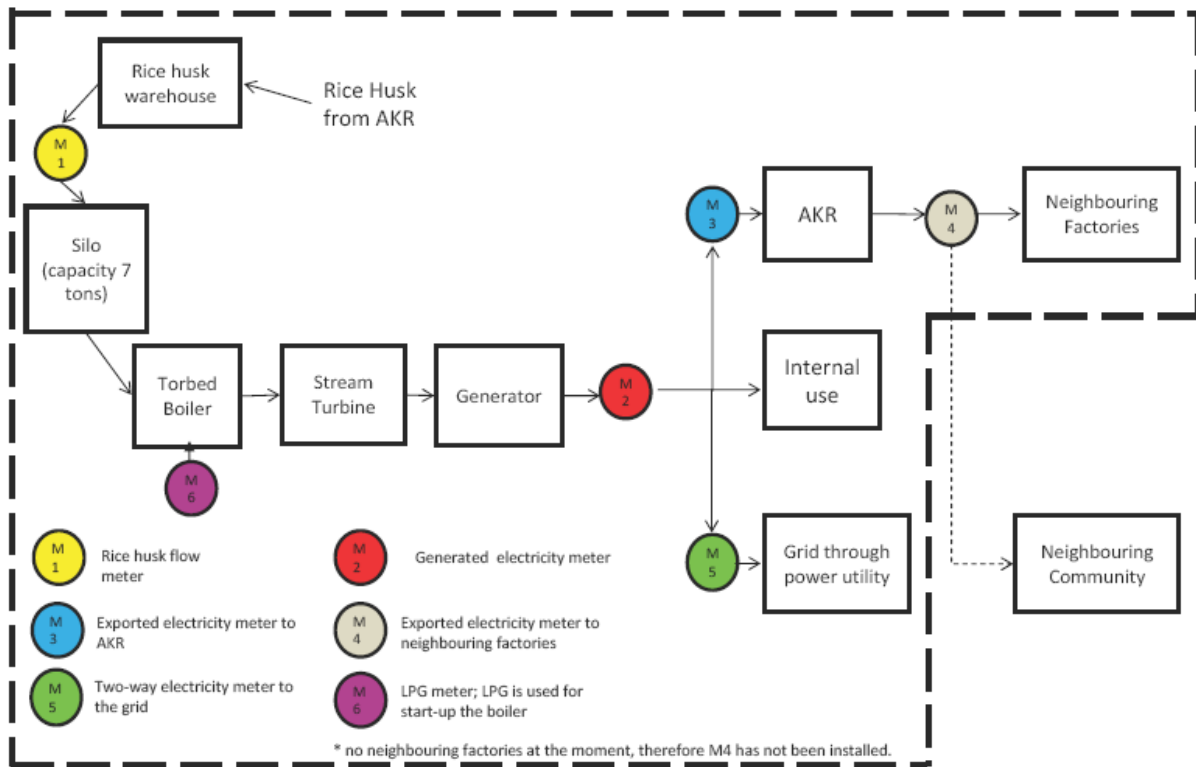


Figure 2. Schematic diagram of the project boundary

The main members of the organisation, shown in Figure 3, are Managing Director, Power Plant Manager, Operation Manager, Maintenance Manager, Shift Manager, Engineers, operators, and administrative staffs. Power plant Manager manages overall power plant operation and maintenance which under the supervision of Operation Manager and Maintenance Manager, respectively. Operators, who are under the supervision of Shift Supervisors, are assigned to monitor different parameters on a timely basis, as well as to record and archive data in an orderly manner. Monitoring log sheets are forwarded to and reviewed by Managing Director on a monthly basis in order to ensure the Project follows the requirements of the monitoring plan.

