# MONITORING REPORT

CARBON OFFSET UNIT (CoU) PROJECT

**Title: TEIL Biomass Grid Supply Power Project, Khatauli, Uttar Pradesh**

**UCR PROJECT ID**: 261

**MR Version 3.0**

**MR Date: 31/07/2023**

UCR Monitored Period: 01 (Monitored Period Duration: 10 Years, 00 Months)
1st UCR Monitoring Period: 01/01/2013 to 31/12/2022
1st UCR Crediting Period: 01/01/2013 to 31/12/2022

| | |
|---|---|
| | **Monitoring Report (MR)**<br>**CARBON OFFSET UNIT (CoU) PROJECT** |

## BASIC INFORMATION

| | |
|---|---|
| Title of the project activity | TEIL Biomass Grid Supply Power Project, Khatauli, Uttar Pradesh |
| Scale of the project activity | Large Scale |
| UCR PROJECT ID | 261 |
| Completion date of the MR | 31/07/2023 |
| Project participants | **Project Proponent:** Triveni Engineering and Industries Ltd (TEIL)<br>**Aggregator:** Carbon Equalizers, KATNI<br>UCR ID : 660687753 |
| Host Party | India |
| Applied methodologies and standardized baselines | **CDM UNFCCC Methodology**<br>**ACM0006**: Grid connected renewable electricity generation (Ver.16.0)<br><br>UCR Standard for Baseline Grid Emission Factor |
| Sectoral scopes | 01 Energy industries (Renewable/NonRenewable Sources) |
| Estimated total amount of average GHG emission reductions per year (Year: Quantity) | 2013: 82304 tCO2 (82304 CoUs) |
| | 2014: 73040 tCO2 (73040 CoUs) |
| | 2015: 74815 tCO2 (74815 CoUs) |
| | 2016: 75570 tCO2 (75570 CoUs) |
| | 2017: 85619 tCO2 (85619 CoUs) |
| | 2018: 96894 tCO2 (96894 CoUs) |
| | 2019: 91779 tCO2 (91779 CoUs) |
| | 2020: 88700 tCO2 (88700 CoUs) |
| | 2021: 97139 tCO2 (97139 CoUs) |
| | 2022: 96341 tCO2 (96341 CoUs) |
| Estimated total amount of average GHG emission reductions for the entire monitoring period (2013-Sept 2022) | 862201 $tCO_2$ (862201 CoUs) |

## SECTION A. Description of project activity

### A.1. Purpose and general description of Carbon offset Unit (CoU) project activity >>

The project **TEIL Biomass Grid Supply Power Project, Khatauli, Uttar Pradesh** is located at Village: Sheikhpura, City: Khatauli, District: Muzaffarnagar, State: Uttar Pradesh (UP), Country India (Pin: 251201).

The details of the UCR project activity are as follows:

**Purpose of the UCR project activity:**
The purpose of the project activity is to generate electricity using renewable biomass and thereby reduce GHG emissions by displacing the fossil fuel dominated grid based electricity with biomass based renewable electricity. The commissioning date or start date of this UCR project activity is **19/10/2005 (**although the power synchronization to the 132 KV substation was on 18/10/2005).

Hence, the project activity is a grid-connected biomass (bagasse based) cogeneration power plant with a high pressure steam-turbine configuration. The high pressure boilers are fired by bagasse, a biomass byproduct from the sugar manufacturing process, to generate steam which in turn is fed to the steam turbine to generate power. The overall business is integrated with alcohol distillation and power generation. The power co-generation units generate biomass based power for captive consumption of the sugar plant and the sale of surplus power to the state grid. The project plant exports power to the Uttar Pradesh Power Corporation Limited (UPPCL), in absence of the project activity, UPPCL would have withdrawn electricity from northern regional grid.

The project activity involves the renewable biomass (bagasse) based electricity generation within the Triveni Engineering & Industries Ltd (TEIL) plant located at City: Khatauli, State: Uttar Pradesh. This UCR project activity involves the installation of two **23 MW** turbo generators along with two high pressure (86 kg/cm$^2$) 120 TPH capacity boilers commissioned in **19/10/2005 and 17/12/2006.** The total installed capacity is hence **46 MW.** The UPPCL electrical substation of 132 kV, for power export, is only 5 km from the boundary of the project activity. The project activity supplies approximately **119925 MW** of renewable power to the grid each year.

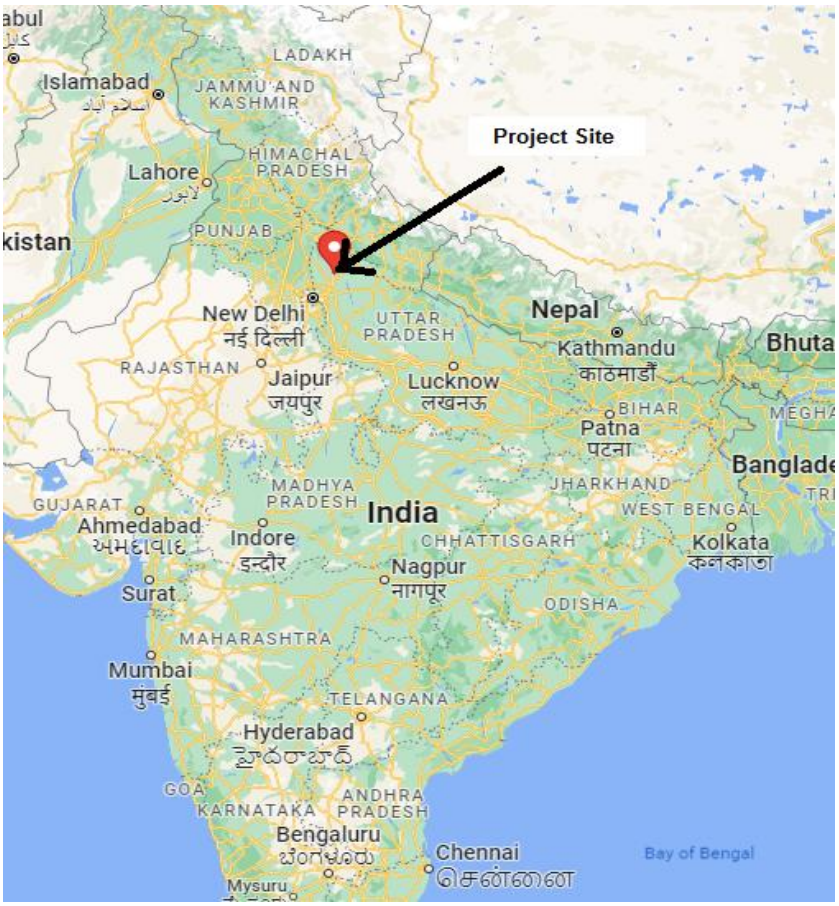
The power generated from the turbines is utilised for captive consumption and the surplus power is exported to the grid. Power is generated both in the sugar season and off-season at 11 kV and stepped-up on-site to 132 kV before being transmitted to the nearby UPPCL sub-station located at Khatauli.

