



**Monitoring report form for CDM project activity
(Version 06.0)**

Complete this form in accordance with the instructions attached 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 PDD applicable to this monitoring report	3.0	
Version number of this monitoring report	1.0	
Completion date of this monitoring report	24/05/2018	
Monitoring period number	Fourth (4 th) monitoring period	
Duration of this monitoring period	From 01/08/2015 to 19/04/2018 (993 days)	
Monitoring report number for this monitoring report	Not Applicable	
Project participants	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 scopes	Energy industries (Scope 1), Waste handling and disposal (Scope 13), Agriculture (Scope 15)	
Applied methodologies and standardized baselines	AMS-I.A. (Ver.7), AMS-III.E. (Ver.7), AMS-I.D (Ver.18)	
Amount of GHG emission reductions or net anthropogenic GHG removals achieved by the project activity in this monitoring period	Amount achieved before 1 January 2013	Amount achieved from 1 January 2013
	Not applicable	102,835 tonnes CO ₂ (from 01/08/2015 to 19/04/2018)

Amount of GHG emission reductions or net anthropogenic GHG removals estimated ex ante for this monitoring period in the PDD	140,434 tonnes CO ₂ (993 days) ¹
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¹ The annual emission reduction in the registered PDD is 51,620 tCO₂/year. The estimated amount for this monitoring period is 140,434 tCO₂, which is derived from 51,620 tCO₂/365 days*993 days.

SECTION A. Description of project activity

A.1. 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 Roongroeng 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 – 19/04/2018 (993 days). Total emission reductions achieved in this monitoring period is 102,835 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.

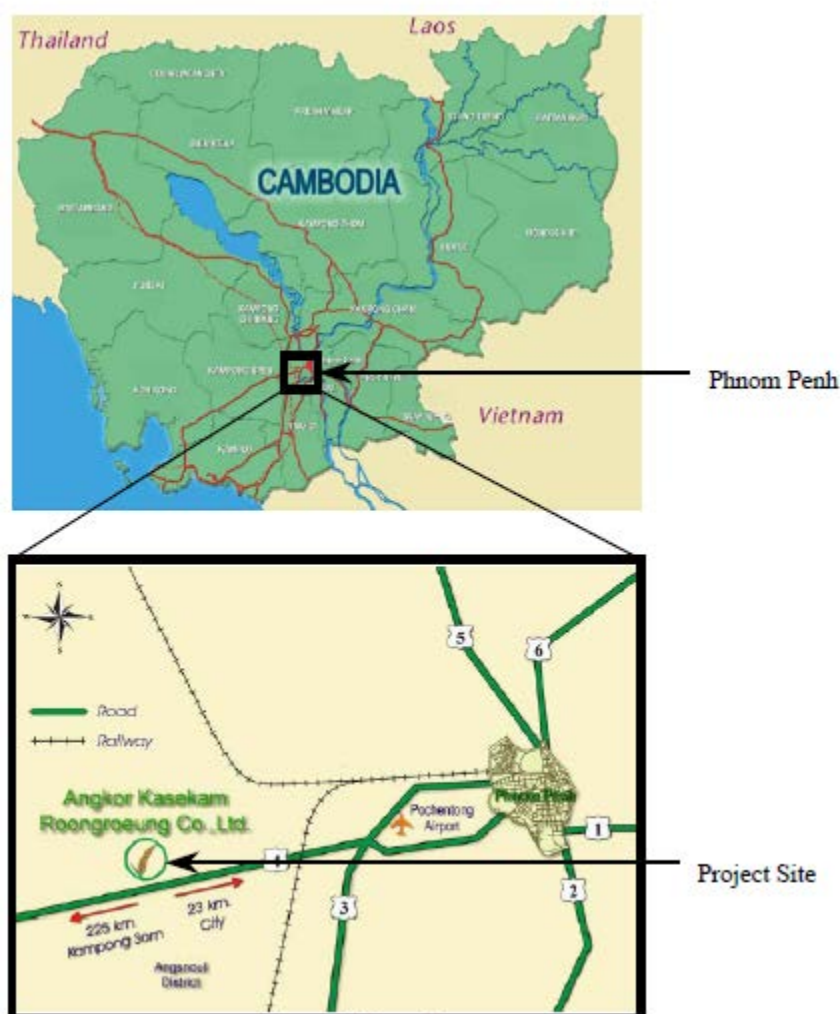


Figure 1. Location of the Project

A.3. Parties and project participants

Parties involved	Project participants	Indicate if 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 to applied methodologies and standardized baselines