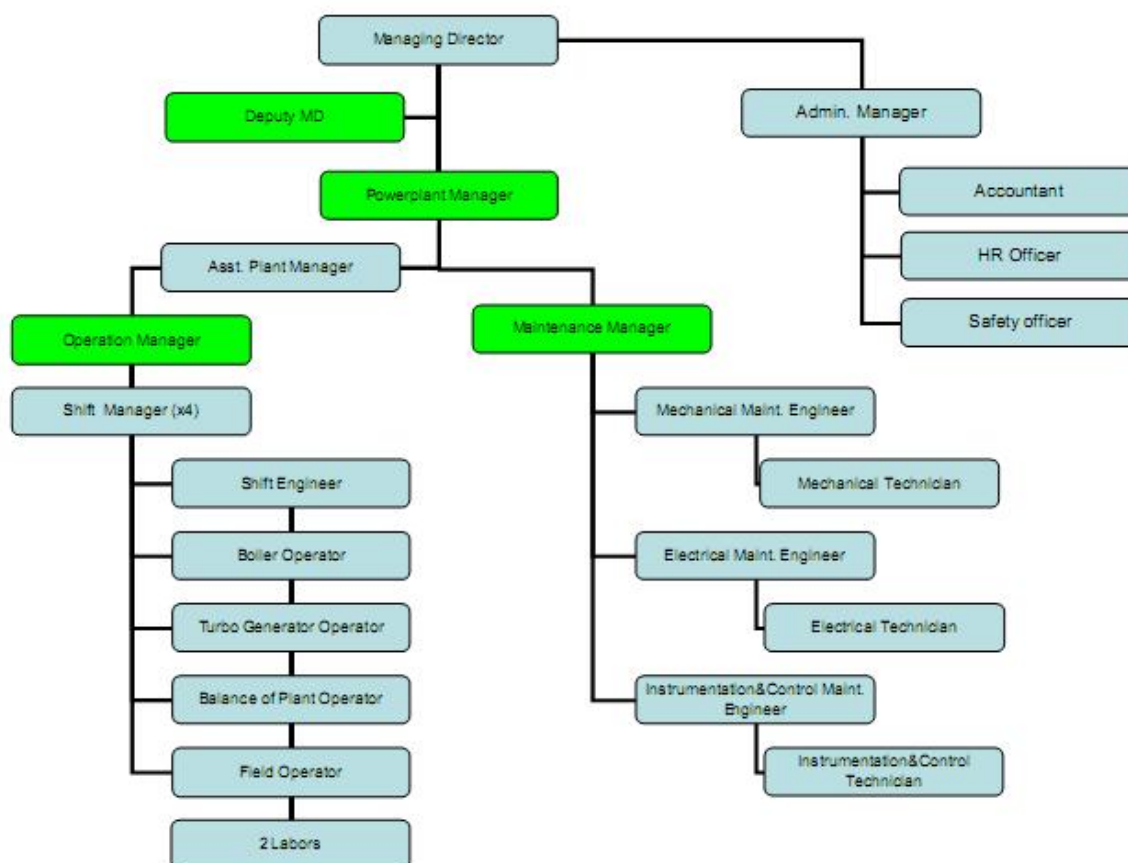


Figure 3 Organisation chart of the monitoring team for the CDM activity

All the parameters, including the default values such as the ones set forth by IPCC, are under the responsibility of ABC's Operation and Management teams.

Monitoring will be conducted with appropriate number of personnel for the tasks according to the operation and maintenance structure in Figure 3. Operation Manager will be the main person responsible for monitoring while the Maintenance Manager will be responsible for the maintenance of monitoring equipment. Both Operation Manager and Maintenance Manager report to Power plant Manager who ultimately reports to the Managing Director. Operation will be conducted in 4 shifts, each with 1 shift manager and 7 staff members.

SECTION D. Data and parameters

D.1. Data and parameters fixed ex ante or at renewal of crediting period

Data/parameter:	EF _{CO2}
Unit	kg CO ₂ e/kWh
Description	Default CO ₂ emission coefficient for the fuel displaced
Source of data	AMS-I.A (Ver.7)
Value(s) applied)	0.9
Choice of data or measurement methods and procedures	Default values in AMS-I.A (Ver. 7)
Purpose of data	Baseline emission calculations
Additional comments	The value is calculated as per the PDD. The value is set ex-ante.

Data/parameter:	/
Unit	-

Description	average technical distribution losses that would have been observed in diesel powered mini-grids installed by public programmes or distribution companies in isolated areas, expressed as a fraction
Source of data	AMS-I.A (Ver.7)
Value(s) applied)	0
Choice of data or measurement methods and procedures	The diesel power plant is located on-site, therefore the distribution losses is zero
Purpose of data	Baseline emission calculations
Additional comments	The value is set ex-ante.

Data/parameter:	MCF
Unit	-
Description	Methane Correction factor
Source of data	AMS-III.E (Ver. 7)
Value(s) applied)	0.4
Choice of data or measurement methods and procedures	Default value in AMS-III.E (Ver. 7)
Purpose of data	Baseline emission calculations
Additional comments	The value is set ex-ante.

Data/parameter:	DOC
Unit	-
Description	Degradable organic carbon
Source of data	AMS-III.E (Ver. 7)
Value(s) applied)	0.3
Choice of data or measurement methods and procedures	Default value in AMS-III.E (Ver. 7)
Purpose of data	Baseline emission calculations
Additional comments	The value is set ex-ante.

Data/parameter:	DOC _f
Unit	-
Description	Fraction DOC dissimilated to landfill gas
Source of data	AMS-III.E (Ver. 7)
Value(s) applied)	0.77
Choice of data or measurement methods and procedures	Default value in AMS-III.E (Ver. 7)
Purpose of data	Baseline emission calculations
Additional comments	The value is set ex-ante.

Data/parameter:	F
Unit	-
Description	Fraction of CH ₄ in landfill gas
Source of data	AMS-III.E (Ver. 7)
Value(s) applied)	0.5
Choice of data or measurement methods and procedures	Default value in AMS-III.E (Ver. 7)

Purpose of data	Baseline emission calculations
Additional comments	The value is set ex-ante.

Data/parameter:	$EF_{grid,OM,y}$
Unit	tCO ₂ e/MWh
Description	OM emission factor of Phnom Penh Electricity Grid
Source of data	Grid Emission Factor of the Phnom Penh Electricity Grid issued by Ministry of Environment Cambodia and Institute for Global Environmental Strategies in 2011
Value(s) applied)	0.6257
Choice of data or measurement methods and procedures	Specific national value as per the requirements in "Tool to calculate the emission factor for an electricity system" Version 4.0
Purpose of data	Baseline emission calculations
Additional comments	-

Data/parameter:	$EF_{grid,BM,y}$
Unit	tCO ₂ e/MWh
Description	BM emission factor of Phnom Penh Electricity Grid
Source of data	Grid Emission Factor of the Phnom Penh Electricity Grid issued by Ministry of Environment Cambodia and Institute for Global Environmental Strategies in 2011
Value(s) applied)	0.6878
Choice of data or measurement methods and procedures	Specific national value as per the requirements in "Tool to calculate the emission factor for an electricity system" Version 4.0
Purpose of data	Baseline emission calculations
Additional comments	-