The UCR project activity is the construction and operation of a power plant/unit that uses renewable energy sources and supplies renewable electricity to the grid. The UCR project activity is thus the displacement of electricity that would be provided to the grid by more-GHG-intensive means and provides long-term benefits to the mitigation of climate change. The UCR project activity qualifies under the environmental additional positive list of pre-approved project types under the UCR carbon incentive model for issuance of voluntary carbon credits.

| | |
|---|---|
| UCR Monitoring Period Number | 01 |
| Start Date | 01/01/2013 |
| End Date | 31/12/2022 |
| Total Emission Reductions over the monitoring period | **862201 $tCO_2$** |

## A.2. Location of project activity >>

Country: India
Village: Sheikhpura,
City: Khatauli,
District: Muzaffarnagar
State: Uttar Pradesh (UP),
Pin: 251201
Latitude: $29^0$ 16’ N
Longitude: $77^o$ 42' E




**A.3. Technologies/measures>>**

The UCR project activity is a grid-connected bagasse based cogeneration power plant with a high pressure steam-turbine configuration. The UCR project activity is the electricity generation capacity and the installation of facilities for allowing the export of electricity to the regional grid.

The project activity has commissioned two (2) boilers with nominal capacity of 120 tons per hour (TPH) and outlet steam configuration of maximum capacity 87 kg/cm$^2$, 515 $^o$C and two turbo generators with rating of **23 MW each (total 46 MW)**. The cogeneration cycle for the plant is designed as an energy efficient regenerative cycle. This plant gives around 7 % more power output than the most of the cogeneration plants designed with boiler outlet steam parameters of greater than 67 kg/cm$^2$ and 485 $^o$C and 23 % more than normal configuration in India of 45 kg/cm$^2$ and 390 $^o$C with back pressure turbine.

The plant is designed with all other auxiliary plant systems like

- Bagasse handling system with storage and processing arrangements,
- High pressure feed water heaters,
- Ash handling system,
- Water treatment plant,
- Compressed air system,
- Air conditioning system,
- Main steam, medium pressure and low pressure steam systems,
- Fire protection system,

- water system which include raw water system, circulating water system, condensate system, De-Mineralised water system and service with potable water system and
- The electrical system for its successful operation.

The power is generated at 11 kV level. The internal consumption requirements for auxiliaries and equipment of the sugar plant and the cogeneration plant are met by stepping down voltage level to 415V. The exportable power is stepped upto 132 kV and paralleled with the UPPCL grid at the substation in Khatauli. The project was commissioned on 18/10/2005 and this can be verified from the minutes of meetings (MoM) held on 18/10/2005 between UPPCL and PP. The MoM states that the energy is received on UPPCL 132 KV substation on 18/10/2005 and the MoM are signed by the UPPCL Executive Engineer and TElL management.

The technology of biomass residue based high steam pressure power generation itself is known and in use in India. The use of high pressure system allows for increased efficiency levels for electricity generation.

| | **Phase-1** | **Phase-2** |
|---|---|---|
| **Turbine** | | |
| Capacity (MW) | 23 | 23 |
| Steam Pressure | 84 kg/cm2 (G) | 84 kg/cm2 (G) |
| Steam temp. | 510 °c | 510 °c |
| Year of Commissioning | 2005 | 2006 |
| **Boiler** | | |
| Capacity (Tons/hr) | 120 | 120 |
| Year of Commissioning | 2005 | 2006 |
| Steam pressure | 86 kg/cm$^2$ (G) | 86 kg/cm$^2$ (G) |
| Steam temp. | 515±5 °c | 515±5 °c |

| INSTRUMENT DETAILS | |
|---|---|
| Steam Flow: | |
| Make | Rosemount. |
| Sr. No | S 0226515 |
| Steam Pressure: | |
| Make | Rosemount |
| Sr. No | S 0226501 |
| Steam Temperature | |
| Make | Rosemount |
| Sr. No | S-225016 |

**Office of Executive Engineer**
**Electricity Distribution Division**
**PASCHIMANCHAL VIDYUT VITRAN NIGAM Ltd.**
**Muzaffarnagar (Uttar Pradesh)**

## Certificate of commissioning

This is to certify that M/s Triveni Engineering & Industries Ltd. Unit-Khatauli, Distt. Muzaffarnagar (U.P.) is having valid Power Purchase Agreement with PVVNL. The commissioning details of their bagasse based co-generation units as per PPA & our records are as follows :-

| Unit Number, Capacity and Date of Commissioning Details | | |
|---|---|---|
| Unit No. | Capacity | Date of Commissioning |
| 1 | 23.0 MW | 19/10/05 |
| 2 | 23.0 MW | 17/12/06 |

UPPCL Nodal Officer
Executive Engineer (Distribution)
Location: Muzaffarnagar

खण्डीय अभियन्ता
विद्युत वितरण खण्ड
मुजफ्फरनगर

Yadav Measurements

# CERTIFICATE OF CALIBRATION


Issued by :
**YADAV MEASUREMENTS PRIVATE LIMITED**
Plot no. F-373-375 RIICO Bhamashah Industrial Area,
Kaladwas ,Udaipur-Rajasthan-313003, INDIA
Tel: 0091-294-2650127,28, Fax: 0091-294-2650129
Email: Yadav.Measurements@yadavmeasurements.com
website: www.yadavmeasurements.com
CIN number: U31909RJ2003PTC018450


463308

ilac-MRA

CC-2735

Certificate No.: YMPL/337016/128101 ULR-CC273521000004934F 

| | | | |
|---|---|---|---|
| 1. | **Name and Address of Customer** | :- | M/s Triveni Engineering & Industries Ltd.,<br>Cogen Power Plant, Sugar Unit, Vill:-Sheikhpura<br>Post: Khatauli, Distt:- Muzaffarnagar<br>Uttar Pradesh-251201 |
| 2. | **Reference** | | |
| | Service request form number | :- | 2021-22/749 |
| | Date of receipt of EUC | :- | 16-Sep-2021 |
| | Condition of EUC on receipt | :- | Satisfactory |
| 3. | **Location of Calibration** | :- | 132 kV Sub Station, Khatauli,<br>Muzaffarnagar (U.P) |
| 4. | **Calibration Details** | | |
| | Date of issue | :- | 18-Sep-2021 |
| | Date of calibration | :- | 16-Sep-2021 |
| | Due Date of calibration | :- | 15-Sep-2022 |
| 5. | **Description of Equipment under Calibration** | | |
| | Name | :- | Three Phase Energy Meter |
| | Sr.No. | :- | APM04213( Main) |
| | Rack No | :- | APS00963 |
| | Make | :- | Secure Meters Limited |
| | Type | :- | R3M021, 3P4W |
| | Model | :- | Apex |
| | Voltage | :- | 3x63.5 Vp-n |
| | Current | :- | Ib: 1A, Imax: 1.2A |
| | Voltage Ratio | :- | -/110/√3V |
| | Current Ratio | :- | -/1A |
| | Class | :- | 0.2S For Active 0.5S For Reactive |
| | Meter constant | :- | 160 Pulses/Unit |
| | Unit | :- | Wh, VArh |
| | Frequency | :- | 50Hz |

