



Monitoring report form for CDM project activity
(Version 08.0)

MONITORING REPORT

Title of the project activity	2.5 MW Rice husk based cogeneration plant at Hanuman Agro Industries Limited		
UNFCCC reference number of the project activity	1667		
Version number of the PDD applicable to this monitoring report	06		
Version number of this monitoring report	01		
Completion date of this monitoring report	04/08/2021		
Monitoring period number	05		
Duration of this monitoring period	07/11/2015 to 30/08/2016 (both days included)		
Monitoring report number for this monitoring period	Not applicable		
Project participants	M/s. Hanuman Agro Industries Limited		
Host Party	India		
Applied methodologies and standardized baselines	Methodology: AMS I.C Thermal Energy for the user with or without electricity, Version - 21 Standardized baselines – Not Applicable		
Sectoral scopes	Sectoral scope 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 ₂ e	21,469 tCO ₂ e	0 tCO ₂ e
Amount of GHG emission reductions or net anthropogenic GHG removals estimated ex ante for this monitoring period in the PDD	28,044 tCO ₂ e		

SECTION A. Description of project activity

A.1. General description of project activity

Hanuman Agro Industries Limited (HAIL) is a public limited company, incorporated on 7th January 1994 with the main objectives of carrying out business activities in the field of Paper & Power Generation using conventional or non-conventional fuel.

The purpose of the project is to collect and utilize available and un-utilized waste biomass resource effectively for effective generation of electricity for in-house consumption. The project activity is the 2.50 MW rice husk based cogeneration power plant generating electricity and steam for captive consumption.

Present Scenario:

The total power requirement of the paper mill was being met by the power supplied by the Chhattisgarh State Electricity Board (Unified Indian Grid)) and total process steam requirement of around 9 TPH at 10 Kg/cm² was being met by coal fired boiler.

Purpose of the Project Activity:

The project activity, which is a 'carbon neutral fuel' based cogeneration plant, generates electricity in addition to steam to meet HAIL's captive electricity requirement thereby displacing power supplied from the State Grid. Apart from the electricity, project activity is saving the equivalent coal otherwise would have been used for steam generation in process plant. The new boiler is a high- pressure boiler with 22 TPH steam production. Envisaged generation MCR of 2,500 KW is comfortably meet the peak power demand, including the cogeneration auxiliaries. 9 TPH of extraction steam of 10 Kg/cm² from the turbine is adequately meet the process steam requirement at the mill. A part of the steam is fed to pulp section at 10 Kg/cm² and rest goes to paper section at 4 Kg/cm² through the existing pressure reducer. The generation is synchronized with utility supply at 11 KV and step down to usage level of 400 V is by the existing 11 KV/400 V transformer.

Since the project envisages the procurement & utilization of local biomasses for power generation and steam production, it is not only supplement the current & planned electricity generation from traditional fossil fuels but also conserve the fossil fuel (coal in this present scenario) and avoid harmful gas emissions that are arised from using the coal.

Hanuman Agro Industries Limited (HAIL) has successfully commissioned its 2.5 MW biomass based cogeneration plant on 31/08/2006 with a purpose to utilise local biomass (rice husk) for meeting captive heat and electricity requirements. The project activity is not only supplementing the current & planned electricity generation from traditional fossil fuels but also conserving the fossil fuel (coal in this present scenario) and avoiding harmful gas emissions that are arised from using the coal.

The project activity is using Fluidized bed combustion technology for generating heat and electricity. The installed capacity of the plant is 2.5 MW in cogeneration mode. The major plant/ equipments installed within the project boundary involve:

- 22 TPH Fluidised Bed Combustion Boiler
- 2.50 MW Extraction cum condensing Steam Turbine

The project activity is located in a rural belt and contributes positively to the 'Sustainable Development of India' by further strengthening four pillars of sustainable development:

Social well-being:

The Project activity is contributing to a small increase in the local employment by employing skilled and unskilled personnel for operation and maintenance of the equipment. The productive use of an agro waste brings in associated economic and social benefits. The project also helps to bridge the gap of electricity demand and supply at local and national level.

Economic well-being:

The increase in demand of rice husk exerted by the project have local effect on its price and generates additional revenue for the rice millers, which in turn benefits the local farmers, as this is paddy-growing area. The project activity results in saving the coal and HSD and allowing it to be diverted to other needy section of the economy.

Environmental well-being:

The project activity is a renewable energy power project, which collects & use waste biomass generated in the local region as a fuel for power generation and export clean power to the CSEB grid. This electricity generation either substitutes or supplements the power generation by CSEB using conventional sources of energy (which also includes high carbon emissive fuel). Thus it reduces the CO₂ emissions which otherwise would have been emitted due to the generation of power by CSEB grid generation mix. Conserving coal by avoiding the process steam generation from coal fired boiler and mitigating the emission of GHG (CO₂) as a rice husk is a carbon neutral fuel.

Technology well-being:

The project activity is adopting an advanced and sustainable technology for long-term benefits.

The operations during the monitoring period from 07/11/2015 to 30/08/2016 have been able to achieve overall emission reductions of 21,469 tCO₂e.