Data/parameter:	$EF_{grid,CM,y}$
Unit	tCO ₂ e/MWh
Description	CM emission factor of Phnom Penh Electricity Grid
Source of data	Grid Emission Factor of the Phnom Penh Electricity Grid issued by Ministry of Environment Cambodia and Institute for Global Environmental Strategies in 2011
Value(s) applied)	0.6568
Choice of data or measurement methods and procedures	Specific national value as per the requirements in "Tool to calculate the emission factor for an electricity system" Version 4.0
Purpose of data	Baseline emission calculations
Additional comments	-

Data/parameter:	$TDL_{i,y}$
Unit	-
Description	Average technical transmission and distribution losses for providing electricity to source <i>j</i> in year <i>y</i>
Source of data	"Tool to calculate baseline, project and/or leakage emissions from electricity consumption"
Value(s) applied)	20%
Choice of data or measurement methods and procedures	Default value in the tool
Purpose of data	Project emission calculations

Additional comments	As the project activity fits to scenario A, the default value of 20% for project electricity consumption source is applied. This is consistent with the tool.
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D.2. Data and parameters monitored

Data/parameter:	D.3-1																															
Unit	MWh																															
Description	Total amount of electricity generation from the project activity																															
Measured/calculated/default	Measured																															
Source of data	Meter reading																															
Value(s) of monitored parameter	8,587.034																															
Monitoring equipment	<table> <tr> <td>Device name</td><td>Electrical Power Meter</td></tr> <tr> <td>Serial No.</td><td>4C977606</td></tr> <tr> <td>Instrument type</td><td>Electricity Meter</td></tr> <tr> <td>Manufacturer</td><td>Schneider Electric</td></tr> <tr> <td>Accuracy class</td><td>Class 1</td></tr> <tr> <td>PT Ratio and CT Ratio</td><td>n/a</td></tr> <tr> <td>4th Calibration/Test report reference ID</td><td>793</td></tr> <tr> <td>Date of 4th Calibrated/Test</td><td>23/09/2014</td></tr> <tr> <td>4th Calibration validity</td><td>20/09/2015</td></tr> <tr> <td>5th Calibration/Test report reference ID</td><td>1023</td></tr> <tr> <td>Date of 5th Calibrated/Test</td><td>20/09/2015</td></tr> <tr> <td>5th Calibration validity</td><td>16/09/2016</td></tr> <tr> <td>6th Calibration/Test report reference ID</td><td>1302</td></tr> <tr> <td>Date of 6th Calibrated/Test</td><td>16/09/2016</td></tr> <tr> <td>6th Calibration validity</td><td>16/09/2017</td></tr> </table>		Device name	Electrical Power Meter	Serial No.	4C977606	Instrument type	Electricity Meter	Manufacturer	Schneider Electric	Accuracy class	Class 1	PT Ratio and CT Ratio	n/a	4th Calibration/Test report reference ID	793	Date of 4 th Calibrated/Test	23/09/2014	4 th Calibration validity	20/09/2015	5th Calibration/Test report reference ID	1023	Date of 5 th Calibrated/Test	20/09/2015	5 th Calibration validity	16/09/2016	6th Calibration/Test report reference ID	1302	Date of 6 th Calibrated/Test	16/09/2016	6 th Calibration validity	16/09/2017
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Measuring/reading/recording frequency:	Continuous measurement and daily recording, Monthly (aggregate) Data is to be recorded monthly and aggregated yearly and will be archived electronically. The archived data will be kept during the crediting period and two years after the end of the crediting period.																															
Calculation method (if applicable):	n/a																															
QA/QC procedures:	The amount of the electricity generated will be monitored by electricity meter which will be maintained and calibrated according to the manufacturer's standards. The data will be subject to annual financial audit. The consistency of the data will be verified through the actual sale record.																															
Purpose of data:	Calculation of baseline emissions																															
Additional comments:	-																															

Data/parameter:	D.3-2	
Unit	MWh	
Description	Amount of electricity delivered to AKR	
Measured/calculated/default	Measured	
Source of data	Meter reading	

