Monitoring report form for CDM project activity
(Version 09.0)

MONITORING REPORT			
Title of the project activity	(ABGSPL): Methane recovery in waste water treatment & Methane/Biomass Energy Generation Project		
UNFCCC reference number of the project activity	3880[1]		
Version number of the PDD applicable to this monitoring report	08		
Version number of this monitoring report	02		
Completion date of this monitoring report	22/11/2021		
Monitoring period number	01		
Duration of this monitoring period	04/03/2018 to 31/12/2020 (inclusive of both dates)		
Monitoring report number for this monitoring period	Not Applicable		
Project participants	M/s AB Grain Spirits Pvt. Ltd. (ABGSPL) (India) M/s Nutrition and Sugar Consultants (India) M/s Amsterdam Capital Trading B.V. (Netherlands)		
Host Party	India		
Applied methodologies and standardized baselines	Applied Methodology: AMS-I.C. ver. 21.0 - Thermal energy production with or without electricity Standardized Baseline: Not Applicable		
Sectoral scopes	1 : Energy industries (renewable - / non-renewable sources)		
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 until 31 December 2020	Amount achieved from 1 January 2021
	0 tCO_2e	54,271 tCO_2e	0 tCO_2e
Amount of GHG emission reductions or net anthropogenic GHG removals estimated ex ante for this monitoring period in the PDD	75,292 tCO_2e		

[1] https://cdm.unfccc.int/Projects/DB/DNV-CUK1280209384.47/view

SECTION A. Description of project activity

A.1. General description of project activity

M/s. AB Grain Spirits Pvt. Ltd (ABGSPL) has established a grain based distillery, at village Kiri Afgana, in a rural area of Batala Tehsil of Punjab state to produce potable spirit from grain. The installed capacity of distillery is 120 (KPLD) kilolitres per day[2]. The purpose of the project activity is to utilize the biogas generated from treatment of wastewater in the Biomethanation plant and the rice husk available in the region for generation of steam and power. The project activity involves installation of a 5.5 MW[3] cogeneration facility to meet the steam and power requirements of the distillery unit and export the surplus electricity to the grid.

The cogeneration unit is fired on rice husk (biomass residue) and biogas. The biogas used is generated from treatment of waste water in an in-house anaerobic digester and is used as fuel along with rice husk in project boiler to generate steam and power.

Out of 5.5 MW, about 0.405 MW[4] of power is used for auxiliary consumption i.e. by the boiler & its accessories. The remaining renewable energy (4.586 MW) displaces fossil fuel based grid electricity. The project involves export of a maximum of 3 MW of surplus power to the grid while the balance is consumed as captive consumption (2 MW[5]) in the industrial facility.

The projects was commissioned successfully on 8 April 2008 as evident from letter dated 2 May 2008 from the Senior Executive Engineer of Punjab State Electricity Board (PSEB) for the commissioning date of the cogeneration plant and start of supply of electricity to PSEB, i.e. 8 April 2008.

During the current Monitoring Period from 04/03/2018 to 31/12/2020 (including both the first and last dates), the amount of emission reduction achieved is 54,271 tCO_2e. No major breakdowns occurred during the entire monitoring period apart from the scheduled outages for routine maintenance.

Contribution of the project activity to sustainable development

The project activity carries a number of sustainability aspects. Ministry of Environment and Forests and Climate Change (MOEFCC), Government of India has stipulated the social wellbeing, economic wellbeing, environmental wellbeing and technological wellbeing as the four indicators for sustainable development in the interim guidelines for the CDM projects[6].

Economic wellbeing:

1. The project is being established in the rural area of Batala Tehsil of Punjab state where farming is a major source of income of the community. Rice and sugar cane are the major crops cultivated in the area. The implementation of project has created direct and indirect jobs. Staff is required for construction and establishment of the power generation plant. In addition, contractors and labourers needed for the construction and controls of the project.

[2] Detailed Project Report, Page 1

[3] Detailed Project Report, Page 1

[4] Detailed Project Report, Page 91

[5] Letter from technology provider for the industrial facility

[6] http://cdmindia.nic.in/host_approval_criteria.html

The unit provides direct employment for operation and maintenance of the plant. Thus, the project activity provides the opportunity to the residents of this Tehsil an alternative source of income, which reduces their dependency on farming as the sole means of subsistence.

2. Project activity is also sourcing biomass from the market, which is transported from the rice mills or from the local suppliers. This indirectly benefits the farmers by enabling them to secure an additional source of income through sale of biomass.

3. The total rice husk available in the region is 90401MT/ year[7]. A part of the biomass generated in the region is used as fuel for the boilers in the rice and sugar mills. The surplus biomass available in the region is 81,937 MT/ year. Hence, the project provides a means of income to the farmers from the sale of the surplus biomass.

4. The project activity has helped to create business opportunity for local stakeholders such as suppliers, manufacturers, contractors etc.

Social well –being:

1. The project has improved the infrastructure conditions in the plant premises and the neighbouring areas. Under this initiative, more than 10 km of roads has been developed. The project activity also includes establishment of 2 bore wells and development of green cover by planting saplings within the facility as well as the nearby areas.

2. The project activity also causes further infrastructure development in the area, which ultimately leads to rural development.

Environmental well –being:

1. The project activity uses only biogas/biomass for electricity generation, thus, it would eliminate an equivalent carbon dioxide which would have been otherwise generated to produce electricity at the grid

Technological well -being:

1. The technology selected for the power plant is modern and energy efficient.
2. Project activity serves a demonstrative project for clean renewable energy generation in the country.