A.2. Location of project activity

Village: Paragaon

Tehsil: Navapara-Rajjim

District: Raipur

State: India

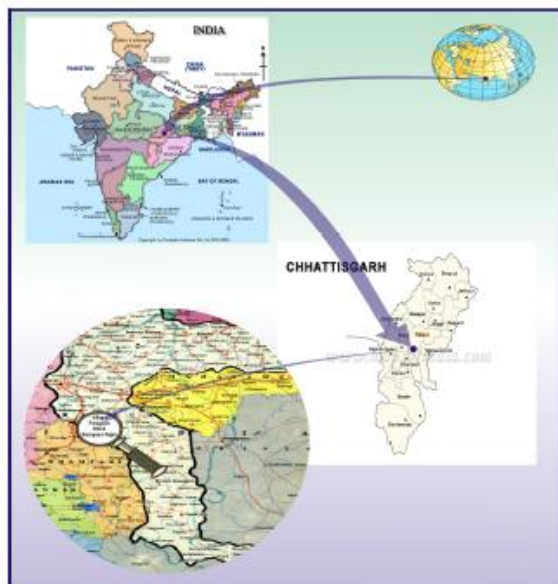
Nearest Airport: Mana, Raipur (32 KM)

Nearest Railway Station: Raipur (43 KM)

GPS Co-ordinates:

Latitude	Longitude
20°57'46" N	81°53'05" E

The map indicating the plant location is as 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. Hanuman Agro Industries Limited	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)¹

Methodological tools used:

- Tool to calculate project or leakage CO₂ emissions from fossil fuel combustion- Version 03²
- Tool to calculate the emission factor for an electricity system- Version 07³

A.5. Crediting period type and duration

Crediting period type – Renewable

Length of crediting period – 7 Years

First crediting period is from 07/11/2008 to 06/11/2015

Second crediting period is from 07/11/2015 to 06/11/2022

¹ <https://cdm.unfccc.int/methodologies/DB/VJWCB0FBX89L3K73D4S1QPUP0UBXGC>

² <https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-03-v3.pdf>

³ <https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v7.0.pdf>

SECTION B. Implementation of project activity

B.1. Description of implemented project activity

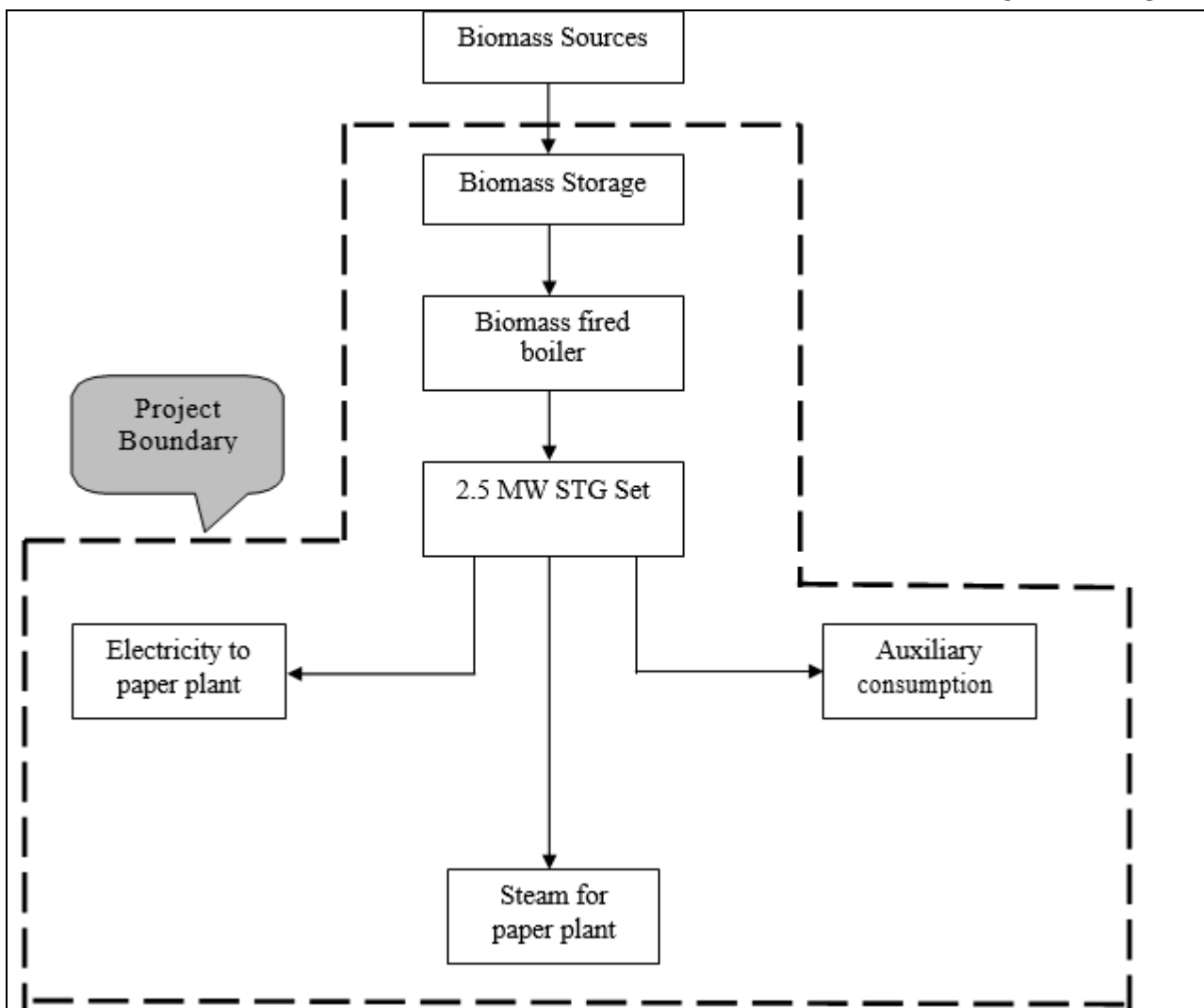
The plant installed one condensing cum extraction 2.5 MW turbine along with 22 TPH high-pressure boiler with steam parameters of 44 kg/cm² and 450 °C with a variation of +/- 5 deg C. This boiler is of modern design with fluidised bed furnace suitable for outdoor installation with water scrubber for dust collection. Uninterrupted flow of rice husk to the boiler is enabled by a twin bunker system located in front of the boiler. In case of exigencies of biomass fuel scarcity, HAIL purposes to use coal as fuel to the extent of 15%. The plant has seven days storage capacity for husk.