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 type and duration

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.

SECTION B. Implementation of project activity**B.1. Description of implemented 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	23,876.165 MWh	-
Electricity Export to AKR	14,449.723 MWh	-
Electricity Export to the grid through the power utility	6,776.655 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	748.581 MWh	
Parasitic load	3,398.368 MWh	-
Operating hours	16,848 hours	-
Outage hours	6,984 hours	-

The power plant's shut-downs occurred due to holidays (commonly, it continuously operates 14 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 the registered monitoring plan, applied methodologies or standardized baselines

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 the start date of the 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 monitoring plan

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 to the registered monitoring plan, or permanent deviation of monitoring from the applied methodologies, standardized baselines, or other applied standards or tools

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

Not applicable

SECTION C. Description of monitoring system

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

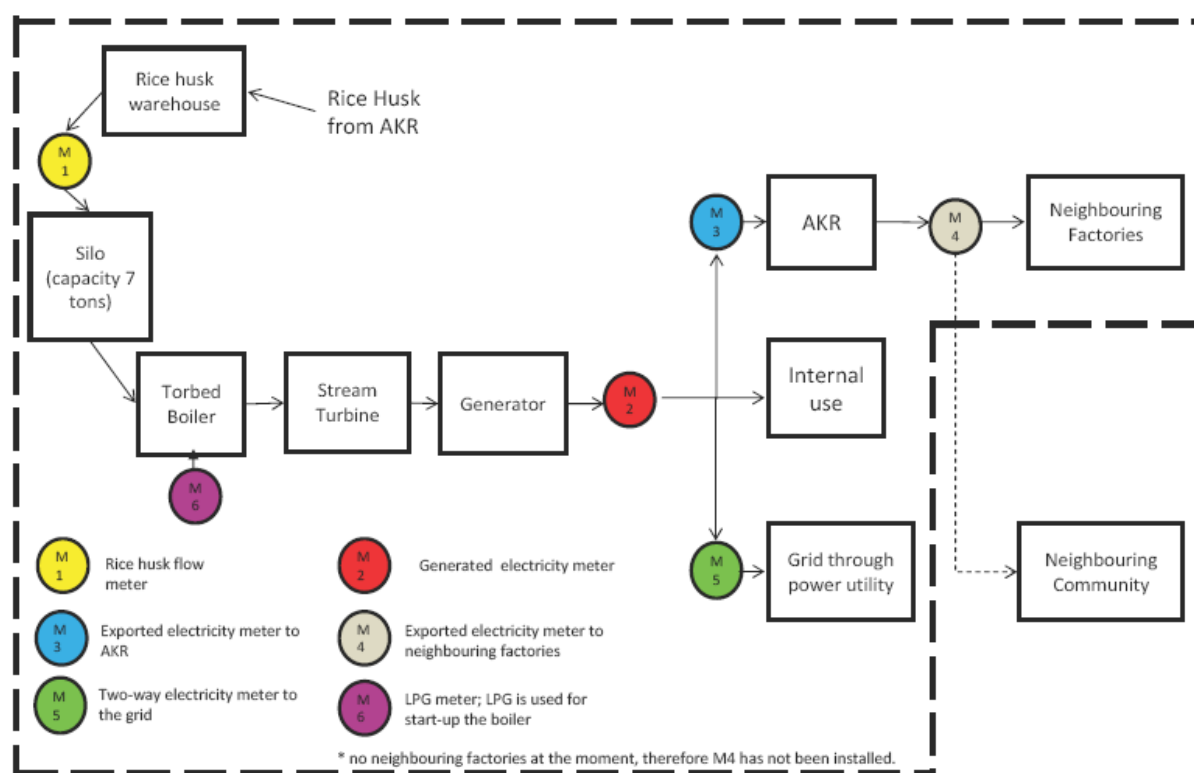


Figure 2. Schematic diagram of the project boundary

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.