A.2. Location of project activity

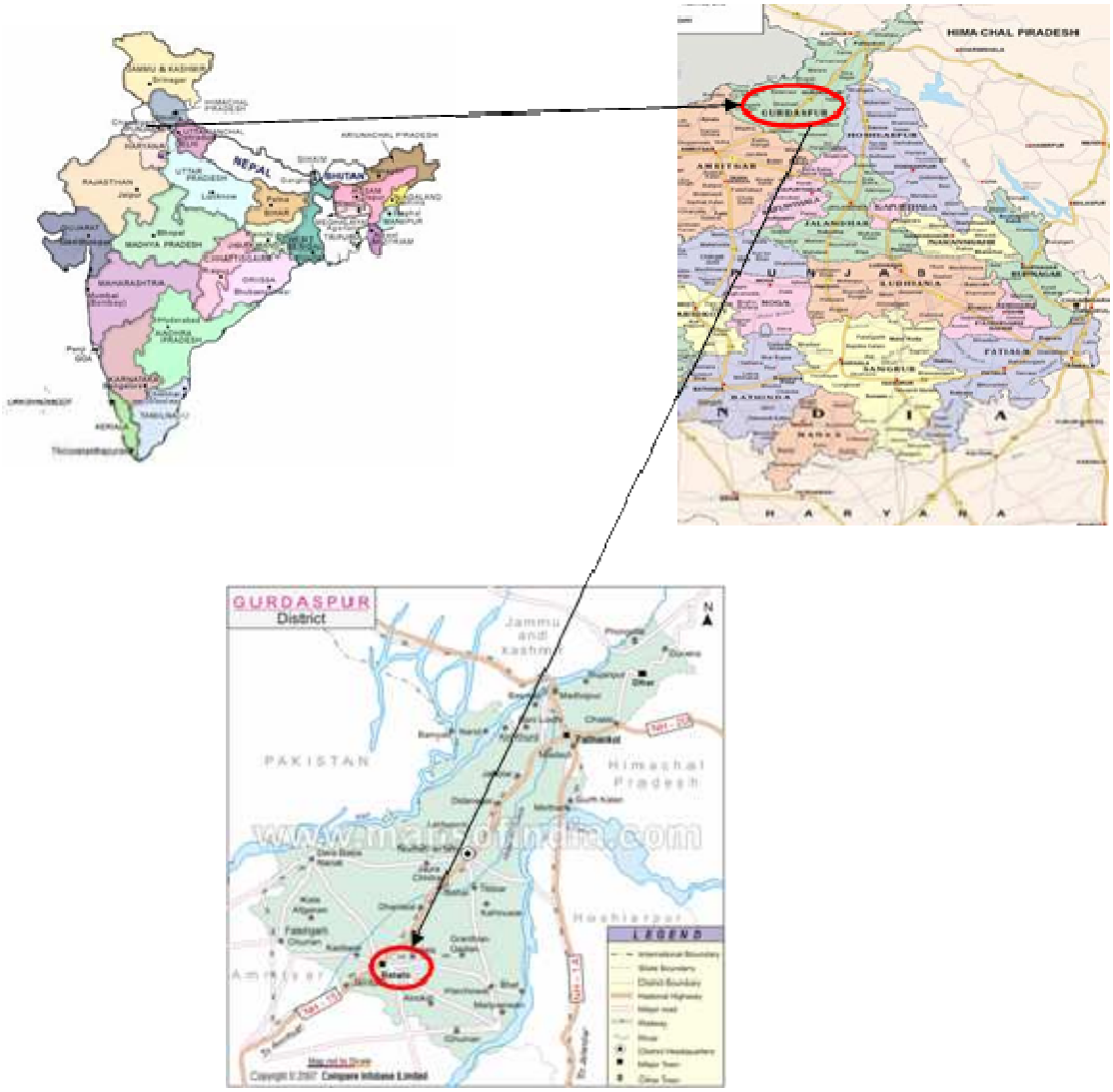
Village: Kiri Afgana,
Tehsil: Batala
District: Gurdaspur

The ABGSPL project activity has been implemented at the distillery plant of A.B. Grain Spirits Pvt. Ltd. located at village Kiri Afgana in Batala Tehsil of Punjab state in India. The village is located 37 km south of Gurdaspur city. Nearest railway station Qadian is at a distance of 5 km and the nearest airport is Amritsar airport which is at a distance of 70 km. The plant is located on the National high way no.15.

[7] Biomass Assessment Report prepared by M.C. Jain & Associates dated February 2006

The geographical coordinates of the project site are:
Latitude: 31° 46' 04.4" N
Longitude: 75° 31' 50.3" E

The detailed physical location of the site is shown in the map below:



A.3. Parties and project participants

Parties involved	Project participants	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
India (host)	M/s AB Grain Spirits Pvt. Ltd. (ABGSPL)	No
India (host)	M/s Nutrition and Sugar Consultants	No
The Netherlands	Amsterdam Capital Trading B.V.	No

A.4. References to applied methodologies and standardized baselines

The approved CDM small-scale baseline and monitoring methodology AMS I.C. "Thermal energy production with or without electricity" (Version 21.0)

https://cdm.unfccc.int/UserManagement/FileStorage/1RGVQOU534LJ2PKIDEW6ST0H9XBMFN

Methodological tools used

- Tool to calculate project or leakage CO2 emissions from fossil fuel combustion version 03
  https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-03-v3.pdf

- Tool to calculate the emission factor for an electricity system- Version 07
  https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v7.0.pdf

- Tool 12: "Project and leakage emissions from transportation of freight", version 01.1.0 (https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-12-v1.1.0.pdf)

- Tool 22: Leakage in biomass small-scale project activities version 04.0 (https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-22-v1.pdf)

A.5. Crediting period type and duration

Type of crediting period	Renewable
Crediting period from	04/03/2018 to 03/03/2025 (Renewable)
Length of the Crediting Period	07 Years

SECTION B. Implementation of project activity

B.1. Description of implemented project activity

The project activity is a cogeneration power plant with a 5.5 MW straight back pressure type turbo generator set and bi-drum type multi-fuel boiler with fluidised bed combustion, balanced draft and bottom supported by RCC construction. The methane generated from the in- house bio-methanation plant is combusted in a boiler along with biomass to generate steam and electricity. A high pressure boiler of 36 tons per hour[9] (TPH) has been installed. The steam conditions at the outlet are a pressure of 87 kg/cm^2 and a temperature of 540 + 5 deg. C. The low pressure steam coming out from the TG set is used for operation of distillery.

Of the total power generated from the combustion of the biogas and rice husk, 0.405 MW power is used for operation of power plant auxiliaries. The balance power is available for displacing the grid electricity generated by combusting the fossil fuels. Out of this balance power 3 MW is supplied to the grid while the balance is consumed as captive consumption in the industrial facility.