For generating maximum of 100% steaming capacity of the boiler at rated parameters, about 6.6 TPH of rice husk (100%rice husk firing) is required. The plant also has coal-handling facilities with necessary crushers and conveyors to meet the requirement in case of exigencies of biomass fuel scarcity. The project generates a gross power output of 2500 KW at the generator terminals. The power generation in the cogeneration plant is at 11 kV which is synchronised with utility supply at 11kV and step down to 440V level for usage in the plant with the use of 11kV/400V transformer. 9TPH steam at 10kg/cm² is used by the process which was in the baseline scenario done by the coal. This 9TPH steam is extracted from the 22TPH steam and fed to the process of paper machine and pulp mill. No transfer of technology is involved to host country because technology is available within India from reputed manufactures.

The plant is designed with all other auxiliary plant system like:

1. Rice husk and coal handling system.
2. Pneumatic Ash handling system
3. Air pollution control devices
4. Water system consist of following sub-systems:
 5. Raw water system
 6. Condensate system
 7. RO system
 8. Service and potable water system
 9. Compressed air system
 10. Fire protection system
11. Complete electrical system for power plant including, instrumentation and control system etc.

The schematic diagram of the proposed technology package is given below:

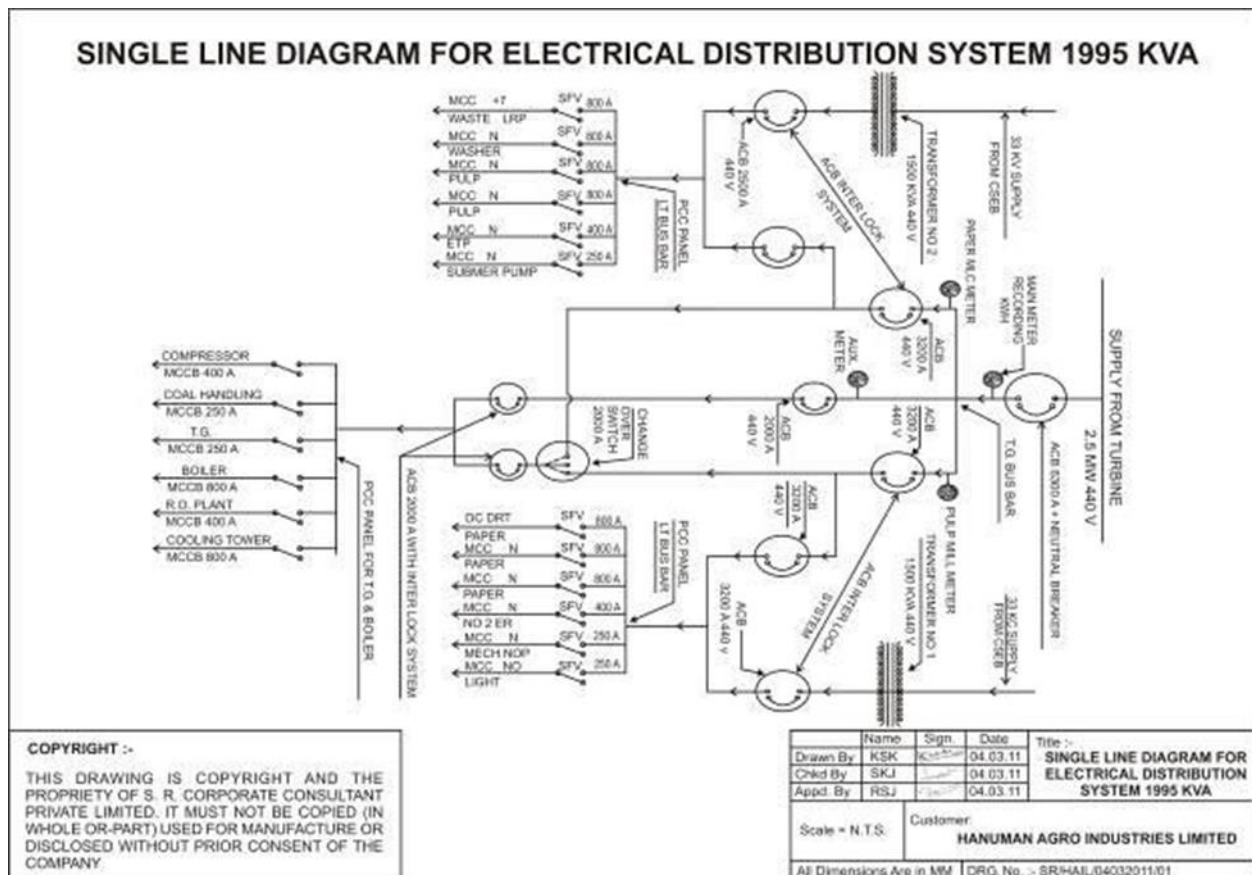
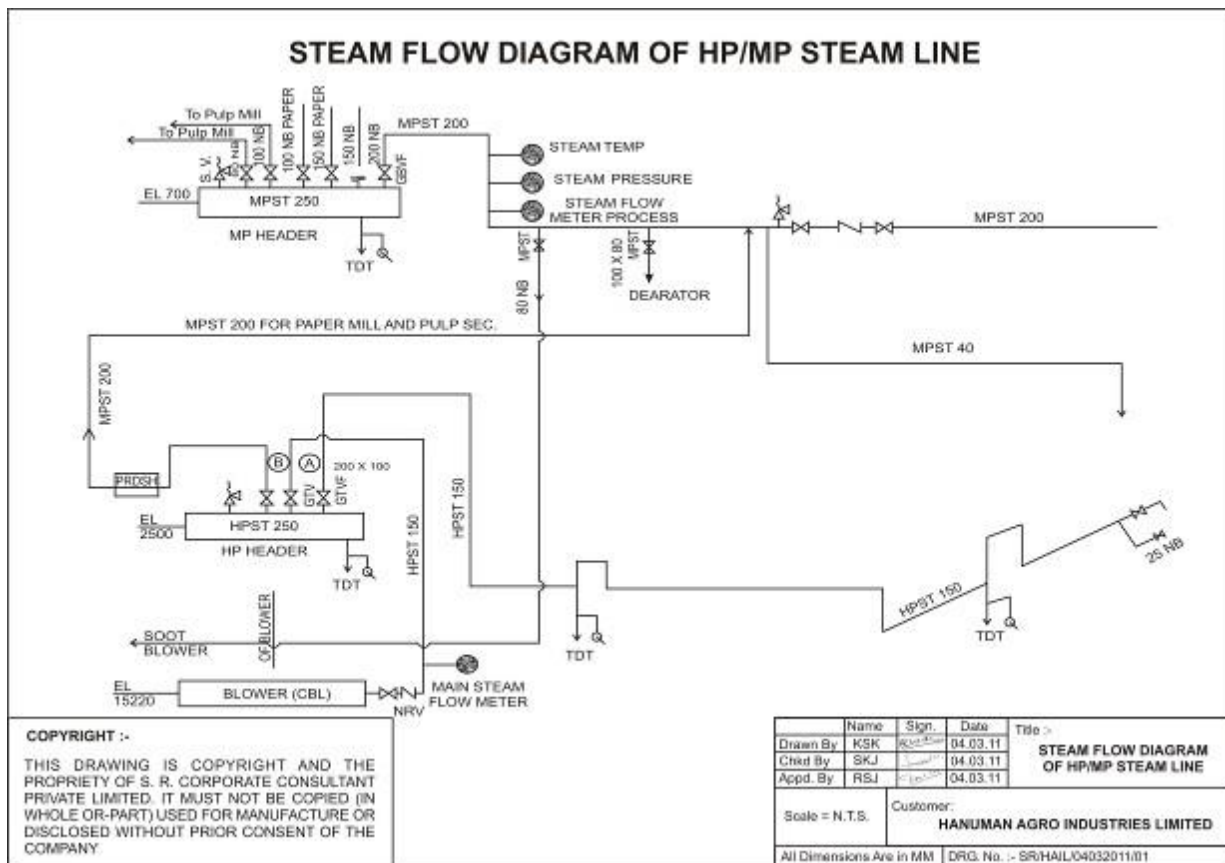