Yadav Measurements

# CERTIFICATE OF CALIBRATION

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**YADAV MEASUREMENTS PRIVATE LIMITED**
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Tel: 0091-294-2650127,28, Fax: 0091-294-2650129
Email: Yadav.Measurements@yadavmeasurements.com
website: www.yadavmeasurements.com
CIN number: U31909RJ2003PTC018450

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CC-2735

**Certificate No.: YMPL/337016/128102** **ULR-CC273521000004935F** **Page 1 of 4**

| | | | |
|---|---|---|---|
| 1. | **Name and Address of Customer** | :- | M/s Triveni Engineering & Industries Ltd., Cogen Power Plant, Sugar Unit, Vill:-Sheikhpura Post: Khatauli, Distt:- Muzaffarnagar Uttar Pradesh-251201 |
| 2. | **Reference** | | |
| | Service request form number | :- | 2021-22/749 |
| | Date of receipt of EUC | :- | 16-Sep-2021 |
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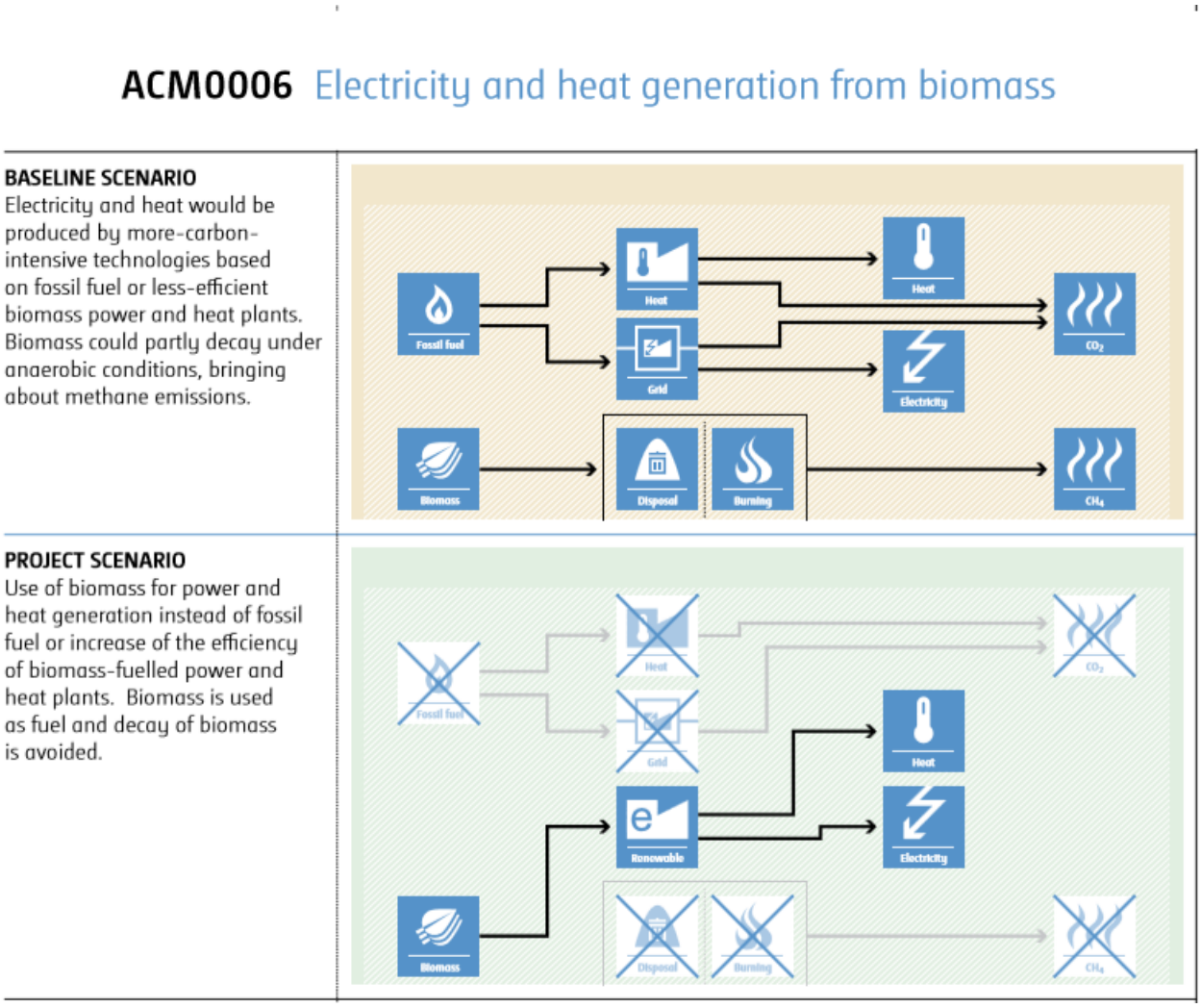
| 3. | **Location of Calibration** | :- | 132 kV Sub Station, Khatauli, Muzaffarnagar (U.P) |
| 4. | **Calibration Details** | | |
| | Date of issue | :- | 18-Sep-2021 |
| | Date of calibration | :- | 16-Sep-2021 |
| | Due Date of calibration | :- | 15-Sep-2022 |
| 5. | **Description of Equipment under Calibration** | | |
| | Name | :- | Three Phase Energy Meter |
| | Sr.No. | :- | APM04214(Check) |
| | Rack No | :- | APS00964 |
| | Make | :- | Secure Meters Limited |
| | Type | :- | R3M021, 3P4W |
| | Model | :- | Apex |
| | Voltage | :- | 3x63.5 Vp-n |
| | Current | :- | Ib: 1A, Imax: 1.2A |
| | Voltage Ratio | :- | -/110/√3V |
| | Current Ratio | :- | -/1A |
| | Class | :- | 0.2S For Active 0.5S For Reactive |
| | Meter constant | :- | 160 Pulses/Unit |
| | Unit | :- | Wh, VArh |
| | Frequency | :- | 50Hz |

## A.4. Parties and project participants>>

Project activity does not involve any public funding from Annex I Party, which leads to the diversion of the official development assistance.

| Party (Host) | Participants/Aggregator |
|---|---|
| India | Project Owner: Triveni Engineering & Industries Ltd (TEIL)<br>Aggregator: Carbon Equalizers, KATNI<br>UCR ID : 660687753<br>Contact: Mr Vikas Chamadia<br>Email: vikaschamadia@rediffmail.com<br>**Mob**: 9303068600 |

## A.5. Baseline Emissions>>




The approved baseline methodology has been referred from the indicative simplified baseline and monitoring methodologies for selected large scale UNFCCC CDM project activities that involve generation of power and heat in thermal power plants, including cogeneration plants using biomass.