All the necessary auxiliary facilities of the power plant including DM water treatment plant, cooling tower, condensate system, fuel storage and handling systems, electrical power evacuation system, compressed air system, instrumentation and control system etc. have been provided for the project activity plant. Power is generated at 11 kV at the plant and is evacuated to grid at 66 kV.

Combustion technology has been selected for the project activity plant, wherein biogas and biomass is burnt as fuel in a steam generator to produce high-pressure steam, which is then expanded in turbo-generators to generate power.

The project activity was successfully commissioned on 8 April 2008 and started supplying electricity to Punjab State Electricity Board on 8 April 2008.

The technological details of the Power Generation Units are as below: -

1. Turbine specification:	
Steam turbine make and type	Extraction cum back pressure
Rated power of the turbine (kW)	5500 kW
Inlet steam pressure	84 Kg/sq. Cm. (g**)**
Inlet steam temperature	535 Deg. C
Extraction quantity and Pressure	15 TPH at 9.0 Ata
Electricity generation volts	11 KV
Up-gradation of electricity for supply to grid	66 KV

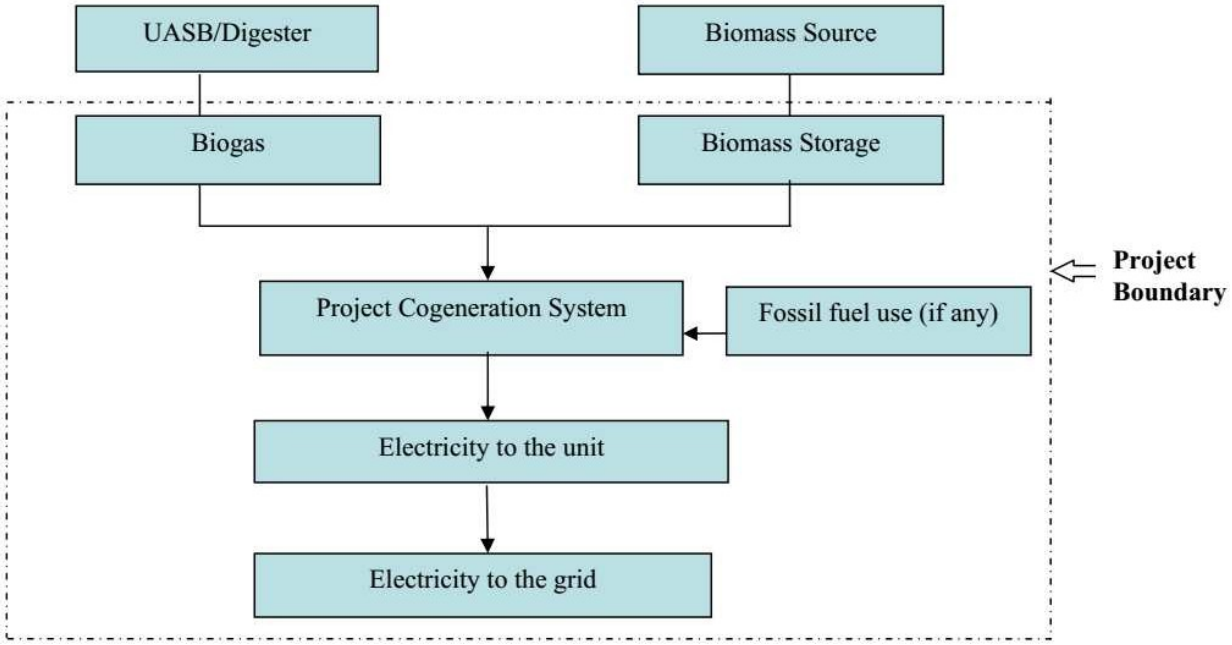
2. Boiler specifications	
Boiler make and type	Multi fuel boiler
Type of furnace	Fluidized bed
Fuel used	Methane, Rice husk and coal
Capacity (TPH)	36.5 Tons per hour
Superheated steam pressure	86 Kg/sq. Cm (g)
Superheated stem temperature	540 Deg. C + 5

3. Wet scrubber	
Make and type	Eco-Tech Sieve Tray Scrubber
SPM in flue gas level after ESP	115 mg/N. Cu. m**.**

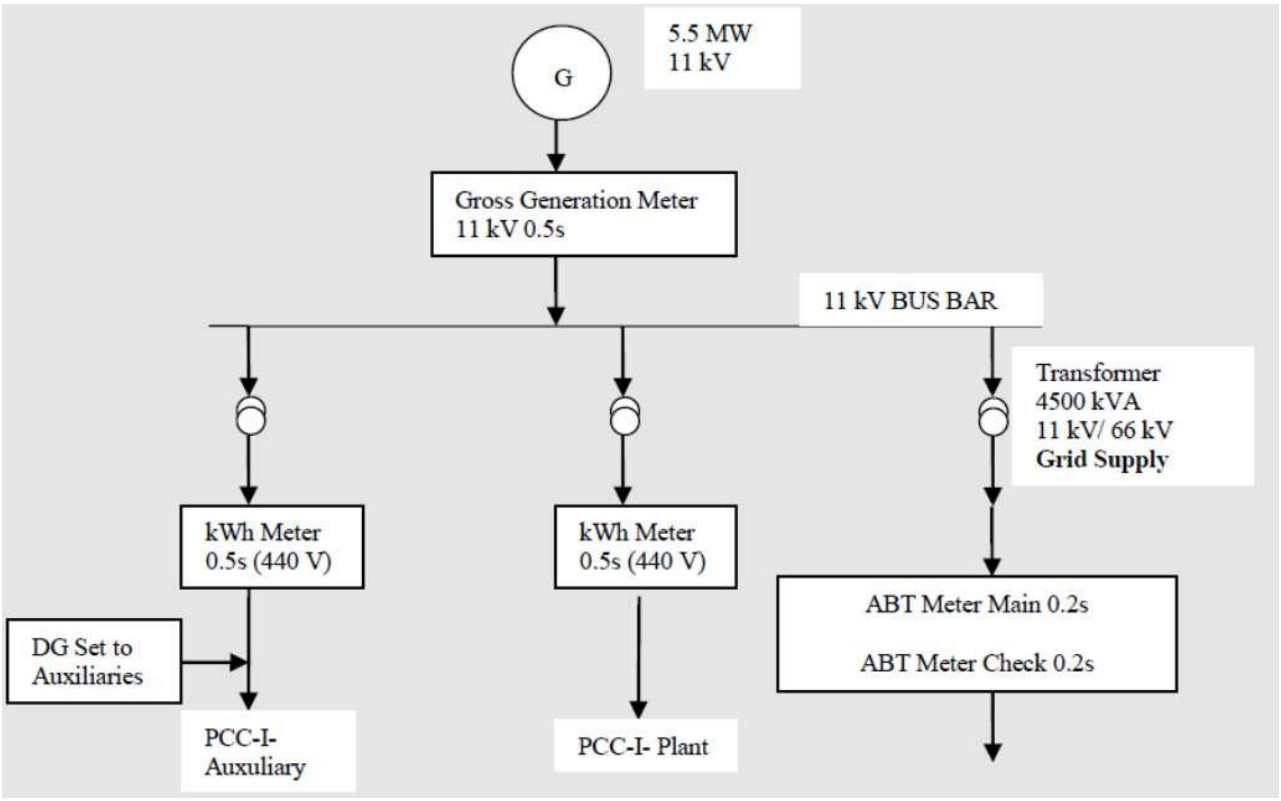
There is no transfer of technology to the host country since the technology is available in India from reputed manufacturers.