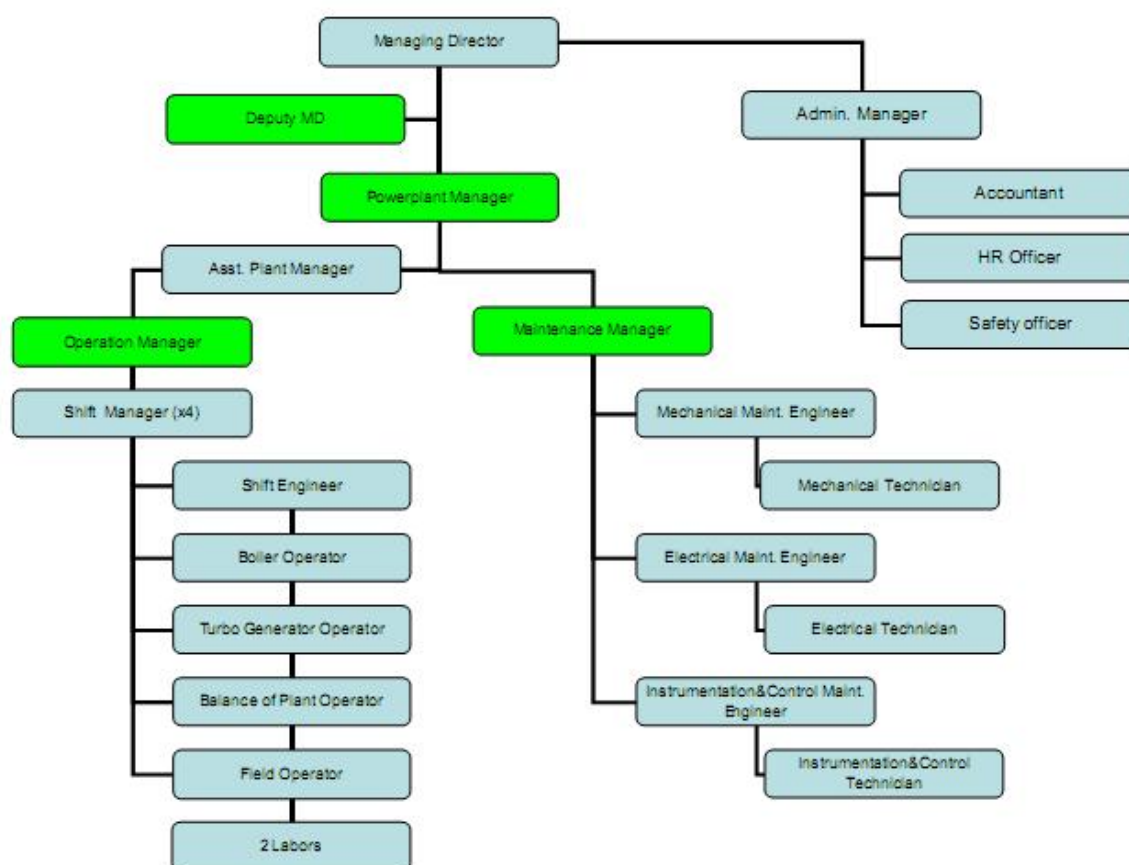


Figure 3 Organisation chart of the monitoring team for the CDM activity

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 is 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

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/parameter	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/parameter	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/parameter	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/parameter	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/parameter	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/parameter	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/parameter	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/parameter	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/parameter	Baseline emission calculations
Additional comments	-

Data/Parameter	$TDL_{i,y}$
Unit	-
Description	Average technical transmission and distribution losses for providing electricity to source j in year y
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/parameter	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.