Typical activities under ACM 0006 are new plants, capacity expansions, energy efficiency improvements or fuel switch projects.

The applicable methodology and simplified modalities and procedures for small scale CDM project activities is "*the baseline scenario is displacement of more-GHG-intensive electricity generation in grid.*"

**Emission coefficient of fuel used in the baseline scenario**

The $CO_2$ emission factor for grid connected power generation in year y calculated using UCR Standard emission factor is 0.9 tCO2/MWh for the period 2013-2022.

## A.6. Debundling>>

This project is not a debundled component of a larger registered carbon offset project activity.

## SECTION B. Application of methodologies and standardized baselines

### B.1. References to methodologies and standardized baselines >>

SECTORAL SCOPE - 01 Energy industries (Renewable/Non-renewable sources)

TYPE I - **Renewable Energy Projects (Large Scale)**

**UCR Positive List Environmental Additionality**

CATEGORY- ***ACM0006 Large-scale Consolidated Methodology***

***Electricity and heat generation from biomass, Version 16.0***

This methodology is applicable to project activities that operate biomass (co-)fired power and-heat plants. The project activity includes the installation of new plants at a site where currently power or heat generation occurs. The new plant replaces or is operated next to existing plants (capacity expansion projects). Project types included under this methodology are co-generation of power and heat using biomass. Typical activities include capacity expansions, as in the current UCR project activity.

UCR CoU Standard is used to determine the baseline grid emission factor for the 2013-2022 period.

### B.2. Applicabilityofmethodologiesandstandardizedbaselines>>

| |
|---|
| The project activity is a power generation project using a biomass (bagasse) and displaces CO2 emissions from electricity generation in power plants that are displaced due to the project activity. Since the project activity utilises biomass (bagasse) for the generation of power and supplies it to the local grid, it displaces fossil fuel (coal), and hence it meets the primary applicability criteria of the methodology. |
| The project activity is a power-and-heat plant that encompasses cogeneration plants, i.e. power-and-heat plant in which at least one heat engine simultaneously generates both process heat and power. The total installed capacity of project activity is 46MW which is acceptable as per the applied large scale methodology. |
| The installation of a new biomass residue fired power generation unit, which replaces or is operated next to existing power generation capacity fired with either fossil fuels or the same type of biomass residue as in the project plant (power capacity expansion projects) is also included in this methodology. |
| For the purposes of this methodology, heat does not include waste heat, i.e. heat that is transferred to the environment without utilization, for example, heat in flue gas, heat transferred to cooling towers or any other heat losses. |
| The biomass used by the project plant is not stored for more than one year. The biomass used by the project plant is not processed chemically or biologically (e.g. through esterification, fermentation, hydrolysis, pyrolysis, bio- or chemical degradation, etc.) prior to combustion. |
| The Project Activity uses biomass residues from a production process (e.g. production of sugar), and the implementation of the project does not result in an increase of the processing capacity of (the industrial facility generating the residues) raw input (e.g. sugar) or in other substantial changes (e.g. product change) in this process |
| The project activity unit does not co-fire fossil fuel and/or does not exceed the limit of 25% co-firing fossil fuel criteria as per the UCR Protocol for such projects. |

| |
|---|
| Biomass generated power is used for direct grid supply and for meeting the captive needs at the facility. The project activity is involves the grid-connected bagasse based electricity generation capacity involving the installation of facilities for allowing the export of electricity to the regional grid |
| Biomass is not sourced from dedicated plantations. The existing installed turbo-generators are fired by bagasse, a byproduct of the sugarcane processing and a biomass residue |
| Bagasse is burnt in boilers as generated form the sugar mill and does not require any specific technology for its preparation before combustion. No fuel preparation equipment has been installed at site for preparation of bagasse. Hence no significant energy quantities are required to prepare the biomass residues for fuel combustion. |
| The project activity also does not include any GHG emissions related to the decomposition or burning of biomass. The baseline heat emissions for the project activity are not included in the project boundary nor does it claim for emission reductions from heat. |

## B.3. Applicability of doublecounting emissionreductions>>

The biomass boilers and turbines are constructed by the project proponent within the project boundary. The biomass boilers, turbines and energy meters have unique IDs, which is visible on the units.

The UCR project activity had been registered as a VCS project activity under the title Bagasse based Co-generation Power Project at Khatauli (Project ID 101).

| | |
|---|---|
| VCS Registration Date | 15/07/2009 |
| VCUs Issued (Period 1) | 19/10/2005 - 31/03/2006 |
| VCUs Issued (Period 2) | 01/04/2006 - 18/03/2007 |

The UCR project activity had been registered as a CDM project activity under the title :Bagasse based Co-generation Power Project at Khatauli (Project ID 0826).

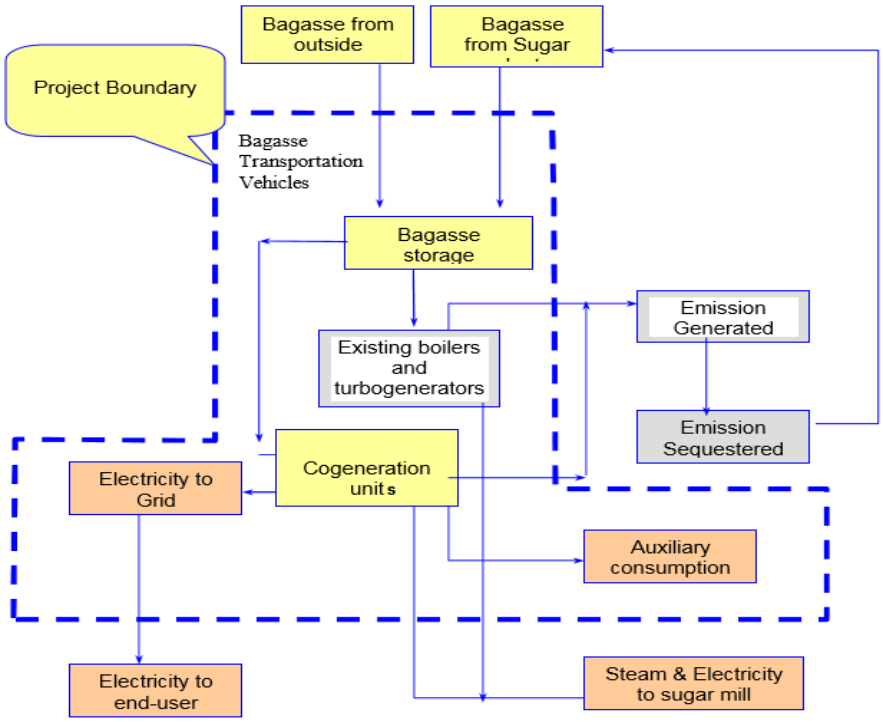
| | |
|---|---|
| CDM Registration Date | 19/03/2007 |
| Crediting Period | 19/03/2007 – 18/03/2017 (Fixed) |
| CERs Issued (Period 1) | 59267 CERs (Period 19/03/2007 – 31/03/2008 ) |
| CERs Issued (Period 2) | 50776 CERs (Period 01/04/2008-31/05/2010) |
| CERs Issued (Period 3) | 28312 CERs (Period 01/06/2010-29/02/2012) |