The project activity has the necessary provisions of a HSD fired DG set installed at the site for any exigency purposes to deal with any unforeseen outages or breakdowns. In the situation where an emergency causes unintended emissions, these emissions have been quantified and recorded on a monthly basis by the Site Supervisor and accounted for as project emissions in Section E.2 of this Monitoring Report.

The schematic layout of the project activity is as follows: -



The metering arrangement of the project activity is as below: -



B.2. Post-registration changes

B.2.1. Temporary deviations from the registered monitoring plan, applied methodologies, standardized baselines or other methodological regulatory documents

There is no request for deviation applied during this monitoring period.

B.2.2. Corrections

There have not been any corrections to project information or parameters fixed at validation during the current monitoring period.

B.2.3. Changes to the start date of the crediting period

There has been no change in start date of crediting period of the project activity during the current monitoring period.

B.2.4. Inclusion of monitoring plan

There has not been any change in the monitoring plan during the current monitoring period.

B.2.5. Permanent changes to the registered monitoring plan, or permanent deviation of monitoring from the applied methodologies, standardized baselines, or other methodological regulatory documents

Not Applicable.

B.2.6. Changes to project design

There has not been any change in the PDD during the current monitoring period.

B.2.7. Changes specific to afforestation or reforestation project activity

Not applicable as the project activity is not an afforestation or reforestation project activity.

SECTION C. Description of monitoring system

The Monitoring Plan for the Project activity has been developed to ensure that complete and reliable data is collected and archived in a well-organized manner.

The objective of this plan is to assure the complete, consistent, clear and accurate monitoring and calculation of the emission reductions realized by the waste water treatment facility and combustion of biogas with rice husk for generation of power for process and supply to grid.

Use of the Monitoring Plan (MP) by the Operator

This Monitoring Plan identifies key performance indicators of the project and sets out the procedures for metering, monitoring, calculating and verifying the ERs generated by the project, annually. Adherence to the instructions in the Monitoring Plan is issued to the operator to measure and track the impact of the project on the environment. The operator prepares all data required for the periodic audit and verification process that must be undertaken to confirm the achievement of the corresponding ERs. The MP is thus the basis for the production of ERs and accreditation of the ERs within the CDM mechanism.

All the results of monitoring is preserved by the project proponent for two years beyond the end of crediting period.

Organizational, Operational and Monitoring Obligations of the Operator

Monitoring the project's performance in terms of ERs achievement requires the fulfilment of operational data collection and processing obligations from the operator. ABGSPL, the operator of plant has the primary obligation to collect data that would facilitate the calculation of the project ERs. The data is collected by the operator based on the most recent available information as per the Procedures presented in this PDD. In addition, roles and responsibilities of monitoring personnel is well defined. Examples of roles and responsibilities for monitoring of data and parameters are provided with this monitoring plan; however these need to be updated on a regular basis.

It is believed that the monitoring plan approach presented here will result in an accurate, yet conservative calculation of ERs. However some uncertainties may lead to a deviation between monitored and verified ERs, especially errors in the data monitoring and processing system. The operator is expected to prevent such errors and the verification audits are expected to uncover any possible errors. The operation of the facilities is documented in a quality control program, monitoring the conditions and procedures that ensure efficient operation of the plant.

Institutional arrangements for data collection and archiving

Agent	Deliverable
The operator AB Grain Spirits Pvt. Ltd.	Overall responsible for completeness of data, reliability of data (calibration of meters, weighing machines measuring samples) and monthly report generation. Following shall be measured and recorded**:** • Quantity of electricity produced by the power plant • Electricity supply to the grid • Electricity consumption for equipment used on site. Data can be collected from electricity meter installed by state electricity board (a kWh-instrument) • Fuel consumption for equipment used on site. Data can be based upon the received invoices for fuel. Operator shall keep/file receipt of invoices • Electricity consumption on-site (if any) • Quantity of rice-husk and biogas used on-site • Quantity of coal fired in the boiler (if any) • Calorific value of rice-husk and the surplus biomass available in the region
Advisor CDM/Quality	Overall responsibility Monitoring plan of CDM registration and compliance with the CDM