Value(s) of monitored parameter	4,492.609																															
Monitoring equipment	<table border="1"> <tr> <td>Device name</td> <td>Electrical Power Meter</td> </tr> <tr> <td>Serial No.</td> <td>4C6B9D8F</td> </tr> <tr> <td>Instrument type</td> <td>Electricity Meter</td> </tr> <tr> <td>Manufacturer</td> <td>Schneider Electric</td> </tr> <tr> <td>Accuracy class</td> <td>Class 1</td> </tr> <tr> <td>PT Ratio and CT Ratio</td> <td>n/a</td> </tr> <tr> <td>4th Calibration/Test report reference ID</td> <td>794</td> </tr> <tr> <td>Date of 4th Calibrated/Test</td> <td>23/09/2014</td> </tr> <tr> <td>4th Calibration validity</td> <td>20/09/2015</td> </tr> <tr> <td>5th Calibration/Test report reference ID</td> <td>1022</td> </tr> <tr> <td>Date of 5th Calibrated/Test</td> <td>20/09/2015</td> </tr> <tr> <td>5th Calibration validity</td> <td>16/09/2016</td> </tr> <tr> <td>6th Calibration/Test report reference ID</td> <td>1303</td> </tr> <tr> <td>Date of 6th Calibrated/Test</td> <td>16/09/2016</td> </tr> <tr> <td>6th Calibration validity</td> <td>16/09/2017</td> </tr> </table>		Device name	Electrical Power Meter	Serial No.	4C6B9D8F	Instrument type	Electricity Meter	Manufacturer	Schneider Electric	Accuracy class	Class 1	PT Ratio and CT Ratio	n/a	4th Calibration/Test report reference ID	794	Date of 4 th Calibrated/Test	23/09/2014	4 th Calibration validity	20/09/2015	5th Calibration/Test report reference ID	1022	Date of 5 th Calibrated/Test	20/09/2015	5 th Calibration validity	16/09/2016	6th Calibration/Test report reference ID	1303	Date of 6 th Calibrated/Test	16/09/2016	6 th Calibration validity	16/09/2017
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Measuring/reading/recording frequency:	Continuous measurement and daily recording, Monthly (aggregate) Data is to be recorded monthly and aggregated yearly and will be archived electronically. The archived data will be kept during the crediting period and two years after the end of the crediting period.																															
Calculation method (if applicable):	n/a																															
QA/QC procedures:	The amount of the electricity delivered to AKR will be monitored by electricity meter which will be maintained and calibrated according to the manufacturer's standards. The data will be subject to annual financial audit. The consistency of the data will be verified through the actual sale record.																															
Purpose of data:	Calculation of baseline emissions																															
Additional comments:	ABC has a separate and independent shareholding structure from Angkor Kasekam Roongroeung, the rice mill. The electricity generation record will be kept at ABC that will be subject to a financial auditing every year.																															

Data/parameter:	D.3-3
Unit	MWh
Description	Amount of electricity supplied to the local community
Measured/calculated/default	Measured
Source of data	Meter reading
Value(s) of monitored parameter	0

Monitoring equipment	Device name	n/a
	Serial No.	n/a
	Instrument type	n/a
	Manufacturer	n/a
	Accuracy class	n/a
	PT Ratio and CT Ratio	n/a
	Calibration/Test report reference ID	n/a
	Date of Calibrated/Test	n/a
	Calibration validity	n/a
	Calibration frequency	n/a
Measuring/reading/recording frequency:	Continuous measurement and daily recording, Monthly (aggregate) Data is to be recorded monthly and aggregated yearly and will be archived electronically. The archived data will be kept during the crediting period and two years after the end of the crediting period.	
Calculation method (if applicable):	n/a	
QA/QC procedures:	The amount of the electricity supplied to the local community will be monitored by electricity meter which will be maintained and calibrated according to the manufacturer's standards. The data will be subject to annual financial audit. The consistency of the data will be verified through the actual sale record.	
Purpose of data:	Calculation of baseline emissions	
Additional comments:	This meter has not yet installed.	

Data/parameter:	D.3-4
Unit	MWh
Description	Amount of electricity supplied to the grid
Measured/calculated/default	Measured
Source of data	Meter reading
Value(s) of monitored parameter	3,059.941

Monitoring equipment	Device name	Electrical Power Meter
	Serial No.	99789289
	Instrument type	Electricity Meter
	Manufacturer	Landis+Gyr (DLMS)
	Accuracy class	Class 1
	PT Ratio and CT Ratio	n/a
	3rd Calibration/Test report reference ID	790
	Date of 3 rd Calibrated/Test	23/09/2014
	3 rd Calibration validity	20/09/2015
	4th Calibration/Test report reference ID	1021
	Date of 4 th Calibrated/Test	20/09/2015
	4 th Calibration validity	16/09/2016
	5th Calibration/Test report reference ID	1301
Date of 5 th Calibrated/Test	16/09/2016	
5 th Calibration validity	16/09/2017	
Measuring/reading/recording frequency:	Continuous measurement and daily recording, Monthly (aggregate) Data is to be recorded monthly and aggregated yearly and will be archived electronically. The archived data will be kept during the crediting period and two years after the end of the crediting period.	
Calculation method (if applicable):	n/a	
QA/QC procedures:	The amount of the electricity supplied to the grid through a power utility will be monitored by the two-way electricity meter (recorded imported from and exported electricity to the grid) which will be maintained and calibrated according to the manufacturer's standards. The data will be subject to annual financial audit. The consistency of the data will be verified through the actual sale record with the power utility.	
Purpose of data:	Calculation of baseline emissions	
Additional comments:	This is the two-way meter to record both exported and imported electricity from the grid.	

Data/parameter:	D.3-5
Unit	MWh
Description	Amount of electricity imported from the grid
Measured/calculated/default	Measured
Source of data	Meter reading
Value(s) of monitored parameter	379.027

Monitoring equipment	Device name	Electrical Power Meter
	Serial No.	99789289
	Instrument type	Electricity Meter
	Manufacturer	Landis+Gyr (DLMS)
	Accuracy class	Class 1
	PT Ratio and CT Ratio	n/a
	3rd Calibration/Test report reference ID	790
	Date of 3 rd Calibrated/Test	23/09/2014
	3 rd Calibration validity	20/09/2015
	4th Calibration/Test report reference ID	1021
	Date of 4 th Calibrated/Test	20/09/2015
	4 th Calibration validity	16/09/2016
	5th Calibration/Test report reference ID	1301
	Date of 5 th Calibrated/Test	16/09/2016
5 th Calibration validity	16/09/2017	
Measuring/reading/recording frequency:	Continuous measurement and daily recording, Monthly (aggregate) Data is to be recorded monthly and aggregated yearly and will be archived electronically. The archived data will be kept during the crediting period and two years after the end of the crediting period.	
Calculation method (if applicable):	n/a	
QA/QC procedures:	The amount of the electricity supplied to the grid through a power utility will be monitored by the two-way electricity meter (recorded imported from and exported electricity to the grid) which will be maintained and calibrated according to the manufacturer's standards. The data will be subject to annual financial audit. The consistency of the data will be verified through the actual sale record with the power utility.	
Purpose of data:	Calculation of project emissions	
Additional comments:	This is the two-way meter to record both exported and imported electricity from the grid.	