**Hence the UCR project activity has never been issued voluntary carbon credits for the current 2013-2022 vintage years** and there is no double counting of the credits envisioned. Although the PP is eligible to claim UNFCCC CDM CERs until 18/03/2017, the PP has decided not to claim any further credits under the CDM program (i.e. post 29/02/2012) and is seeking CoUs under the UCR program. Additionally, the same has been stated in the undertaking provided in the Double Counting Avoidance Assurance Document (DAA) by TEIL.

## B.4. Projectboundary,sourcesandgreenhousegases(GHGs)>>

The project boundary includes the physical, geographical site(s) of:

(a) the project power plant and all power plants connected physically to the electricity system that the project activity is connected to.




**Leakage Emissions ($LE_y$)**

Leakage emissions is not applicable as the project activity does not use technology or equipment transferred from another activity.

Hence $LE_y = 0$

| | Source | GHG | Included? | Justification/Explanation |
|---|---|---|---|---|
| Baseline | GHG Emissions from fossil fuel in Grid Baseline Power Generation | $CO_2$ | **Included** | Major source of GHG emissions |
| | | $CH_4$ | Excluded | Excluded for simplification. This is conservative |
| | | $N_2O$ | Excluded | Excluded for simplification. This is conservative |
| | Uncontrolled burning or decay of surplus biomass residue | $CO_2$ | Excluded | Excluded for simplification. This is conservative |
| | | $CH_4$ | Excluded | Excluded for simplification. This is conservative |
| | | $N_2O$ | Excluded | Excluded for simplification. This is conservative |
| Project Activity | Emissions from Biomass Project Activity<br>On-site fossil fuel and electricity consumption due to the project activity (stationary or mobile)<br>Transportation of biomass residue<br>Combustion of biomass residue for electricity and / or heat generation<br>Storage of biomass residue | $CO_2$ | Included | No fossil fuel / electricity is consumed at the project site due to the project activity. Biomass residue transportation using default values is applied.<br>This is conservative |
| | | $CH_4$ | Excluded | Excluded for simplification. This is conservative |
| | | $N_2O$ | Excluded | Excluded for simplification. This is conservative |

**Project Emissions (PEy)**

The project emissions (PEy) under the methodology may include

- $CO_2$ emissions from transportation of biomass residue to the project site,
- $CO_2$ emissions from on-site consumption of fossil fuels due to project activity,
- $CO_2$ emissions from electricity consumption at the project site that is attributable to the project activity and
- $CH_4$ emissions from combustion of biomass.

where

**$PET_y$** = Default project emissions resulting from transport of biomass residues as determined by following the provisions from the TOOL12, taking into account the following transport routes:

- For biomass residues:

- (i) If the biomass residues are consumed without further processing, the route shall include only the transport of the biomass residues between the biomass processing facility or the biomass generation site and the biomass residues utilization facility;
- As an alternative to the monitoring of the parameters needed to calculate the emissions from the transportation, project proponents may apply the following options:
  - For large-scale project activities, apply a net-to-gross adjustment of 10%, i.e. multiply the emission reductions determined based on the applied methodology by 0.9 to determine the final amount of emission reductions that can be claimed.

**$PEFF_{CO2,y}$** = are the $CO_2$ emissions during the year y due to fossil fuels co-fired by the generation facility in tons of $CO_2$,

**$PE_{EC,y}$** = are the $CO_2$ emissions during the year y due to electricity consumption at the project site that is attributable to the project activity in tons of $CO_2$,

**$GWP_{CH4}$** = is the Global Warming Potential for methane valid for the relevant commitment period and,

**$PE_{Biomass,CH4,y}$** = are the $CH_4$ emissions from the combustion of biomass during the year y.

The proposed project activity does not have any $CO_2$ emissions due to fossil fuel co-firing and from electricity consumption at site. The project activity also doesn't include the $CH_4$ emissions from the combustion of biomass.

Hence,

**$PEFF_{CO2,y}$** = 0,

**$PE_{EC,y}$** = 0 and,

**$PE_{Biomass,CH4,y}$** = 0.

## B.5. Establishmentanddescriptionofbaselinescenario >>

T

he baseline scenario identified at the MR stage of the project activity is:

Renewable energy technologies that displace technologies using fossil fuels, wherein the simplified baseline is the fuel consumption of the technologies that would have been used in the absence of the project activity, times an emission factor for the fossil fuel displaced.

The baseline emissions due to displacement of electricity are determined by net quantity of electricity generation as a result of the project activity (incremental to baseline generation) during the year y in MWh times the $CO_2$ emission factor for the electricity displaced due to the project activity during the year y in tons $CO_2$/MWh

Given that steam and electric power generation for internal consumption is part of the present project activity, ***emission reductions are only claimed from on-site incremental power generation that is injected to the grid***. Therefore, the baseline scenario is the emission of GHG from the present electricity generation mix of the UPPCL grid in the northern region.

Emission Reductions ($ER_y$) The emission reduction due to the project activity is calculated as the difference between the baseline emissions and the sum of the project emissions and the leakage:

**$ERy = BE_y - (PE_y + LE_y)$**

$BE_y$= Baseline emissions in year y (t $CO_{2e}$)

*As mentioned in the methodology the baseline emissions are calculated as follows:*

$$BE_y = EG_{pj,y} * EF_{grid,y}$$

Where:

**EG $_{grid,y}$** = Quantity of net electricity generation that is fed into the local grid as a result of the implementation of the project activity in year y (MWh)

**$EF_{grid,y}$** = The $CO_2$ emission factor for grid connected power generation in year y calculated using UCR Standard emission factor (0.9 tCO2/MWh).

**$PE_y$ =** Project activity emissions are calculated by applying a net-to-gross adjustment of 10%, i.e. multiply the emission reductions determined based on the applied methodology by 0.9 to determine the final amount of emission reductions that can be claimed.

**$LE_y$** = Leakage emissions = 0

For this methodology, it is assumed that transmission and distribution losses in the electricity grid are not influenced significantly by the project activity and are therefore not accounted for and also the UCR grid emission factor results in conservative estimates of the carbon credits.