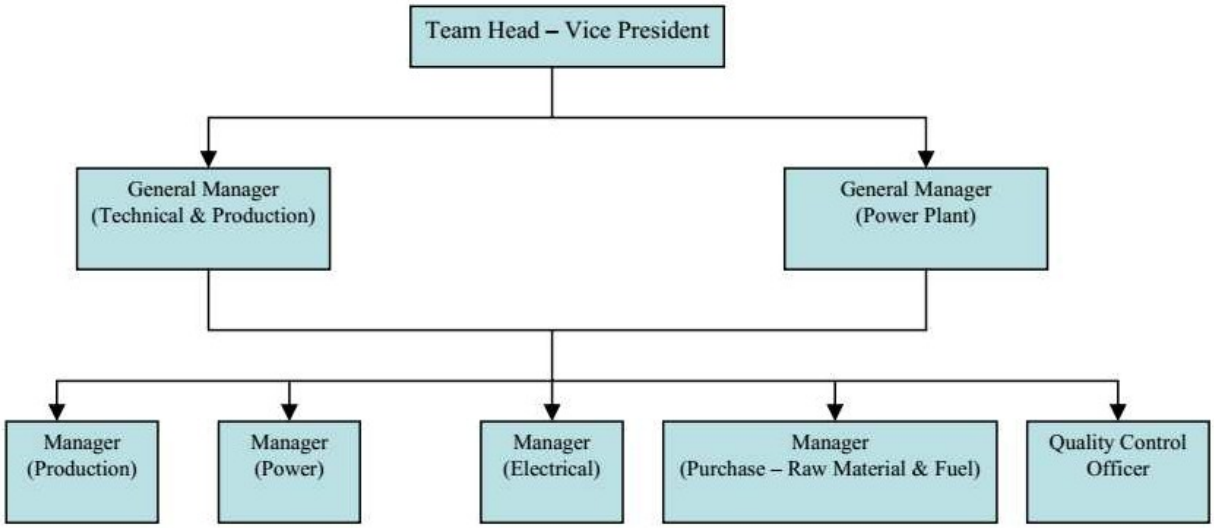
Monitoring Organization

The project activity is managed by the Vice President (VP) of the company under the overall guidance of the Managing Director. The Vice President is a qualified Alcohol technologist having long experience of operation of distillery and generation of power. The VP is assisted by a qualified & experienced team of General Managers in the field of technical and commercial aspects.

Formation of CDM team:

A CDM project team has been constituted with participation of relevant departments. Members of the team is trained on CDM concept and monitoring plan. The team is responsible for data collection and archiving. The members meet periodically to review the CDM project activity, checking of collected data, emission reductions etc. Monitoring reports are checked weekly by the senior team members/managers. Any irregularity observed during the checks are reported to the concerned person for taking corrective actions. Weekly review is followed by monthly review. Monthly reports is forwarded to the senior management level.

Members of the Monitoring team:



The following operators and section in-charges maintain the CDM related data as under:

Personnel	Responsibility
Switch board operators	Logging of electrical data
DG set operators	Logging of DG set data and diesel oil consumption data
Turbine Generator supervisor	Logging of TG operational data
Boiler in-charge	Logging of boiler operational data
Mechanical engineer	Compilation of boiler data, rice husk procurement and combustion data, biogas generation and combustion data daily, monthly and yearly
Electrical engineering	Compilation of electrical data, power consumption data and power supply data to grid daily, monthly and yearly.
Store Incharge	Logging of raw material and fuel purchase and compilation daily, monthly and yearly.
Quality control Incharge	Proper sampling and analysis carried out in laboratory relating the CDM activity.
GM power plant	Analysis of collected data relevant for CDM and preparation of daily reports and their safe keeping up to two years on completion of crediting period. He is also responsible management of the team in carrying out their duties

Detailed Roles and Responsibilities for implementing the monitoring plan

Parameter	Description	Frequency	Responsible Person	Supervisor
$EG_{grid,y}$	Electricity supplied to the grid	Continuous	Manager (Power)	General Manager (Power Plant)
$FC_{diesel,y}$	Quantity of fuel (diesel) combusted onsite	Monthly	DG set operator	General Manager (Power Plant)

$FC_{coal, y}$	Quantity of fuel (coal) combusted onsite	Monthly	Manager (Purchase – Raw material and fuel)	General Manager (Power Plant)
Surplus Biomass Availability	Surplus Biomass availability in the region	Every crediting period	Survey by internal/ external	General Manager (Power
			agency	Plant)
$D_{f,m}$	Return trip distance between the origin and destination of freight transportation activity f in monitoring period m	Continuous	Manager (Power)	General Manager (Power Plant)

Data is collected and archived electronically as well as manually to ensure accuracy and to calculate the flare emissions, and the ERs etc.

All measurement equipments have been maintained according to the technical standards provided by the manufacturer. The measurement and recording is done in an accurate and transparent manner.

The main risk associated with the project activity is the actual amount of biogas that is generated. However, this is monitored using flow meters installed at the project site.

It is believed that the monitoring plan approach presented here results in an accurate, yet conservative calculation of ERs. However, some uncertainties may lead to a deviation between monitored and verified ERs, especially errors in the data monitoring and processing system. The operator is expected to prevent such errors and the verification audits are expected to uncover all possible errors.

The Return trip distance between the origin and destination of freight transportation activity in every monitoring period is continuously monitored by means of Vendor Certificates providing the biomass to project activity.

Calibration

All the measurement instruments are subject to regular calibration as per manufacturer's specifications or at least once in a year. The regular check and calibration is entrusted to the operators. The General Manager is responsible for checking the equipment's proper working order, as well as checking and storing up the calibration certificates and records. Calibration documents are kept for all the equipments until two years after the end of the crediting period.

Data Management and Storing system

The data is archived electronically onsite and spreadsheets are prepared. The information archived is aggregated hourly, monthly and yearly in a standard format for the preparation for reporting purposes.
The general manager implements a document control system to ensure that all the necessary documents (records of monitored data, drawings, maintenance and calibration instructions etc.) are available and stored in a proper manner. A copy of the monitored data (both on CDs and papers) is kept separately in fire proof cabins, so as to ensure safety.

All data, including calibration records and Monitoring reports are kept until 2 years after the end of crediting period for the project activity, whichever occurs later.

Training of CDM team personnel:

CDM team and plant personnel have been trained for CDM activities, collection and monitoring of data, record keeping through a planned schedule prepared in advance.

Checking data for its correctness and completeness:

The CDM team is over all responsible for checking the data for its completeness and correctness. The data collected from daily log is forwarded to the laboratory after verifications from the concerned departments.