The project activity was completed as planned in the project design document (PDD). The Biomass based cogeneration power has been successfully commissioned on 31/08/2006. The project was completed with major equipment supplied as follows:

S. No.	Equipment	Supplier
01	Boiler	Cheema Boiler Ltd.
02	Turbine	Pentagon Turbine (P) Ltd.
03	Alternator	Kirloskar Electric
04	E.S.P.	Adhor and Cheema
05	Fuel Handling Plant	Bevcon (P) Ltd.
06	Ash Handling Plant	O.S.M. Engineering (P) Ltd.
07	Mist Cooling tower	Mist
08	Balance of Plant	Various suppliers like Siemens for breaker and panel. AVR, Kirloskar, Ion Exchange, R.O. D.M. Plant Ultra filtration etc.

PP confirms that there has been no such event or to the project which has impact the applicability of the methodology of the project activity.

The Schematic showing electrical power & steam output metering arrangements 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**

Not applicable

B.2.2. Corrections

There are no corrections.

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

There are no changes in start date of the crediting period.

B.2.4. Inclusion of monitoring plan

Not Applicable.

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 are no changes to project design of registered project activity.

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

Not Applicable

SECTION C. Description of monitoring system

The project activity results in GHG emission reductions from generation of thermal and electrical energy using renewable biomass and helps in displacing an equivalent amount of energy from fossil fuel based sources. This requires proper monitoring of all the relevant GHG performance parameters. Therefore the project proponent has developed a robust monitoring protocol which is followed throughout the proposed crediting period in order to ensure proper operation of the project activity resulting in generation of quality carbon credits.

- The monitoring plan covers:
- Overall project management
- Recording of results
- Calibration of measurement equipments
- Maintenance procedures
- Procedures for training of project personnel
- Internal audit procedure
- Corrective actions

The data and parameters (as outlined below) under monitoring plan, shall strictly be monitored at the site by means of accurately calibrated instruments and authentic procedure dedicated for the intended purposes.

- Electricity Generation (EG_{gross}) and Auxiliary Consumption (EG_{aux})
- Net Energy supply (EG_y) (EG_y = EG_{paper} + EG_{pulp})
- Fuel Consumption (Q_{fc_biomass} – Quantity of Biomass)
- Fuel Consumption (Q_{fc} – Quantity of Coal)
- Total Steam Generation (Q_{totalsteam})
- Total Process Steam consumption (Q_{processsteam})
- Pressure of Process Steam (P_{processsteam})
- Temperature of Process Steam (t_{processsteam})
- Steam Enthalpy

Parameters to be measured	Monitoring system	Data recording system
Electricity Generation (EG _{gross}) and Auxiliary Consumption (EG _{aux})	Direct measurement through duly calibrated energy meters	Data is captured on continuous basis through online PLC system and manually on hourly basis in logbooks. Daily measurement and monthly recording in excel sheet
Net Energy supply (EG _y)	Direct measurement through duly calibrated energy meters	Data is captured on continuous basis through online PLC system and manually on hourly basis in logbooks. Daily measurement and monthly recording in excel sheet
Fuel Consumption (Q _{fc_biomass} – Quantity of Biomass)	Measurement through duly calibrated weighbridges.	Data is captured on daily basis through both the electronic and manual method. Logbooks towards Goods received at site (GRN), Store records for receipt & issue to the boiler section. Daily measurement and monthly recording in excel sheet
Fuel Consumption (Q _{fc} – Quantity of Coal)	Measurement through duly calibrated weighbridges.	Data is captured on daily basis through both the electronic and manual method. Logbooks towards Goods received at site (GRN), Store records for receipt & issue to the boiler section. Daily measurement and monthly recording in excel sheet
Total Steam Generation (Q _{totalsteam}) and Total Process Steam consumption (Q _{processsteam})	Direct measurement through duly calibrated steam flow meters	Data is captured on continuous basis through online PLC system and manually on hourly basis in logbooks. Daily measurement and monthly recording in excel sheet
Pressure of Process Steam (P _{processsteam}), Temperature of Process Steam (t _{processsteam}) and Steam Enthalpy	Direct measurement through duly calibrated pressure and temperature gauges	Data is captured on continuous basis through online PLC system and manually on hourly basis in logbooks. Daily measurement and monthly recording in excel sheet

HAIL has an operational and management structure in place, which has set procedures and systems to monitor emission reductions generated by the project activity. The details of the set procedures are being followed and have been described in detail in the “HAIL CDM Manual”. This manual describes the best practices in industry and established procedures for monitoring emission reductions. A CDM team comprising of persons from relevant departments has been constituted, who are responsible for carrying out the procedures set by the manual.