Direct off-site emissions in the project activity arise from the biomass residue transport. However, the biomass is generated from the in-house processes pertaining to the sugar processing industry, hence, biomass residue transport is only accounted if biomass residue is imported from outside the project boundary. The same type of $CO_2$ emission occurs during transportation of coal from coal mines to thermal power plants (supplying power to state grid). The biomass is collected from the nearby sources and is transported by trucks to the project site. Each truck laden with biomass is weighed on the electronic weighbridge and the corresponding readings are noted in the plant log books. For the current monitoring period no biomass residue was collected from outside, thus for this monitoring period, the value of this parameter is zero, however, using the UCR principles of conservativeness, transport emissions are calculated by applying a net-to-gross adjustment of 10%, i.e. multiply the emission reductions determined based on the applied methodology by 0.9 to determine the final amount of emission reductions. The reported values of the quantity of biomass transported can be verified against the plant records.

| Year | MWh supplied to the grid |
|---|---|
| 2013 | 101610.3 |
| 2014 | 90174.3 |
| 2015 | 92364.6 |
| 2016 | 93297 |
| 2017 | 105703.5 |
| 2018 | 119622.3 |
| 2019 | 113308.5 |
| 2020 | 109507.5 |
| 2021 | 119925.9 |
| 2022 | 118940.4 |

| Year | Baseline Emissions y (tCO2) | Emission Reductions (tCO2) |
|---|---|---|
| 2013 | 91449 | 82304 |
| 2014 | 81156 | 73040 |
| 2015 | 83128 | 74815 |
| 2016 | 83967 | 75570 |
| 2017 | 95133 | 85619 |
| 2018 | 107660 | 96894 |
| 2019 | 101977 | 91779 |
| 2020 | 98556 | 88700 |
| 2021 | 107933 | 97139 |
| 2022 | 107046 | 96341 |
| Total | 958005 | 862201 |

**B.6. PriorHistory>>**

The project has received no public funding. The project activity was registered under the UNFCCC

CDM and also the voluntary carbon market in the past. Details have been explained in the relevant section (B3) of this MR.

The project activity has not applied to any other GHG program for generation or issuance of carbon offsets or credits for the current crediting period.

**B.7.Changes to startdate of crediting period >>**

The updated crediting, monitoring and issuance period is as follows:
UCR Monitored Period: 01 (Monitored Period Duration: 10 Years, 00 Months)
1st UCR Monitoring Period: 01/01/2013 to 31/12/2022
1st UCR Crediting Period: 01/01/2013 to 31/12/2022

**B.8. Permanent changes from PCN monitoring plan, applied methodology or applied standardized baseline >>**

There are no permanent changes from registered PCN monitoring plan and applied methodology.

**B.9.Monitoring period number and duration>>**

MR Version 3.0

UCR Monitored Period: 01 (Monitored Period Duration: 10 Years, 00 Months)
1st UCR Monitoring Period: 01/01/2013 to 31/12/2022
1st UCR Crediting Period: 01/01/2013 to 31/12/2022

**B.10.Monitoringplan>>**

The monitoring of electricity data revolves around the power generation from the turbine generators and the auxiliary consumption of the power plant. All auxiliary units at the power plant is metered and there are also main meters attached to each turbine generator to determine their total generation.

Operational records and other evidences have been documented, collected and archived in either hard-copies or electronic manners. The energy generation is metered by calibrated meters. The biomass consumption is measured by Weigh Bridge calibrated after every two year by state government organisation. Steam quantity, temperature and pressure are measured by calibrated meters. The date of calibration and next due date of calibration can be checked against the calibration certificates. All the values can be checked from the source data ie. plant records. The calorific value of biomass can be checked against the third party analysis reports.

The total amount of bagasse generated by the sugar plant can be calculated from the amount of cane crushed in the season (monitored variable), which is obtained from the in house records. Therefore, bagasse can be calculated using the formula:

**Bagasse = Cane + Added water – Juice**

This quantity will be cross-checked using an annual energy balance using the monitored steam values. The total heat generated as well as the heat generated by the project activity is monitored using the temperature and pressure values and calculating the enthalpies of the steam generated and the feed water.

The management of the plant has designated one person to be responsible for the collation of data as per the monitoring methodology. The designated person collects all data to be monitored as mentioned in this MR and reports to the head of the plant.

The overall project management responsibility remains with the Plant Head. The electricity generation from turbines and auxiliary consumption is recorded continuously on an hourly basis by the operators in the shift. At the end of the day this data is collated by the engineer in charge and signed off by the power plant manager. The steam data is also manually recorded on an hourly basis from the meters. The data is recorded in logbooks by the operators and the engineer in charge collates the data from these log books and stores them electronically. This data is used by engineer in charge to prepare a monthly report and send it to Plant Head for verification. The monthly reports become a part of the Management Information System (MIS) and are reviewed by the management during the quarterly review meeting.

The monthly reports can be made available during the verification of the project activity, to estimate the monthly emission reductions, which are also, included in the MIS. The monitoring personnel are familiar with the process of monitoring and documentation. They have been maintaining and reviewing the factory records pertaining to the sugar manufacturing.

All the meters are checked and calibrated each year by an independent agency and they are maintained as per the instructions provided by their suppliers. Hence there are no uncertainties or adjustments associated with data to be monitored. An internal audit team, comprising of personnel from the factory but from a department other than utility, reviews the daily reports, monthly reports, procedure for data recording and maintenance reports of the meters. This team checks whether all records are being maintained as per the details provided in the MR and PCN.

The audit team also enlists the modifications/corrective actions required, if any, in more accurate monitoring and reporting. All the data and reports will be kept at the offices of the sugar mill until 2 years after the end of the crediting period or the last issuance of CoUs for the project activity, whichever occurs later.

Emergency preparedness plans have been laid out to meet with situations leading to unintended emissions. These emergency situations have been identified as:

1. Fire in the fuel yard
2. Fuel spoilage due to water. These emergency situations haven been taken care by putting up a fire safety system and a water drainage system in the fuel yard. T

| Parameters | Description | Measured Data |
|---|---|---|
| $Q_{S,y}$ | Quantity of steam supplied per year measured at recipient's end | The net heat generated from the project plant is determined as a difference between the steam energy (based on measured steam flow, temperature and pressure) and feed water energy (based on feed water flow, temperature). The outlet steam conditions, pressure and temperature, are continuously monitored using pressure transmitter and temperature sensor respectively. The steam flow rate is monitored on a continuous basis using the steam flow meter. At the boiler outlet, steam pressure and temperature condition, the enthalpy is obtained from the standard steam table. The multiplication of the enthalpy of steam with the steam flow rate, gives the total heat content of the outlet steam from the boiler. Similarly, |