Data/parameter:	D.3-6 (Q_{biomass})
Unit	tonne
Description	Amount of rice husk combusted
Measured/calculated/default	Measured
Source of data	Rice Husk Flow Meter
Value(s) of monitored parameter	27,871

Monitoring equipment	Device name	Rice Husk Flow Meter
	Serial No.	087378 L005249
	Instrument type	Flow Meter
	Manufacturer	Pro. Face
	Accuracy class	n/a
	3rd Calibration/Test report reference ID	357/14DML
	Date of 3 rd Calibrated/Test	03/12/2014
	3 rd Calibration validity	15/12/2016
Measuring/reading/recording frequency:	Continuous measurement and daily recording, Monthly (aggregate) Data is to be recorded monthly and aggregated yearly and will be archived electronically. The archived data will be kept during the crediting period and two years after the end of the crediting period.	
Calculation method (if applicable):	n/a	
QA/QC procedures:	The amount of biomass combusted in the boiler will be monitored by a flow meter with scale function. Maintenance and calibration of the equipments will be carried out according to the manufacturer's standards. The consistency of the data will be verified through the actual supply records between AKR and ABC.	
Purpose of data:	Calculation of baseline and project emissions	
Additional comments:	The meter is counted when door of the rice husk shutter is opened and rice husk is transferred to the furnace for the combustion. Each count is equivalent to 100 kilogrammes.	

Data/parameter:	D.3-7
Unit	TJ/Tonne
Description	Energy content of biomass treated
Measured/calculated/default	Measured
Source of data	Heating value analysis report
Value(s) of monitored parameter	0.01635 for the period of 19/07/2015-03/07/2016 0.01629 for the period of 02/07/2016-01/07/2017
Monitoring equipment	It will be measured by an independent third party laboratory. The archived data will be kept during the crediting period and two years after the end of the crediting period.
Measuring/reading/recording frequency:	Yearly measurement by the third party laboratory
Calculation method (if applicable):	n/a
QA/QC procedures:	The energy content of biomass will be measured on a yearly basis according to the international approved standards and procedures through a qualified laboratory.
Purpose of data:	Calculation of project emissions
Additional comments:	Two samples were sent to the laboratory. The value used in this monitoring report is an average value of these two samples.

Data/parameter:	D.3-8 (FC _{i,j,y})
Unit	Mass unit per year (i.e. ton/yr)
Description	Quantity of fuel type i combusted in process j during the year y
Measured/calculated/default	Measured
Source of data	Meter reading

Value(s) of monitored parameter	6.635																				
Monitoring equipment	<p>Use a mass meter to monitor small daily tanks of LPG that are used for start-up the boiler.</p> <table border="1"> <tr> <td>Device name</td><td>LPG Mass Meter</td></tr> <tr> <td>Serial No.</td><td>2304289</td></tr> <tr> <td>Instrument type</td><td>Mass Meter</td></tr> <tr> <td>Manufacturer</td><td>Sunny Tech</td></tr> <tr> <td>2nd Calibration/Test report reference ID</td><td>n/a</td></tr> <tr> <td>Date of 2nd Calibrated/Test</td><td>17/10/2014</td></tr> <tr> <td>2nd Calibration validity</td><td>16/10/2016</td></tr> <tr> <td>3rd Calibration/Test report reference ID</td><td>3203/16</td></tr> <tr> <td>Date of 3rd Calibrated/Test</td><td>10/10/2016</td></tr> <tr> <td>3rd Calibration validity</td><td>09/10/2018</td></tr> </table>	Device name	LPG Mass Meter	Serial No.	2304289	Instrument type	Mass Meter	Manufacturer	Sunny Tech	2nd Calibration/Test report reference ID	n/a	Date of 2 nd Calibrated/Test	17/10/2014	2 nd Calibration validity	16/10/2016	3rd Calibration/Test report reference ID	3203/16	Date of 3 rd Calibrated/Test	10/10/2016	3 rd Calibration validity	09/10/2018
Device name	LPG Mass Meter																				
Serial No.	2304289																				
Instrument type	Mass Meter																				
Manufacturer	Sunny Tech																				
2nd Calibration/Test report reference ID	n/a																				
Date of 2 nd Calibrated/Test	17/10/2014																				
2 nd Calibration validity	16/10/2016																				
3rd Calibration/Test report reference ID	3203/16																				
Date of 3 rd Calibrated/Test	10/10/2016																				
3 rd Calibration validity	09/10/2018																				
Measuring/reading/recording frequency:	Data is to be recorded daily and aggregated monthly and yearly and will be archived electronically. The archived data will be kept during the crediting period and two years after the end of the crediting period.																				
Calculation method (if applicable):	N/A																				
QA/QC procedures:	The measurement results will be cross-checked with purchased fuel invoices and stock changes of LPG consumption to ensure consistency.																				
Purpose of data:	Calculation of project emissions																				
Additional comments:	-																				