Internal audit:

An internal audit is carried out to check the correctness of the procedures and monitored data by the auditing team entrusted for this job. Report of the internal audit team, with details of faults found and corrective action taken are maintained and passed to external audit team for re-verification of correctness

SECTION D. Data and parameters

D.1. Data and parameters fixed ex ante

Data/Parameter	**NCV_{diesel}**
Unit	TJ/Gg
Description	Net Calorific Value of fossil fuel (diesel)
Source of data	Used IPCC 2006 guidelines for National Greenhouse gas Inventories, volume 2, Table 1.2, p.1.1
Value(s) applied	43.3
Choice of data or measurement methods and procedures	In the absence of project specific data and region specific data, IPCC values shall be taken.
Purpose of data/parameter	-
Additional comments	The fossil fuel consumption has been considered as 0 for the ex-ante calculations. However, the same has been monitored ex-post once the project is operational.

Data/Parameter	**NCV_{coal}**
Unit	TJ/Gg
Description	Net Calorific Value of fossil fuel (coal)
Source of data	Used IPCC 2006 guidelines for National Greenhouse gas Inventories, volume 2, Table 1.2, p.1.1
Value(s) applied	26.0
Choice of data or measurement methods and procedures	In the absence of project specific data and region specific data, IPCC values shall be taken.

Purpose of data/parameter	-
Additional comments	The fossil fuel consumption has been considered as 0 for the ex-ante calculations. However, the same has been monitored ex-post once the project is operational.

Data/Parameter	**$EF_{CO2,diesel}$**
Unit	tCO_2e/GJ
Description	CO_2 emission factor of fossil fuel used onsite (Diesel)
Source of data	Used IPCC 2006 guidelines for National Greenhouse gas Inventories, volume 2, Table 1.4, p.1.23
Value(s) applied	74.8
Choice of data or measurement methods and procedures	In the absence of project specific data and region specific data, IPCC values shall be taken.
Purpose of data/parameter	-
Additional comments	IPCC values have been found conservative to the local values provided by CEA, hence used for calculation.

Data/Parameter	**$EF_{CO2,coal}$**
Unit	tCO_2e/GJ
Description	CO_2 emission factor of fossil fuel used onsite (coal)
Source of data	Used IPCC 2006 guidelines for National Greenhouse gas Inventories, volume 2, Table 1.4, p.1.23
Value(s) applied	100
Choice of data or measurement methods and procedures	In the absence of project specific data and region specific data, IPCC values shall be taken.
Purpose of data/parameter	-
Additional comments	IPCC values have been found conservative to the local values provided by CEA, hence used for calculation.

Data/Parameter	**ρ_{diesel}**
Unit	Kg/L
Description	Density of diesel
Source of data	Indian Oil
Value(s) applied	0.880
Choice of data or measurement methods and procedures	Average density of diesel in India has been used as provided by Indian Oil Corporation Limited (IOCL)[39] which gives density of diesel in the range of 820– 880 kg/m3. When converted to kg/L, it gives a value of 0.882 – 0.880 kg/L. Hence, 0.880 kg/L shall be used since it is more conservative.
Purpose of data/parameter	-
Additional comments	The fossil fuel consumption has been considered as 0 for the ex-ante calculations. However, the same has been monitored ex-post once the project is operational.

Data/Parameter	TDLj, 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	A default value of 20% has been taken since electricity consumption by all project and leakage electricity consumption sources shall be larger than the electricity consumption of all the baseline electricity consumption.
Purpose of data/parameter	-
Additional comments	-

Data/Parameter	GWP_{CH4}
Unit	t CO_2e / t CH_4
Description	Global warming potential commitment period
Source of data	IPCC Default value
Value(s) applied	25
Choice of data or measurement methods and procedures	Decisions under the UNFCCC and the Kyoto Protocol (a value of 21 was applied for the first commitment period of the Kyoto Protocol)
Purpose of data/parameter	-
Additional comments	The same has been updated at the end of first commitment of Kyoto Protocol as per the decisions under UNFCCC and Kyoto Protocol.

Data/Parameter	$EF_{grid,OM,y}$
Unit	tCO_2/MWh
Description	Operating Margin CO_2 emission factor in year y
Source of data	Calculated from CEA database, Version 14, Dec 2018[8]
Value(s) applied	0.9610
Choice of data or measurement methods and procedures	Calculated as per "Tool to calculate the emission factor for an electricity system, version 7.0" as 3-year generation weighted average using data for the years 2015-16, 2016-17 & 2017-18. The data are obtained from "CO_2 Baseline Database for Indian Power Sector" version 14, published by the Central Electricity Authority, Ministry of Power, Government of India.
Purpose of data/parameter	For the calculation of the Baseline Emission
Additional comments	This parameter is fixed ex-ante for the entire crediting period.

[8] http://www.cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver14.pdf

Data/Parameter	$EF_{grid,BM,y}$
Unit	tCO_2/MWh
Description	Build Margin CO_2 emission factor in year y
Source of data	Calculated from CEA database, Version 14, Dec 2018[9]
Value(s) applied	0.8644
Choice of data or measurement methods and procedures	Calculated as per "Tool to calculate the emission factor for an electricity system, version 7.0" as per the latest data available for the most recent year 2017-18. The data is obtained from "CO_2 Baseline Database for Indian Power Sector" version 14, published by the Central Electricity Authority, Ministry of Power, Government of India.
Purpose of data/parameter	For the calculation of the Baseline Emission
Additional comments	This parameter is fixed ex-ante for the entire crediting period.

Data/Parameter	$EF_{grid,CM,y} = EF_{grid,y}$
Unit	tCO_2/MWh
Description	Combined Margin CO_2 emission factor in year y
Source of data	Calculated from CEA database, Version 14, Dec 2018[10]
Value(s) applied	0.8885
Choice of data or measurement methods and procedures	The combined margin emissions factor is calculated as follows: $EF_{grid,CM,y} = EF_{grid,OM,y} * W_{OM} + EF_{grid,BM,y} * W_{BM}$ Where: $EF_{grid,BM,y}$= Build margin CO_2 emission factor in year *y* (tCO_2/MWh) $EF_{grid,OM,y}$= Operating margin CO_2 emission factor in year *y* (tCO_2/MWh) W_{OM} = Weighting of operating margin emissions factor (%) = 25 % W_{BM}= Weighting of build margin emissions factor (%) = 75%
Purpose of data/parameter	For the calculation of the Baseline Emission
Additional comments	This parameter is fixed ex-ante for the entire crediting period.