| | | |
|---|---|---|
| | | the enthalpy of feed water has also been monitored and reported and the same was considered to obtain the final Qproject plant which reflects the actual net quantity of heat generation from the project plant boiler. The readings recorded from the flow meter are converted to MWh. |
| $T_{steam,y}$ | Temperature of steam at the recipient's end | A temperature transmitter is used to measure the temperature of the steam produced. The temperature of the steam is monitored on a continuous basis and recorded daily. A daily average value of temperature is recorded in the plant log book. **The recorded daily values of the temperature of steam were 488-507 $^{o}$C over the monitoring period.** |
| $P_{steam,y}$ | Pressure of steam | A Pressure transmitter is used to measure the pressure of the steam produced. The pressure of the steam generated is monitored on a continuous basis and recorded daily. The daily average value is taken from the digital reading and the same is recorded into log books**. The average daily steam pressure reading per boiler is between 75.50 and 86 kg/cm$^2$ over the monitoring period.** |
| $E_{steam,y}$ | Enthalpy of the saturated steam supplied to the recipient from each boiler | The enthalpy of feed water is obtained from the steam table at the temperature condition of the feed water supplied to the project boilers. **The monthly average enthalpy is between 3356-3410 MJ/Tonne for each boiler**. |
| $T_{Feedwater}$ | Temperature of boiler feed water | A temperature transmitter is used to measure the temperature of the feedwater and is monitored on a continuous basis and recorded daily. A daily average value of temperature is recoded in to the plant log book**.** |
| $E_{Feedwater}$ | Enthalpy of feed water | Enthalpy of feed water for the project plant from each boiler for the entire monitoring period was measured between **665-678 MJ/t** |
| $EG_{thermal,y}$ | Net quantity of thermal energy supplied by the project activity during the year y | The enthalpy of steam is obtained from the steam table by using pressure and temperature condition (temperature and pressure as being monitored above) of the steam generated from the project boiler. |
| $B_{Biomass,y}$ | Net quantity of biomass consumed in year y (on dry basis) | The quantity of biomass type (on "as received" basis) combusted in the project plant is measured on conveyor belt by load cells. Load cells are calibrated on an annual basis according to the standard procedure by the PP. Calibration certificates of load cells are |

| | | |
|---|---|---|
| | | available on site. Calibration of load cell had been done by accredited a NABL (National Accreditation Board for Testing and Calibration Laboratories) approved lab. The amount of biomass combusted in the process can be verified from the plant log books. It is worth mentioning here that this parameter is not being used in the ER calculation. |
| $MC_{biomass}$ | Moisture content of the biomass | NA |

Monthly joint meter reading of main meters installed at interconnection points are taken and signed by authorised officials of TEIL and UPPCL on the first day of every month. Records of this joint meter reading are maintained by TEIL and UPPCL. Daily and monthly reports stating the net power export is prepared by the shift in-charge and verified by the plant manager. Power Purchase Agreement (PPA) with UPPCL has been signed. Reliability of energy data is maintained as per PPA. TEIL archives and preserves all the monthly invoices raised against net saleable energy and also archives the complete metering data at generation electronically. All the records are maintained at site. Uttar Pradesh Pollution Control Board (UPPCB) and Environment Department of Uttar Pradesh have prescribed standards of environmental compliance and monitor the adherence to the standards. TEIL has received the 'Consent to Operate' the plant. State's regulatory body of power is Uttar Pradesh Electricity Commission (UPERC) and they have issued consent for the installation of co-generation power plant of 46 MW capacity. As a buyer of the power, the UPPCL is a major stakeholder in the project. They hold the key to the commercial success of the project.

Gross electricity generation is being measured continuously by energy meters. The meter readings are recorded in the plant log books on shift wise basis. Energy meters have been calibrated as per standard procedures by third party agencies which are also according to the monitoring plan. The same can be verified from the calibration certificates provided during the UCR verification process. The average thermal efficiency of the boiler for the current monitoring period is 70.5% and is found comparable to the rated efficiency as per the manufacturer (71.2%).

| Year | **MONTH** | **Net Power Generated ( MWH)** | **Bagasse** (MT) |
|---|---|---|---|
| 2013 | Jan-13 | 32045.44 | 332587 |
| | Feb-13 | 25286.88 | |
| | Mar-13 | 31985.60 | |
| | Apr-13 | 18185.76 | |
| | May-13 | 0.00 | |
| | Jun-13 | 7210.56 | |
| | Jul-13 | 10887.84 | |
| | Aug-13 | 0.00 | |
| | Sep-13 | 0.00 | |
| | Oct-13 | 0.00 | |
| | Nov-13 | 0.00 | |
| | Dec-13 | 22240.32 | |
| | **Total - 2013** | **147842.40** | **332587.00** |
| 2014 | Jan-14 | 30129.44 | 331320.51 |

| | | | |
|---|---|---|---|
| | Feb-14 | 26713.12 | |
| | Mar-14 | 29539.36 | |
| | Apr-14 | 20429.60 | |
| | May-14 | 0.00 | |
| | Jun-14 | 0.00 | |
| | Jul-14 | 0.00 | |
| | Aug-14 | 0.00 | |
| | Sep-14 | 0.00 | |
| | Oct-14 | 0.00 | |
| | Nov-14 | 4532.96 | |
| | Dec-14 | 29808.96 | |
| | **Total - 2014** | **141153.44** | **331320.51** |
| 2015 | Jan-15 | 31099.36 | 356094.81 |
| | Feb-15 | 27929.12 | |
| | Mar-15 | 26955.84 | |
| | Apr-15 | 26844.48 | |
| | May-15 | 1244.00 | |
| | Jun-15 | 0.00 | |
| | Jul-15 | 0.00 | |
| | Aug-15 | 0.00 | |
| | Sep-15 | 0.00 | |
| | Oct-15 | 0.00 | |
| | Nov-15 | 6350.24 | |
| | Dec-15 | 27108.96 | |
| | **Total - 2015** | **147532.00** | **356094.81** |
| 2016 | Jan-16 | 29598.24 | 354791.73 |
| | Feb-16 | 28219.04 | |
| | Mar-16 | 27981.76 | |
| | Apr-16 | 7504.16 | |
| | May-16 | 0.00 | |
| | Jun-16 | 0.00 | |
| | Jul-16 | 0.00 | |
| | Aug-16 | 0.00 | |
| | Sep-16 | 0.00 | |
| | Oct-16 | 23.68 | |
| | Nov-16 | 22483.68 | |
| | Dec-16 | 31784.96 | |
| | **Total - 2016** | **147595.52** | **354791.73** |
| 2017 | Jan-17 | 28083.04 | 423706.99 |
| | Feb-17 | 26037.28 | |
| | Mar-17 | 27672.00 | |
| | Apr-17 | 23639.20 | |
| | May-17 | 354.56 | |
| | Jun-17 | 470.40 | |