Data/parameter:	D.3-9 (NCV _{i,y})
Unit	GJ per mass unit (e.g. GJ/ton)
Description	Weighted average net calorific value of fuel type i in year y
Measured/calculated/default	Default
Source of data	2006 IPCC Guidelines on National GHG Inventories
Value(s) of monitored parameter	47.30
Monitoring equipment	IPCC default value is applied.
Measuring/reading/recording frequency:	Any future revision of the IPCC Guidelines should be taken into account. The archived data will be kept during the crediting period and two years after the end of the crediting period.
Calculation method (if applicable):	n/a
QA/QC procedures:	-
Purpose of data:	Calculation of project emissions
Additional comments:	Applicable where Option B of the "Tool to calculate project or leakage CO ₂ emissions from fossil fuel combustion (Version 02)" is used

Data/parameter:	D.3-10 (EF _{CO₂,i,y})
Unit	tCO ₂ /GJ
Description	Weighted average CO ₂ emission factor of fuel type i in year y
Measured/calculated/default	Default
Source of data	2006 IPCC Guidelines on National GHG Inventories

Value(s) of monitored parameter	0.063100 tCO ₂ /GJ (or 63,100 kgCO ₂ /TJ)
Monitoring equipment	IPCC default value is applied.
Measuring/reading/recording frequency:	Any future revision of the IPCC Guidelines should be taken into account. The archived data will be kept during the crediting period and two years after the end of the crediting period.
Calculation method (if applicable):	n/a
QA/QC procedures:	-
Purpose of data:	Calculation of project emissions
Additional comments:	Applicable where Option B of the "Tool to calculate project or leakage CO ₂ emissions from fossil fuel combustion (Version 02)" is used.

D.3. Implementation of sampling plan

Not Applicable.

SECTION E. Calculation of emission reductions or GHG removals by sinks

E.1. Calculation of baseline emissions or baseline net GHG removals by sinks

(1) Baseline emissions for electricity generation component supplied to AKR

The electricity generation component is conducted in accordance with the instructions provided in paragraphs 5 to 7 of Type I.A., Appendix B of the simplified modalities and procedures for small-scale CDM project activities. According to the instructions, there are two options that the project participants may choose from regarding the baseline formula. As stated in B.2, Option 2 is selected for this project activity.

The formula is expressed as follows:

$$E_B = \sum_i O_i / (1 - l)$$

where,

- E_B = annual energy baseline (in kWh per year)
- \sum_i = the sum over the group of "i" renewable energy technologies implemented as part of the project
- O_i = the estimated annual output of the renewable energy technologies of the group of "i" renewable energy technologies installed (in kWh per year)
- l = average technical distribution losses that would have been observed in diesel powered mini- grids installed by public programs or distribution companies in isolated areas, expressed as a fraction.

According to paragraph 7 of Type I.A, Appendix B of the simplified modalities and procedures for small-scale CDM project activities, the emissions baseline is the energy baseline calculated above times the CO₂ emission coefficient for the fuel displaced. Following the instruction, a default value of 0.9 kg CO₂e/kWh (or 0.9 tCO₂e/MWh), which is derived from diesel generation units, will be used.

The distribution loss (l) is zero as the diesel power plant is currently located on-site. 4,492.609 MWh/year, emission reduction due to electricity generation supplied to AKR is calculated as per the following equation.

Baseline emissions for electricity	=	Net electricity supplied to AKR	x	CO2 emission coefficient
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generation supplied to AKR (tCO ₂ e/year)		(MWh/year)		(tCO ₂ e/MWh)
	=	4,492.609	x	0.9
	=	4,043.35		

(2) Baseline emissions for electricity generation component supplied to the grid

$$BE_y = EG_{PJ,y} \times EF_{grid,y}$$

where,

BE_y = Baseline emissions in year y (t CO₂)
 $EG_{PJ,y}$ = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year y (MWh)
 $EF_{grid,y}$ = Combined margin CO₂ emission factor for grid connected power generation in year y calculated using the latest version of the "Tool to calculate the emission factor for an electricity system" (t CO₂/MWh) = $EF_{grid,CM,y}$

Electricity generation after supplying to AKR will be sold to the grid and quantity of net electricity generation supplied to the grid is 3,059.941 MWh/year. Emission reduction due to electricity generation supplied to the grid is calculated as follows.