SECTION D. Data and parameters

D.1. Data and parameters fixed ex ante

Data/Parameter	NCV _{coal}
Unit	TJ/kt
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	18.9
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	To determine Project Emissions
Additional comments	The fossil fuel consumption has been considered as 0 for the ex-ante calculations. However, the same is monitored ex-post once the project is operational.

Data/Parameter	EFCO _{2,coal}
Unit	tCO ₂ e/TJ
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	96.1
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	To determine Project Emissions
Additional comments	IPCC values have been found conservative to the local values provided by CEA, hence used for calculation.

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 15, Dec 2019 ⁴
Value(s) applied	0.9622

⁴ <https://cea.nic.in/cdm-co2-baseline-database/?lang=en>

Choice of data or measurement methods and procedures	Calculated as the last 3 year (2016-17, 2017-18, 2018-19) generation-weighted average, sourced from Baseline CO ₂ Emission Database, Version 15.0, Dec 2019 published by Central Electricity Authority (CEA), 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,BM,y}
Unit	tCO ₂ /MWh
Description	Build Margin CO ₂ emission factor in year y
Source of data	Calculated from CEA database, Version 15, Dec 2019
Value(s) applied	0.8811
Choice of data or measurement methods and procedures	Calculated as per “Tool to calculate the emission factor for an electricity system, version 07” as per the latest data available for the most recent year 2018-19. The data is obtained from “CO ₂ Baseline Database for Indian Power Sector” version 15, 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}
Unit	tCO ₂ /MWh
Description	Combined Margin CO ₂ emission factor in year y
Source of data	Calculated from CEA database, Version 15, Dec 2019
Value(s) applied	0.9014
Choice of data or measurement methods and procedures	The combined margin emissions factor is calculated as follows: $EF_{grid,CM,y} = EF_{grid,OM,y} \times WOM + EF_{grid,BM,y} \times WBM$ 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) WOM = Weighting of operating margin emissions factor (%) = 25% WBM = 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.

Data/Parameter	η_{th}
Unit	%
Description	Boiler Efficiency
Source of data	Calculated on the basis of actual measured data during last 6 years prior to validation of project activity.
Value(s) applied	76.7%
Choice of data or measurement methods and procedures	As per AMS-I.C. version 21 highest baseline boiler efficiency measured during last six years has been considered.

Purpose of data/parameter	To determine Baseline Emissions
Additional comments	Nil

Data/Parameter	Q _{biomass}
Unit	MT/ Year
Description	Evaluation of Surplus Biomass within a range of 50 Km from plant site
Source of data	Secondary as well as primary data to be collected by the third party working in this field
Value(s) applied	215,220
Choice of data or measurement methods and procedures	As the data are critical in calculating emission reductions by project activity, the assessment shall be carried out by the professional assistance Once prior to crediting period. The availability of biomass is about 44% larger than the required quantity of biomass for the project. Hence leakage due to competing uses for the biomass is neglected.
Purpose of data/parameter	To determine Leakage Emissions if applicable
Additional comments	Nil

D.2. Data and parameters monitored

Data/Parameter	EG _{Gross}
Unit	GWh
Description	Total electricity generated from the project Activity.
Measured/calculated/default	Measured
Source of data	Measured data at Plant Site
Value(s) of monitored parameter	9.74
Monitoring equipment	Gross energy meter
Measuring/reading/recording frequency	Gross electricity generation had been measured through energy meter installed within the project boundary on continuous basis and Data had been recorded electronically through online PLC system and spot readings of the meter made on hourly basis is noted on the logbook . This is updated and reported on the excel sheet on daily basis and further on monthly and yearly basis in the excel sheet. The parameter is measured using energy meters which measure the electricity in kWh and further updated to GWh on monthly basis while achieving on the excel sheet.
Calculation method (if applicable)	Gross electricity generation is measured through energy meter installed within the project boundary on continuous basis and Data is recorded electronically through online PLC system and spot readings of the meter is made hourly and recorded on logbook. The energy meter was installed within the project boundary by HAIL and is checked & sealed by CSEB.
QA/QC procedures	Measurement through accurately calibrated Gross Energy Meter. Check of the data logging by department head on daily basis Check of the data logging by Commercial Manager on weekly basis Check of the data logging by General Manager on monthly basis

Purpose of data/parameter	This parameter is not directly used for Emission Reduction calculations
Additional comments	Nil

Data/Parameter	EG _{aux}
Unit	GWh
Description	Auxilliary Consumption by Power Plant
Measured/calculated/default	Measured
Source of data	Measured data at Plant Site
Value(s) of monitored parameter	2.10
Monitoring equipment	Auxiliary energy meter
Measuring/reading/recording frequency	Auxiliary electricity consumption had been measured through energy meter installed within the project boundary on continuous basis and Data had been recorded electronically through online PLC system and spot readings of the meter made on hourly basis is noted on the logbook . This is updated and reported on the excel sheet on daily basis and further on monthly and yearly basis in the excel sheet. The parameter is measured using energy meters which measure the electricity in kWh and further updated to GWh on monthly basis while achieving on the excel sheet.
Calculation method (if applicable)	Auxiliary electricity consumption is measured through energy meter installed within the project boundary on continuous basis and Data is recorded electronically through online PLC system and spot readings of the meter is made hourly and recorded on logbook. The energy meter was installed within the project boundary by HAIL and is checked & sealed by CSEB.
QA/QC procedures	As the data are critical in calculating emission reductions by project activity, these variables are strictly monitored at the site by means of accurately calibrated instruments dedicated for the intended purpose. Measurement through accurately calibrated Auxiliary Energy Meter. Check of the data logging by department head on daily basis Check of the data logging by Commercial Manager on weekly basis Check of the data logging by General Manager on monthly basis
Purpose of data/parameter	This parameter is not directly used for Emission Reduction calculations
Additional comments	Nil