| | | | |
|---|---|---|---|
| | Jul-17 | 0.00 | |
| | Aug-17 | 0.00 | |
| | Sep-17 | 0.00 | |
| | Oct-17 | 3796.64 | |
| | Nov-17 | 28548.48 | |
| | Dec-17 | 30134.40 | |
| | **Total - 2017** | **168736.00** | **423706.99** |
| 2018 | Jan-18 | 30416.32 | 455274.11 |
| | Feb-18 | 27383.04 | |
| | Mar-18 | 30211.20 | |
| | Apr-18 | 28344.16 | |
| | May-18 | 17820.32 | |
| | Jun-18 | 0.00 | |
| | Jul-18 | 0.00 | |
| | Aug-18 | 0.00 | |
| | Sep-18 | 37.12 | |
| | Oct-18 | 0.00 | |
| | Nov-18 | 19994.08 | |
| | Dec-18 | 30263.52 | |
| | **Total - 2018** | **184469.76** | **455274.11** |
| 2019 | Jan-19 | 28731.52 | 488309.27 |
| | Feb-19 | 25227.04 | |
| | Mar-19 | 27601.44 | |
| | Apr-19 | 27166.88 | |
| | May-19 | 18801.28 | |
| | Jun-19 | 0.00 | |
| | Jul-19 | 0.00 | |
| | Aug-19 | 0.00 | |
| | Sep-19 | 0.00 | |
| | Oct-19 | 831.04 | |
| | Nov-19 | 26353.12 | |
| | Dec-19 | 27416.80 | |
| | **Total - 2019** | **182129.12** | **488309.27** |
| 2020 | Jan-20 | 22406.40 | 543593.21 |
| | Feb-20 | 20674.24 | |
| | Mar-20 | 18965.92 | |
| | Apr-20 | 26021.44 | |
| | May-20 | 27404.64 | |
| | Jun-20 | 11120.80 | |
| | Jul-20 | 0.00 | |
| | Aug-20 | 0.00 | |
| | Sep-20 | 0.00 | |
| | Oct-20 | 2341.12 | |
| | Nov-20 | 28845.92 | |

| | | | |
|---|---|---|---|
| | Dec-20 | 30331.68 | |
| | **Total - 2020** | **188112.16** | **543593.21** |
| 2021 | Jan-21 | 29671.20 | 473978 |
| | Feb-21 | 27318.24 | |
| | Mar-21 | 27881.44 | |
| | Apr-21 | 27926.40 | |
| | May-21 | 22421.12 | |
| | Jun-21 | 0.00 | |
| | Jul-21 | 0.00 | |
| | Aug-21 | 0.00 | |
| | Sep-21 | 0.00 | |
| | Oct-21 | 98.24 | |
| | Nov-21 | 21081.28 | |
| | Dec-21 | 30131.68 | |
| | **Total - 2021** | **186529.60** | **473978.00** |
| 2022 | Jan-22 | 25439.84 | 336084 |
| | Feb-22 | 25699.36 | |
| | Mar-22 | 28802.88 | |
| | Apr-22 | 27718.56 | |
| | May-22 | 23302.72 | |
| | Jun-22 | 0.00 | |
| | Jul-22 | 0.00 | |
| | Aug-22 | 0.00 | |
| | Sep-22 | 0.00 | |
| | Total - 2022 | **130963.36** | **336084.00** |

| Data/Parameter | **$NCV_k$** |
|---|---|
| Data unit | The Net calorific value of the bagasse ("as received" basis) is measured monthly in the internal plant lab and annually by the third party in an accredited lab. The NCV values specified fall in range as per IPCC 2006 Guidelines (1,409,191 to 5,493,456 kCal/Ton). NCVI [Net calorific value of biomass, { MWh/ton }] ranges between 2.56-2.60 MWh/ton. |
| Description | Net Calorific Value of Biomass Residue Type *K* |
| Source of data<br>Value(s) applied | Measurements is carried out by reputed labs and reported in dry biomass basis. |
| Measurement methods and procedures | On site and in labs |
| Monitoring frequency | Every 6 months |
| Purpose of data | Quality control |

| Data/Parameter | $Q_{biomass,yr}$ |
|---|---|
| Data unit | MT/yr |
| Description | The quantity of bagasse used to generate steam in the boilers each year |
| Source of data<br>Value(s) applied | Plant records and log books receipts. 45000 kg weighbridge purchase order and installation certificate is provided to the verifier. |
| Measurement methods and procedures | Monitoring: The quantity of biomass fed into the boiler is controlled.<br>Data type: Measured<br>Responsibility: Boiler Operator |
| Monitoring frequency | Daily |
| QA/QC | The amount of biomass used can be cross checked by the purchase orders and stock inventory. Quantity of biomass has been monitored. Biomass measuring device has an accuracy level of +/- 0.5% of full scale, and ranging between 0-120 TPH. |

| Data/Parameter | **$EG_{project\ plant,\ y}$** |
|---|---|
| Data unit | MWh |
| Description | Net quantity of electricity generated in the project plant during the year y |
| Source | TEIL-factory records |
| Measurement methods and procedures | This value will be determined annually from the records maintained at the factory. All auxiliary units at the power plant are metered and there is also a main meters attached to each turbine generator to determine their total generation. |
| Monitoring frequency | The hourly recordings of data is to be taken from energy meters located at the project activity site. This data is to be recorded hourly by the shift attendant and entered into logbooks on site. This hourly data is to be signed off at the end of every shift by an engineer in charge of the shift and again at the end of each day and signed off by the power plant manager. The energy meters are calibrated annually by an independent third party |
| QA/QC | Net electricity production has been calculated by deducting auxiliary consumption from gross generation of the plant. Digital meters calibration procedures are planned. Daily productions details are kept in log books and electronic data base. Energy meters are of class 0.2 with tolerance of 0.5%. All Meters are calibrated by accredited external third party, as per standard procedures, periodically. |

| Data/Parameter | **$EF_{grid,y}$** |
|---|---|
| Data unit | Grid Emission Factor |
| Description | $tCO_2/MW_h$ |
| Source of data<br>Value(s) applied | UCR CoU Standard Default for Indian grid<br>0.9 $tCO_2/MW_h$ for the period 2017-2021 |
| Measurement methods and procedures | NA |
| Monitoring frequency | NA |
| QA/QC | The parameter is conservative. |
| Purpose of data | To estimate baseline emissions |

| Data/Parameter | **$EG_{grid,y}$** |
|---|---|
| Data unit | MWh |
| Description | Net quantity of electricity supplied to the grid |
| Source of data<br>Value(s) applied | JMR and/or Monthly Meter Readings |
| Measurement methods and procedures | Type: Calculated<br>Data type: Monitored<br>This parameter may be checked with the necessary invoices or JMR (issued by the state grid) each month. |
| Monitoring frequency | Daily |
| QA/QC | Energy meters on existing turbines are calibrated on annual basis by NABL accredited labs. Electricity generation in these units are recorded and kept in log books for verification purpose.Energy meters are of class 0.2 with tolerance of 0.5%. All Meters are calibrated by accredited external third party, as per standard procedures, periodically |
| Purpose of data | To estimate baseline emissions |