Baseline emissions for electricity generation to the grid (tCO ₂ /year)	=	Net electricity supplied to the grid (MWh/year)	x	Combined margin CO ₂ EF (t CO ₂ e/MWh)
	=	3,059.941	x	0.6568
	=	2,009.77		

(3) Baseline emissions for methane avoidance

The baseline emission for methane avoidance is calculated based on item 3 of AMS-III.E., Version 7, expressed as follows:

BE _y (tCO ₂ e)	=	Q _{biomass} (tonnes)	x	CH ₄ _IPCC _{decay} (tCH ₄ /tonne of biomass)	x	GWP_CH ₄ (tCO ₂ e/tCH ₄)
	=	27,871	x	0.0616	x	21
	=	36,054.05				

Where,

BE_y = Baseline methane emissions from biomass decay (tonnes of CO₂ equivalent)
 $Q_{biomass}$ = Quantity of biomass treated under the project activity (tonnes)
 GWP_{CH_4} = GWP for CH₄ (tonnes of CO₂ equivalent/tonnes of CH₄, default is 21)

and

CH ₄ _IPCC _{decay} (tCH ₄ /tonne of biomass)	=	MCF	x	DOC	x	DOC _f	x	F	x	16/12
	=	0.4	x	0.3	x	0.77	x	0.5	x	16/12
	=	0.0616								

where

$CH_4_IPCC_{decay}$ = IPCC CH_4 emission factor for decaying biomass in the region of the project activity (tonnes of CH_4 /tonne of biomass)
 MCF = Methane correction factor (fraction, default is 0.4 for less than 5 metres in depth)
 DOC = Degradable organic carbon (fraction, default is 0.3)
 DOC_f = Fraction DOC dissimilated to landfill gas (default is 0.77)
 F = Fraction of CH_4 in landfill gas (default is 0.5)

The sum of baseline emissions is calculated as below:

Total baseline emissions (tCO ₂ e)	=	BE for electricity generation supplied to AKR (tCO ₂ e)	+	BE for electricity generation supplied to the grid (tCO ₂ e)	+	Baseline emissions for methane avoidance (tCO ₂ e)
	=	4,043	+	2,009	+	36,054
	=	42,106				

E.2. Calculation of project emissions or actual net GHG removals by sinks

Project emissions were calculated as per the following formula:

(1) Project emissions from combustion of biomass ($PE_{biomass,y}$)

$PE_{biomass,y}$ (tCO ₂ e)	=	$Q_{biomass}$ (tonnes)	x	$E_{biomass}$ (TJ/tonnes)	x	$(CH_4bio_comb \times CH_4_GWP) + (N_2Obio_comb \times N_2O_GWP)$ (tCO ₂ /TJ)
	=	27,871	x	0.01633	x	7.54*
	=	3,432.56				

* The emission of CH_4 and N_2O from biomass combustion
 = $(CH_4bio_comb \times CH_4_GWP + N_2Obio_comb \times N_2O_GWP)$
 = $(0.3 \text{ tCH}_4/\text{TJ} \times 21 \text{ tCO}_2\text{e}/\text{tCH}_4 + 0.004 \text{ tN}_2\text{O}/\text{TJ} \times 310 \text{ tCO}_2\text{e}/\text{tN}_2\text{O})$
 = 7.54 tCO₂e/TJ

where,

$PE_{biomass,y}$ = Project activity emissions (tCO₂e)
 $Q_{biomass}$ = Quantity of biomass treated under the project activity (tonnes)
 $E_{biomass}$ = Energy content of biomass (TJ/tonnes)
 CH_4bio_comb = CH_4 emission factor for biomass waste (which includes dung and agricultural, municipal and industrial wastes) combustion (t CH_4 /TJ, default value is 0.3)
 CH_4_GWP = GWP for CH_4 (tCO₂e/t CH_4)
 N_2Obio_comb = N_2O emission factor for biomass waste (which includes dung and agricultural, municipal and industrial wastes) combustion (t N_2O /TJ, default value is 0.004)
 N_2O_GWP = GWP for N_2O (tCO₂e/t N_2O)

(2) Project emissions from combustion of fossil fuel ($PE_{FC,y}$)

The Project uses LPG, a fuel to be burned during start-up of the boiler, to preheat the combustion zone, before the rice husk can sustain its own combustion. This project emission from combustion of LPG as the use of fossil fuel is calculated according to "Tool to calculate project or leakage

CO₂ emissions from fossil fuel combustion (Version 02)". Option B of CO₂ emission coefficient is selected to calculate based on net calorific value and CO₂ emission factor of fossil fuel.

PE_{FC,y} (tCO ₂ e)	=	Q_{LPG} (tonnes)	x	NCV_{LPG} (GJ/tonne)	x	EF_{CO₂,LPG} (tCO ₂ /GJ)
	=	6.635	x	47.30	x	0.063100
	=	19.80				

Where,

PE_{FC,y} = CO₂ emissions from fossil fuel combustion in process j during the year y (tCO₂/yr)

FC_{i,j,y} = Quantity of fuel type i combusted in process j during the year y (mass unit/yr)

NCV_{i,y} = Weighted average net calorific value of the fuel type i in year y (GJ/mass unit)

EF_{CO₂,i,y} = Weighted average CO₂ emission factor of fuel type i in the year y (tCO₂/GJ)

(3) Project emissions from electricity consumption by the project activity (PE_{EC,y})

Project emission from electricity consumption is calculated based on the quantity of electricity consumed, an emission factor for electricity generation and a factor to account for transmission losses, as stated below:

PE_{EC,y} (tCO ₂ e)	=	EC_{PJ,y} (MWh)	x	EF_{EL,y} (tCO ₂ e/MWh)	x	(1+TDL_{j,y})
	=	379.027	x	0.6568	x	1.20
	=	298.73				

where:

PE_{EC,y} Project emissions from electricity consumption in year y (tCO₂/yr)

EC_{PJ,j,y} Quantity of electricity consumed by the project electricity consumption source j in year y (MWh/yr)

EF_{EL,j,y} Emission factor for electricity generation for source j in year y (tCO₂/MWh)

TDL_{j,y} Average technical transmission and distribution losses for providing electricity to source j in year y (use default values of 20%)

j Sources of electricity consumption in the project

The sum of project emissions is calculated as below:

Total project emissions (tCO ₂ e)	=	PE from combustion of biomass (tCO ₂ e)	+	PE from combustion of fossil fuel (tCO ₂ e)	+	PE from electricity consumption (tCO ₂ e)
	=	3,433	+	20	+	299
	=	3,752				

E.3. Calculation of leakage

Leakage calculation associated with the electricity generation component of the Project Activity is not required. According to paragraph 4 of Type III.E., Appendix B (Version 7) of the simplified modalities and procedures for small-scale CDM project activities, leakage calculation is not required for the methane avoidance component of the Project Activity.