Data/Parameter	EG _y
Unit	GWh
Description	The electricity consumed by the Paper Mill and pulp section from the project activity.
Measured/calculated/default	Calculated
Source of data	Measured data at Plant Site
Value(s) of monitored parameter	8.58

Monitoring equipment	Paper machine energy meter Pulp mill energy meter
Measuring/reading/recording frequency	Electricity supplied to Paper Mill and pulp section had been measured through energy meter installed within the project boundary on continuous basis and Data had been recorded electronically through online PLC system and spot readings of the meter made on hourly basis is noted on the logbook. This is updated and reported on the excel sheet on daily basis and further on monthly and yearly basis in the excel sheet. The parameter is measured using energy meters which measure the electricity in kWh and further updated to GWh on monthly basis while achieving on the excel sheet. Net electricity supplied to the paper & Pulp mill had been measured through energy meter installed with the project boundary on continuous basis and The Net Energy Consumption had been Calculated from EGpaper and EGpulp on daily basis and compiled on daily basis in Daily register then monthly and annual basis.
Calculation method (if applicable)	Net electricity supplied to the paper and pulp mill is measured through energy meter installed within the project boundary on continuous basis and Data is recorded electronically through online PLC system and spot readings of the meter is made hourly and recorded on logbook. The energy meter was installed within the project boundary by HAIL and is checked & sealed by CSEB. Calculated as $EG_y = EG_{paper} + EG_{pulp}$
QA/QC procedures	As the data are critical in calculating emission reductions by project activity, these variables are strictly monitored at the site by means of accurately calibrated instruments dedicated for the intended purpose.
Purpose of data/parameter	For calculation of baseline emission
Additional comments	Nil

Data/Parameter	$Q_{fcbiomass}$
Unit	MT
Description	Total quantity of biomass used for generation of power & steam shall be maintained at Plant site in form of Daily logbooks at stores department
Measured/calculated/default	Measured
Source of data	Measured at Plant Site
Value(s) of monitored parameter	25,410.00
Monitoring equipment	Weigh bridge
Measuring/reading/recording frequency	The Biomass quantity had been continuously measured at fuel receiving station & storage station through weighbridges. The supply of fuel to the steam generation set had been monitored on daily basis. Data had been recorded electronically as well as manually.
Calculation method (if applicable)	The Biomass quantity is continuously measured at fuel receiving station & storage station through weighbridges. The supply of fuel to the steam generation set shall be monitored on daily basis. Data is recorded electronically as well as manually.

QA/QC procedures	<p>As the data are critical in calculating emission reductions by project activity, these variables are strictly monitored at the site by means of accurately calibrated instruments dedicated for the intended purpose and the monthly biomass consumption can be cross checked through biomass stock balance with reference to the Store receipts and biomass invoices.</p> <p>Measurement through accurately calibrated weigh bridge Check of the data logging by storekeeper on daily basis Check of the data logging by Commercial Manager on weekly basis Check of the data logging by General Manager on monthly basis Monthly biomass consumption is cross checked with stock balance and further with store receipt and biomass invoices.</p>
Purpose of data/parameter	This parameter is not directly used for Emission Reduction calculations
Additional comments	Nil

Data/Parameter	Q_{fccoal}
Unit	MT
Description	Total quantity Q_{fccoal} used for generation of power & steam shall be maintained at Plant site in form of Daily logbooks at supply department
Measured/calculated/default	Measured
Source of data	Measured at Plant Site
Value(s) of monitored parameter	2,922.00
Monitoring equipment	Weigh bridge
Measuring/reading/recording frequency	The coal quantity is continuously measured at fuel receiving station & storage station through weighbridges. The supply of fuel to the steam generation set is monitored on daily basis. Data is recorded electronically as well as manually.
Calculation method (if applicable)	The coal quantity is continuously measured at fuel receiving station & storage station through weighbridges. The supply of fuel to the steam generation set shall be monitored on daily basis. Data is recorded electronically as well as manually.
QA/QC procedures	<p>As the data are critical in calculating emission reductions by project activity, these variables are strictly monitored at the site by means of accurately calibrated instruments dedicated for the intended purpose and the monthly biomass consumption can be cross checked through coal stock balance with reference to the Store receipts and biomass invoices.</p> <p>Measurement through accurately calibrated weigh bridge Check of the data logging by storekeeper on daily basis Check of the data logging by Commercial Manager on weekly basis Check of the data logging by General Manager on monthly basis Monthly coal consumption is cross checked with stock balance and further with store receipt and coal invoices.</p>
Purpose of data/parameter	This parameter is used for Project emission calculations
Additional comments	Nil

Data/Parameter	$Q_{\text{totalsteam}}$
Unit	Tonnes
Description	Total quantity of steam generated per hour shall be maintained at Plant site in form of Shift Engineer's report
Measured/calculated/default	Measured
Source of data	Measured data at Plant Site
Value(s) of monitored parameter	103,256
Monitoring equipment	Total steam flow meter
Measuring/reading/recording frequency	Total Steam generation had been measured through steam flow meter installed within the project boundary on continuous basis and Data had been recorded electronically through online PLC system and spot readings of the steam generation was made on daily basis and recorded on logbook.
Calculation method (if applicable)	Steam generation is measured through steam flow meter installed within the project boundary on continuous basis and Data is recorded electronically through online PLC system and spot readings of the steam generation is made hourly and recorded on logbook.
QA/QC procedures	As the data are critical in calculating emission reductions by project activity, these variables are strictly monitored at the site by means of accurately calibrated instruments dedicated for the intended purpose. Measurement through accurately calibrated steam flow meter. Check of the data logging by Department data on daily basis Check of the data logging by Commercial Manager on weekly basis Check of the data logging by General Manager on monthly basis.
Purpose of data/parameter	This parameter is not directly used for Emission Reduction calculations
Additional comments	Nil