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	23,876.165																																				
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> <tr> <td>7th Calibration/Test report reference ID</td><td>2010</td></tr> <tr> <td>Date of 7th Calibrated/Test</td><td>15/09/2017</td></tr> <tr> <td>7th Calibration validity</td><td>15/09/2018</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	7th Calibration/Test report reference ID	2010	Date of 7 th Calibrated/Test	15/09/2017	7 th Calibration validity	15/09/2018
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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/parameter	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	14,449.723																																					
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> <tr> <td>7th Calibration/Test report reference ID</td> <td>2009</td> </tr> <tr> <td>Date of 7th Calibrated/Test</td> <td>15/09/2017</td> </tr> <tr> <td>7th Calibration validity</td> <td>15/09/2018</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	7th Calibration/Test report reference ID	2009	Date of 7 th Calibrated/Test	15/09/2017	7 th Calibration validity	15/09/2018
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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/parameter	Calculation of baseline emissions																																					
Additional comments	ABC has a separate and independent shareholding structure from Angkor Kasekam Roongroeng, 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/parameter	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	6,776.655

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
	6th Calibration/Test report reference ID	2011
Date of 6 th Calibrated/Test	15/09/2017	
6 th Calibration validity	15/09/2018	
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/parameter	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	748.581

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
	6th Calibration/Test report reference ID	2011
Date of 6 th Calibrated/Test	15/09/2017	
6 th Calibration validity	15/09/2018	
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/parameter	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	73,536.4

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	2742/14
	Date of 3 rd Calibrated/Test	03/12/2014
	3 rd Calibration validity	15/12/2016
	4th Calibration/Test report reference ID	2911/16
	Date of 4 th Calibrated/Test	14/12/2016
	4 th Calibration validity	31/12/2018
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/parameter	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	0.01642 (weighted average of heating value for this monitoring period) 0.01635 for the period of 19/07/2015-03/07/2016 0.01629 for the period of 03/07/2016-02/07/2017 0.01666 for the period of 02/07/2017-30/06/2018
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/parameter	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 ($FC_{i,y}$)																				
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	15.772																				
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/parameter	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/parameter	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 ($EF_{CO_2,i,y}$)
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/parameter	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 net anthropogenic removals

E.1. Calculation of baseline emissions or baseline net removals

(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.

14,449.723 MWh/year, emission reduction due to electricity generation supplied to AKR is calculated as per the following equation.

Baseline emissions for electricity generation supplied to AKR (tCO₂e/year)	=	Net electricity supplied to AKR (MWh/year)	x	CO ₂ emission coefficient (tCO ₂ e/MWh)
	=	14,449.723	x	0.9
	=	13,004.75		

(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 6,776.655 MWh/year. Emission reduction due to electricity generation supplied to the grid is calculated as follows.

Baseline emissions for electricity generation to the grid (tCO₂/year)	=	Net electricity supplied to the grid (MWh/year)	x	Combined margin CO ₂ EF (t CO ₂ e/MWh)
	=	6,776.655	x	0.6568
	=	4,450.91		

(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 (tCO₂e)	=	Q _{biomass} (tonnes)	x	CH ₄ _IPCC _{decay} (tCH ₄ /tonne of biomass)	x	GWP_CH ₄ (tCO ₂ e/tCH ₄)
	=	73,536.4	x	0.0616	x	21
	=	95,126.69				

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

CH₄_IPCC_{decay} (tCH₄/tonne of	=	MCF	x	DOC	x	DOC _f	x	F	x	16/12
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biomass)										
	=	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)
	=	13,004	+	4,450	+	95,126
	=	112,580				

E.2. Calculation of project emissions or actual net removals

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	$(CH_4_{bio_comb} \times CH_4_GWP) +$ $(N_2O_{bio_comb} \times N_2O_GWP)$ (tCO ₂ /TJ)
	=	73,536.4	x	0.01642	x	7.54*
	=	9,105.48				