E.4. Summary of calculation of emission reductions or net GHG removals by sinks

Item	Baseline emissions or baseline net GHG removals by sinks (t CO ₂ e)	Project emissions or actual net GHG removals by sinks (t CO ₂ e)	Leakage (t CO ₂ e)	GHG emission reductions or net GHG removals by sinks (t CO ₂ e) achieved in the monitoring period		
				Up to 31/12/2012	From 01/01/2013 onwards	Total amount
Total	42,106	3,752	-	-	38,354	38,354

E.5. Comparison of actual emission reductions or net GHG removals by sinks with estimates in registered PDD

Item	Values estimated in ex ante calculation of registered PDD	Actual values achieved during this monitoring period
Emission reductions or GHG removals by sinks (t CO ₂ e)	64,772 tonnes per monitoring period (01/08/2015 – 31/10/2016), 458 days	38,354

E.6. Remarks on difference from estimated value in registered PDD

The actual emission reduction achieved during this monitoring period is much lower than the estimation anticipated in the registered CDM-PDD because electricity requirement from AKR is low resulting from small rice mill activity. During this period of time, AKR was ordered to cleaning, grading and packing of the rice. These processes required small loading of electricity. Under this situation, it was not economically profitable for ABC to operate the power plant at its maximum capacity. It is summarised in Section B. 1 of this monitoring report.

Appendix 1. Contact information of project participants and responsible persons/entities

Project participant and/or responsible person/ entity	<input checked="" type="checkbox"/> Project participant <input type="checkbox"/> Person/entity responsible for completing the CDM-MR-FORM
Organization name	1. Angkor Bio Cogen Co., Ltd. (ABC)
Street/P.O. Box	Phum Angsnoul
Building	
City	
State/region	Angsnoul District, Kandal Province
Postcode	
Country	Cambodia
Telephone	(+855)-23-369218
Fax	(+855)-23-364228
E-mail	angkorrice@hotmail.com
Website	www.angkorrice.com
Contact person	
Title	Managing Director
Salutation	Mr.
Last name	Chieu
Middle name	
First name	Adisorn
Department	
Mobile	
Direct fax	
Direct tel.	
Personal e-mail	

Project participant and/or responsible person/ entity	<input checked="" type="checkbox"/> Project participant <input checked="" type="checkbox"/> Responsible person/ entity for completing the CDM-MR-FORM
Organization name	2. Mitsubishi UFJ Morgan Stanley Securities Co., Ltd.
Street/P.O. Box	3-2-20 Toyosu
Building	5th Floor Toyosu Front
City	Koto-ku, Tokyo
State/Region	
Postcode	135-0061
Country	Japan
Telephone	+81 3 6213 5721
Fax	+81 3 6213 6175
E-mail	toyofuku-masayuki@sc.mufig.jp
Website	http://www.sc.mufig.jp/english/
Contact person	
Title	General Manager
Salutation	Mr.
Last name	Toyofuku

Middle name	
First name	Masayuki
Department	Clean Energy Finance Division
Mobile	
Direct fax	
Direct tel.	
Personal e-mail	

Project participant and/or responsible person/ entity	<input checked="" type="checkbox"/> Project participant <input type="checkbox"/> Responsible person/ entity for completing the CDM-MR-FORM
Organization name	3. Asian Development Bank, as trustee of the Future Carbon Fund
Street/P.O. Box	6 ADB Avenue
Building	Asian Development Bank
City	Mandaluyong City
State/Region	Metro Manila
Postcode	1550
Country	Philippines
Telephone	+63 2 632 4444
Fax	+63 2 632 5114
E-mail	futurecarbonfund@adb.org
Website	www.adb.org
Contact person	
Title	Director General
Salutation	Ms.
Last name	Locsin
Middle name	
First name	Ma. Carmela D.
Department	Regional and Sustainable Development
Mobile	
Direct fax	
Direct tel.	
Personal e-mail	
Project participant and/or responsible person/ entity	<input checked="" type="checkbox"/> Project participant <input type="checkbox"/> Responsible person/ entity for completing the CDM-MR-FORM

Organization name	4. Swedish Energy Agency
Street/P.O. Box	P.O.Box 310
Building	
City	SE-631 04 Eskilstuna
State/Region	
Postcode	
Country	Sweden
Telephone	+46 16 544 22 12
Fax	+46 16 544 20 99
E-mail	bengt.bostrom@energimyndigheten.se
Website	http://www.energimyndigheten.se/en/
Contact person	
Title	Head

Salutation	Mr.
Last name	Boström
Middle name	
First name	Bengt
Department	International Carbon Market Unit
Mobile	
Direct fax	
Direct tel.	
Personal e-mail	