Data/Parameter	$Q_{\text{processsteam}}$
Unit	Tonns
Description	Total quantity of steam supplied per hour to the paper and pulp section shall be maintained at Plant site in form of Shift Engineer's report
Measured/calculated/default	Measured
Source of data	Measured data at Plant Site
Value(s) of monitored parameter	57,383
Monitoring equipment	Total steam flow meter
Measuring/reading/recording frequency	Total steam supplied to the paper and pulp section had been measured through steam flow meter installed within the project boundary on continuous basis and Data had been recorded electronically through online PLC system and spot readings of the steam generation was made on daily basis and recorded on logbook.

Calculation method (if applicable)	Steam supplied to the paper and pulp section is measured through steam flow meter installed within the project boundary on continuous basis and Data is recorded electronically through online PLC system and spot readings of the steam generation is made hourly and recorded on logbook.
QA/QC procedures	As the data are critical in calculating emission reductions by project activity, these variables are strictly monitored at the site by means of accurately calibrated instruments dedicated for the intended purpose. Measurement through accurately calibrated steam flow meter. Check of the data logging by Department data on daily basis Check of the data logging by Commercial Manager on weekly basis Check of the data logging by General Manager on monthly basis.
Purpose of data/parameter	This parameter is used for Baseline Emission calculations
Additional comments	Nil

Data/Parameter	$P_{\text{processsteam}}$
Unit	Kg/cm ²
Description	Pressure of process steam supplied per hour shall be maintained at Plant site in form of Shift Engineer's report
Measured/calculated/default	Measured
Source of data	Measured data at Plant Site
Value(s) of monitored parameter	10.5
Monitoring equipment	Pressure gauge installed within the project boundary
Measuring/reading/recording frequency	Pressure of total steam supplied to Paper & Pulp section had been measured through steam pressure gauge installed within the project boundary on continuous basis and data has been recorded electronically through online PLC system and spot readings of the steam generation was made on daily basis and recorded log book and further on excel sheet and used for calculation of emission reductions. Monthly average is calculated which is used to calculate enthalpy.
Calculation method (if applicable)	Online measurement and manual logging Spot reading through PLC system and manual logging on daily basis as per standard industrial norms which shall be averaged on monthly basis; monthly average value shall be used to calculate Steam Enthalpy
QA/QC procedures	As the data are critical in calculating emission reductions by project activity, these variables are strictly monitored at the site by means of accurately calibrated instruments dedicated for the intended purpose. Measurement through accurately calibrated Pressure gauge. Check of the data logging by Department data on daily basis Check of the data logging by Commercial Manager on weekly basis Check of the data logging by General Manager on monthly basis.
Purpose of data/parameter	This parameter is used for Baseline Emission calculations
Additional comments	Nil

Data/Parameter	$t_{\text{processsteam}}$
Unit	0C
Description	Temperature of process steam supplied per hour shall be maintained at Plant site in form of Shift Engineer's report
Measured/calculated/default	Measured
Source of data	Measured data at Plant Site
Value(s) of monitored parameter	184.0
Monitoring equipment	Temperature gauge installed within the project boundary
Measuring/reading/recording frequency	Temperature of total steam supplied to Paper & Pulp section had been measured through steam temperature gauge installed within the project boundary on continuous basis and data has been recorded electronically through online PLC system and spot readings of the steam generation was made on daily basis and recorded log book and further on excel sheet and used for calculation of emission reductions. Monthly average is calculated which is used to calculate enthalpy.
Calculation method (if applicable)	Online measurement and manual logging Spot reading through PLC system and manual logging on daily basis as per standard industrial norms which shall be averaged on monthly basis; monthly average value shall be used to calculate Steam Enthalpy
QA/QC procedures	As the data are critical in calculating emission reductions by project activity, these variables are strictly monitored at the site by means of accurately calibrated instruments dedicated for the intended purpose. Measurement through accurately calibrated Temperature gauge. Check of the data logging by Department data on daily basis Check of the data logging by Commercial Manager on weekly basis Check of the data logging by General Manager on monthly basis.
Purpose of data/parameter	This parameter is used for Baseline Emission calculations
Additional comments	Nil

Data/Parameter	Steam Enthalpy
Unit	KJ/Kg
Description	Heat value of process steam supplied to paper & pulp section
Measured/calculated/default	Calculated
Source of data	Calculated based on temp and pressure of process steam
Value(s) of monitored parameter	2781.8

Monitoring equipment	Not applicable
Measuring/reading/recording frequency	Pressure and Temperature of steam supplied to Paper & Pulp section had been measured through pressure and steam temperature gauge installed within the project boundary on continuous basis and data has been recorded electronically through online PLC system and spot readings of the Pressure and Temperature of steam supplied to Paper & Pulp section was made on daily basis and recorded log book and further on excel sheet and used for calculation of emission reductions. Monthly average is calculated which is used to calculate enthalpy.
Calculation method (if applicable)	Calculated on monthly average value of steam pressure and temperature through steam table or below link or equivalent source, https://www.spiraxsarco.com/resources-and-design-tools/steam-tables/dry-saturated-steam-line
QA/QC procedures	As there is no condensate return, the enthalpy of process steam is the net enthalpy/heat supplied by the project activity. Measurement through accurately calibrated Pressure and Temperature gauge. Check of the data logging by Department data on daily basis Check of the data logging by Commercial Manager on weekly basis Check of the data logging by General Manager on monthly basis.
Purpose of data/parameter	This parameter is used for Baseline Emission calculations
Additional comments	Nil

D.3. Implementation of sampling plan

Sampling is not required for the given project activity.