* The emission of CH_4 and N_2O from biomass combustion
 $= (CH_4_{bio_comb} \times CH_4_GWP + N_2O_{bio_comb} \times N_2O_GWP)$
 $= (0.3 \text{ tCH}_4/\text{TJ} \times 21 \text{ tCO}_2\text{e}/\text{tCH}_4 + 0.004 \text{ tN}_2\text{O}/\text{TJ} \times 310 \text{ tCO}_2\text{e}/\text{tN}_2\text{O})$
 $= 7.54 \text{ tCO}_2\text{e}/\text{TJ}$

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)

$CH_4_{bio_comb}$ = CH_4 emission factor for biomass waste (which includes dung and agricultural, municipal and industrial wastes) combustion (tCH₄/TJ, default value is 0.3)

CH_4_GWP = GWP for CH_4 (tCO₂e/tCH₄)

$N_2O_{bio_comb}$ = N_2O emission factor for biomass waste (which includes dung and agricultural, municipal and industrial wastes) combustion (tN₂O/TJ, default value is 0.004)

N_2O_GWP = GWP for N_2O (tCO₂e/tN₂O)

(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)
	=	15.772	x	47.30	x	0.063100
	=	47.07				

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})
	=	748.581	x	0.6568	x	1.20
	=	590.00				

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)
	=	9,106	+	48	+	591
	=	9,745				

E.3. Calculation of leakage emissions

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. Calculation of emission reductions or net anthropogenic removals

	Baseline GHG emissions or	Project GHG emissions or actual net	Leakage GHG emissions	GHG emission reductions or net anthropogenic GHG removals (t CO₂e)
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				Before 01/01/2013	From 01/01/2013	Total amount
Total	112,580	9,745	-	-	102,835	102,835

E.5. Comparison of emission reductions or net anthropogenic removals achieved with estimates in the registered PDD

Amount achieved during this monitoring period (t CO ₂ e)	Amount estimated ex ante (t CO ₂ e)
102,835 tonnes per monitoring period (01/08/2015 – 19/04/2018), 993 days	140,434

E.6. Remarks on increase in achieved emission reductions

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, 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.

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Document information

<i>Version</i>	<i>Date</i>	<i>Description</i>
06.0	7 June 2017	Revision to: <ul style="list-style-type: none"> • Ensure consistency with version 01.0 of the "CDM project standard for project activities" (CDM-EB93-A04-STAN); • Make editorial improvements.
05.1	4 May 2015	Editorial revision to correct version numbering.
05.0	1 April 2015	Revisions to: <ul style="list-style-type: none"> • Include provisions related to delayed submission of a monitoring plan; • Provisions related to the Host Party; • Remove reference to programme of activities; • Overall editorial improvement.
04.0	25 June 2014	Revisions to: <ul style="list-style-type: none"> • Include the Attachment: Instructions for filling out the monitoring report form (these instructions supersede the "Guideline: Completing the monitoring report form" (Version 04.0)); • Include provisions related to standardized baselines; • Add contact information on a responsible person(s)/ entity(ies) for completing the CDM-MR-FORM in A.6 and Appendix 1; • Change the reference number from <i>F-CDM-MR</i> to <i>CDM-MR-FORM</i>; • Editorial improvement.
03.2	5 November 2013	Editorial revision to correct table in page 1.
03.1	2 January 2013	Editorial revision to correct table in section E.5.
03.0	3 December 2012	Revision required to introduce a provision on reporting actual emission reductions or net GHG removals by sinks for the period up to 31 December 2012 and the period from 1 January 2013 onwards (EB 70, Annex 11).
02.0	13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the monitoring report form" (EB 66, Annex 20).
01.0	28 May 2010	EB 54, Annex 34. Initial adoption.
Decision Class: Regulatory Document Type: Form Business Function: Issuance Keywords: monitoring report		