D.2. Data and parameters monitored

Data/Parameter	$EG_{Grid\ y}$
Unit	MWh
Description	Quantity of electricity supplied to grid by project activity
Measured/calculated/ default	Measured
Source of data	Plant records

[9] http://www.cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver14.pdf

[10] http://www.cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver14.pdf

Value(s) of monitored parameter	61,811.90
Monitoring equipment	Gross Generation Meter: Type: Energy Meter Meter Make: Socomec Serial No/Model : DIRISA40 with accuracy 0.5% Auxiliary Consumption meter: Type: Energy Meter Make: AEL Meter Serial No: 05/09/001786/06 with accuracy: 0.5%
Measuring/reading/recording frequency	Continuous Recording Frequency: Daily.
Calculation method (if applicable)	Quantity of electricity supplied to grid by project activity shall be calculated as the difference between the total generation and auxiliary consumption; i.e. = Gross Electricity generation – Auxiliary consumption
QA/QC procedures	Electricity meters are subject to regular (in accordance with stipulation of the meter supplier) maintenance and testing to ensure accuracy. The meters are AC static, HT, 3 Phase 4 wire type with 0.5 class accuracy. The meters are calibrated as per the manufacturer's specifications or at least once a year.
Purpose of data/parameter	For calculation of baseline emission
Additional comments	-

Data/Parameter	$D_{f,m}$
Unit	Kilometer
Description	Return trip distance between the origin and destination of freight transportation activity *f* in monitoring period *m.*
Measured/calculated/ default	Measured
Source of data	Vendor Certificates provided by the biomass vendors of the Project Participant.
Value(s) of monitored parameter	-
Monitoring equipment	Determined once for each freight transportation activity f for a reference trip using the vehicle odometer by the Vendor(s) and same mentioned in the Certificate provided by the vendor(s) for ex-post evaluation.
Measuring/reading/recording frequency	Continuous; To be updated whenever the distance changes
Calculation method (if applicable)	-
QA/QC procedures	-
Purpose of data/parameter	For Project Emission
Additional comments	-

Data/Parameter	$FC_{diesel\ y}$
Unit	Mass or unit volume per year (litres)
Description	Quantity of fuel (diesel) combusted onsite

Measured/calculated/ default	Measured
Source of data	Consumption records cross checked with purchase invoices
Value(s) of monitored parameter	227,179
Monitoring equipment	Data is calculated annually based on logbook records for fuel consumption. Data is kept manually and electronically and is cross checked with invoices.
Measuring/reading/recording frequency	Monitoring Frequency: As and when the fuel is purchased from the supplier. The data shall be aggregated and recorded on a monthly basis.
Calculation method (if applicable)	-
QA/QC procedures	The amount of fuel (diesel) is derived from the consumption records cross checked with paid fuel invoices.
Purpose of data/parameter	For Project Emission
Additional comments	Fuel consumption onsite for any exigency purpose has been taken to be 0. However, it is monitored and accounted for ex post.

Data/Parameter	**$FC_{coal, y}$**
Unit	Mass or unit volume per year (tonnes)
Description	Quantity of fuel (coal) combusted onsite
Measured/calculated/ default	Measured
Source of data	Consumption records cross checked with purchase invoices
Value(s) of monitored parameter	0
Monitoring equipment	Data is kept manually and electronically and has been cross checked with invoices. Weighbridge I and II, having an accuracy of 3% Calibration Frequency: Yearly
Measuring/reading/recording frequency	Monitoring Frequency: As and when the coal is purchased from the supplier. The data is aggregated and recorded on a monthly basis.
Calculation method (if applicable)	-
QA/QC procedures	The amount of fuel (coal) has been derived from the consumption records cross checked with paid fuel invoices. The weigh bridges are calibrated yearly by Department of Weights and Measures, Government of Punjab.
Purpose of data/parameter	-
Additional comments	Fuel consumption onsite for any start up or emergency purpose has been taken to be 0. However, if any, it is monitored and accounted for ex post.

Data/Parameter	**Surplus Biomass Availability**
Unit	%
Description	Surplus biomass residue availability in the region
Measured/calculated/ default	Calculated
Source of data	Field visits and surveys

Value(s) of monitored parameter	The value for the current crediting period is been based on the biomass assessment carried out for the project by M.C. Jain and Associates in February 2019. As per the report, the total consumption of biomass including the project activity works out to be 67 365 MT/annum as against a total availability of 90 401 MT. Thus availability of biomass (rice husk) is more than 25% than the requirement.
Monitoring equipment	-
Measuring/reading/recording frequency	Measured
Calculation method (if applicable)	-
QA/QC procedures	-
Purpose of data/parameter	-
Additional comments	This data has been calculated to substantiate that there is no leakage emissions due to competent use of biomass.

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

The applicable baseline for the project is Para 12 (e) of methodology i.e. Electricity is imported from the grid and steam and heat is produced using biomass. Under para 19 of the methodology, it is stated that the baseline emissions from heat generation are not eligible.

Hence, the baseline emission can be calculated as:-

$$\mathbf{BEy = EG_{Grid,y} * EF_{Grid\ CM\ y}}$$

Where:
BEy = Baseline emissions in tCO_2e.
$\mathbf{EG_{Gridy}}$ = Net Electricity Generation by project activity in MWh
$\mathbf{EF_{Grid\ CM\ y}}$ = Baseline emission factor in tCO_2e/MWh

The baseline is calculated using the combined margin approach. The baseline emission factor has been calculated and fixed ex-ante as 0.885 tCO_2/MWh.
Hence,

Parameter	Unit	Value
Net Energy Generation by project activity	MWh	61811.90
Emission Factor	tCO_2e/MWh	0.8885
Baseline Emissions	**tCO_2e**	**54,919**

BEy = 54,919 (Rounded down figure)

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

The calculations of emissions from electricity use have been provided as per equation 1 of "Tool to calculate baseline, project and/or leakage emissions from electricity consumption.