SECTION E. Calculation of emission reductions or net anthropogenic removals

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

The following Formulas have been used for estimating the Net Emission Reductions arising out of the project activity:

I. Baseline Emission Reductions resulting from Steam/heat produced using fossil fuel:

$$BE_{th} = HG_y * CO_2EF_{coal} / \eta_{th}$$

Where:

BE_{th} : The baseline emissions from steam/heat displaced by the project activity during the year y in tCO₂e.

HG_y : The net quantity of steam/heat supplied by the project activity during the year y in TJ.

CO_2EF_{coal} : the CO₂ emission factor per unit of energy of the fuel that would have been used in the baseline plant in (tCO₂ / TJ), obtained from reliable local or national data if available, otherwise, IPCC default emission factors are used.

η_{th} : the efficiency of the plant using fossil fuel that would have been used in the absence of the project activity.

II. Carbon emission reduction per annum by project activity due to displacement of electricity from grid

$$BE_{el} = EG_y \times BEF_e$$

Where:

BE_E : Carbon Emission reduction per annum by project activity due to displacement of electricity from Grid in t CO₂

EG_y : Net power supplied by the project activity i.e. Clean Power to be consumed by the entity replacing the Grid Power in GWh.

BEF_e : Baseline Emission Factor for Western Grid of India in Kg CO₂ per kWh

III. Total baseline emission reduction per annum by project activity (BE_y)

$$BE_y = BE_{th} + BE_{el}$$

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

Onsite Project Emission expected from the Project Activity (PE_y):

The project may use coal as auxiliary fuel to the extent of 15% in case of exigency. The MNES also allows use of fossil fuel to the extent of 25% in case of exigencies.

In the project activity during the monitoring period 11.49% was the coal consumption. Hence the coal consumption has found to be below 15%.

Accordingly the project emissions in the form of tonnes CO₂ from combustion of coal is calculated using CO₂ emission factor refereeing the IPCC 2006 Guidelines for National Green House Gas Inventories. Formula used for calculation:

$$PE_y = NCV_{coal} \times Q_{fc} \times CO_2EF_{coal}$$

Where:

PE_y : Carbon-dioxide emission due to coal burning at project site in tCO₂

NCV_{coal} : Calorific value of sub-bituminous coal in TJ/Kt

Q_{fc} : Quantity of coal burned in MT

CO_2EF_{coal} : Baseline Emission Factor for sub-bituminous coal

E.3. Calculation of leakage emissions

There is no energy generating equipment being transferred from or to another activity.

Para 17 & 18 of Attachment C to Appendix B of Indicative Simplified Baseline and Monitoring Methodologies for selected small-scale CDM project activity categories - General guidance on leakage in biomass project activities, version 02, EB 28 states that if the quantity of available biomass in the region (e.g. 50 km radius), is at least 25% larger than the quantity of biomass that is utilised including the project activity, then this source of leakage can be neglected.

The plant consumes 6555 Kgs of biomass per hour. According to the Biomass Assessment Study in Paragaon with adjoining area of 50 KM radius for 2.5 MW Rice husk based cogeneration power plant by Hanuman Agro Industries Limited., the surplus availability of rice

husk in the 50 Km radius from the proposed plant site is assessed at 215,220 tonnes per annum and 15 Km radius from the proposed plant site is assessed at 78,523 tonnes per annum whereas the plant consumes 44,126 tonnes of rice husk at 100% capacity utilization assuming a fuel mix ratio of 85:15. Hence the availability of biomass is about 44% larger than the required quantity of biomass for the project. Hence leakage due to competing uses for the biomass is neglected.

Therefore, leakage emissions are not considered.

Net Carbon Emission Reduction by project activity $ER_y = BE_y - PE_y - LE_y$

Where:

ER_y : Net Carbon Emission Reduction by project activity

PE_y : Carbon-dioxide emission due to coal burning at project site

LE_y : Project Leakage

Using the formula the achieved emission reductions from the project activity during current monitoring period (07/11/2015 to 30/08/2016) is provided in ER calculation excel sheet.

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

	Baseline GHG emissions or baseline net GHG removals (t CO ₂ e)	Project GHG emissions or actual net GHG removals (t CO ₂ e)	Leakage GHG emissions (t CO ₂ e)	GHG emission reductions or net anthropogenic GHG removals (t CO ₂ e)			
				Before 01/01/2013	From 01/01/2013 until 31/12/2020	From 01/01/2021	Total amount
Total	26,777	5,307	0	0	21,469	0	21,469

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 for this monitoring period in the PDD (t CO ₂ e)
21,469	28,044

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

As per registered CDM- PDD, 34,349 tCO₂e is the amount of CERs generated annually. Therefore, following unitary method, the amount of estimated ex ante for this monitoring period is identified. The total number of days in this monitoring period is 298.

$$= (34,349/365) * 298$$

$$= 28,044 \text{ tCO}_2\text{e}$$

The actual emission reductions are lower by 23.44% the values applied in ex-ante calculation of the registered CDM – PDD due to the seasonal requirement of paper manufacturing wherein the plant not on full capacity. Also, there has been periods of shutdown in the plant resulting in the lowering of production.

E.6. Remarks on increase in achieved emission reductions

The actual emission reductions are lower by 23.44% the values applied in ex-ante calculation of the registered CDM – PDD.

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

The project activity remain as a small scale project activity for the entire period.

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Document information

<i>Version</i>	<i>Date</i>	<i>Description</i>
08.0	6 April 2021	Revision to: <ul style="list-style-type: none"> • Reflect the “Clarification: Regulatory requirements under temporary measures for post-2020 cases” (CDM-EB109-A01-CLAR).
07.0	31 May 2019	Revision to: <ul style="list-style-type: none"> • 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: <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.

<i>Version</i>	<i>Date</i>	<i>Description</i>
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.
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