Formula Applied:

Project Emissions (PEy) = $PE_{EC,y}$ + $PE_{FC,y}$

1. Project emissions from electricity consumption during the year y (t CO_2) (PE_{ECy})

Emissions due to electricity consumption (as per equation 1 of "Tool to calculate baseline project and/or leakage emissions from electricity consumption)

$$PE_{EC,y} = EC_{PJ,j,y} * EF_{EL,\ j,y} * (1+ TDL_{j,\ y})$$

Where

$PE_{EC,y}$	Project emissions from electricity consumption in year y (tCO_2/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 of the Electricity Generation for source j in year y (tCO_2/MWh)
$TDL_{j,\ y}$	Average technical transmission and distribution losses for providing electricity to source *j* in year *y*

Hence, the values obtained during the current monitoring period is: -

Parameter	Unit	Value
Net Electricity Import	MWh	0.00
Emission Factor	tCO_2e/MWh	0.8885
Transmission & Distribution Losses	%	20
Project Emissions from import of electricity	tCO_2e	0

Hence, $PE_{EC,y}$ = 0 (Rounded Up figure)

2. Project emissions from fossil fuel consumption during the year y (t CO_2) (PE_{FCy})

Emissions from on-site fuel consumption of diesel and coal has been calculated using following formulae:

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

Where:

$$FC_{i,\ j,\ y(t)} = FC_{i,\ j,\ ,y(L)} * \rho_{i,y}$$

And

$$COEF_{iy} = NCV_{iy} * EFCO_{2iy}$$

The fuel consumption during the project activity can be from two sources, i.e. from HSD fired DG set installed at the site for any exigency purposes and coal consumption (if any) in the boiler furnace.
Hence,

$$PE_{FC,j,y} = PE_{diesel,onsite,y} + PE_{coal,onsite,y}$$

For project emissions due to diesel consumption onsite:

$$PE_{diesel,onsite,y} = FC_{diesel,y(t)} * COEF_{diesel}$$

$$FC_{diesel,y(t)} = FC_{diesel,y(L)} * \rho_{diesel}$$

$$COEF_{diesel} = NCV_{diesel} * EF_{CO2,diesel}$$

For project emissions due to coal consumption onsite:

$$PE_{FC(coal),y} = FC_{coal,y(t)} * COEF_{coal,y}$$

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

Parameter	Unit	**Value**
On-site diesel consumption	Litres	227179
Density of Diesel	kg/litre	0.88
NCV Diesel	Tj/Gg	43.30
Emission Factor- diesel	tCO_2e/TJ	74800
Project Emissions due to onsite diesel consumption	tCO_2e	647.50
Project Emissions due to onsite diesel consumption (Rounded up)	tCO_2e	648

Project Emission due to diesel = 648 tCO_2e (Rounded Up figure)

Parameter	Unit	**Value**
On-site coal consumption	tonnes	0
NCV Coal	Tj/Gg	26.0
Emission Factor- coal	tCO_2e/TJ	100000
Project Emissions due to onsite coal consumption	tCO_2e	0.00

As per plant records, Coal consumption is zero. Hence, project emissions due to coal consumption is also zero.

Total Project Emissions due to fuel consumption at site can be calculated as below:

$PE_{FC,j,y} = PE_{diesel,onsite,y} + PE_{coal,onsite,y}$

$= 648 + 0$

$= 648\ tCO_2e$

E.3. Calculation of leakage emissions

Since the Surplus biomass residue availability in the region is greater than 25%, hence as per the applied methodology, the Leakage Emission has been take as zero, LEy = 0.

E.4. Calculation of emission reductions or net anthropogenic removals

	Baseline GHG emissions or baseline net GHG removals (t CO_2e)	Project GHG emissions or actual net GHG removals (t CO_2e)	Leakage GHG emissions (t CO_2e)	GHG emission reductions or net anthropogenic GHG removals (t CO_2e)			
				Before 01/01/ 2013	From 01/01/ 2013 until 31/12/ 2020	From 01/01/ 2021	Total amount
Total	54,919	648	0	0	54,271	0	54,271

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_2e)	Amount estimated ex ante for this monitoring period in the PDD (t CO_2e)
54,271	75,292

E.5.1. Explanation of calculation of "amount estimated ex ante for this monitoring period in the PDD"

As per CDM registered PDD, 29,334 tCO_2e is the estimated amount of emission reduction annually determined ex ante for 365 days. The total number of days in this monitoring period from 04/03/2018 to 31/12/2020 is 1034 days.

Therefore, following unitary method, the amount of emission reduction estimated ex ante for this monitoring period is identified as below: -

$= (29334*1034) / 365$

$= 75,292\ tCO_2e$

Hence, the estimated ex ante amount of emission reductions for current monitoring period is 75,292 tCO_2e.

E.6. Remarks on increase in achieved emission reductions

During the present monitoring period, actual emission reductions achieved are 54,271 tCO_2e whereas estimated emission reductions was 75,292 tCO_2e. The project witnessed decrease of 27.92% in emission reductions as compared to ex-ante emissions. There is decrease in actual emission reductions due to low Plant Load Factor.

E.7. Remarks on scale of small-scale project activity

The installed capacity of the project activity is 5.5 MW. The project activity remained within the limit of small scale project activity in each year of the crediting period as the emission reductions are less than the limit of small scale CDM Project activity.

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Document information

Version	*Date*	*Description*
09.0	8 October 2021	Revision to: • Ensure consistency with version 03.0 of the "CDM project standard for project activities" (CDM-EB93-A04-STAN).
08.0	6 April 2021	Revision to: • Reflect the "Clarification: Regulatory requirements under temporary measures for post-2020 cases" (CDM-EB109-A01-CLAR).
07.0	31 May 2019	Revision to: • Ensure consistency with version 02.0 of the "CDM project standard for project activities" (CDM-EB93-A04-STAN); • Add a section on remarks on the observance of the scale limit of small-scale project activity during the crediting period; • Add "changes specific to afforestation or reforestation project activity" as a possible post-registration changes; • Clarify the reporting of net anthropogenic GHG removals for A/R project activities between two commitment periods; • Make editorial improvements.
06.0	7 June 2017	Revision to: • 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: • 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: • 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 *F-CDM-MR* to *CDM-MR-FORM*; • Editorial improvement.

Version	*Date*	*Description*
03.2	5 November 2013	Editorial revision to correct table in page 1.
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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).
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