MONITORING REPORT (MR)

CARBON OFFSET UNIT (CoU) PROJECT

Title: TEIL Biomass Grid Supply Power Project, Deoband, Uttar Pradesh
MR Version 2.0
UCR PROJECT ID: 328

Date of MR: 09/10/2023
1st CoU Issuance Period: 01/01/2013-31/12/2022 (10 Years, 00 Months)
1st UCR Monitoring Period: 01/01/2013-31/12/2022 (10 Years, 00 Months)
1st UCR Crediting Period: 01/01/2013-31/12/2022 (10 Years, 00 Months)

Universal Carbon Registry	**Monitoring Report (MR)** **CARBON OFFSET UNIT (CoU) PROJECT**

BASIC INFORMATION

Title of the project activity	TEIL Biomass Grid Supply Power Project, Deoband, Uttar Pradesh
Scale of the project activity	Large Scale
UCR PROJECT ID	328
Completion date of the MR	09/10/2023
Project participants	**Project Proponent:** Triveni Engineering and Industries Ltd (TEIL) **Aggregator:** Carbon Equalizers, KATNI **UCR ID** : 660687753
Host Party	India
Applied methodologies and standardized baselines	**CDM UNFCCC Methodology** **ACM0006**: Electricity and heat generation from biomass (Ver.16.0) 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: 39791 tCO2 (39791 CoUs)
	2014: 36559 tCO2 (36559 CoUs)
	2015: 37222 tCO2 (37222 CoUs)
	2016: 43126 tCO2 (43126 CoUs)
	2017: 56652 tCO2 (56652 CoUs)
	2018: 54940 tCO2 (54940 CoUs)
	2019: 43961 tCO2 (43961 CoUs)
	2020: 50071 tCO2 (50071 CoUs)
	2021: 45464 tCO2 (45464 CoUs)
	2022: 46670 tCO2 (46670 CoUs)
Estimated total amount of average GHG emission reductions for the entire monitoring period (01/01/2013-31/12/2022)	454456 tCO_2 (454456 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, Deoband, Uttar Pradesh** is located at Village: Deoband, District: Saharanpur, State: Uttar Pradesh, Country: India. The project activity is located near Meerut & Saharanpur highway and is about 35 km from Saharanpur Village.

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 project activity is a **22.0 MW** totalled installed capacity cogeneration project activity and displaces the carbon intensive grid energy mix with a renewable, carbon neutral energy source, the project activity reduces carbon dioxide emissions over the project life. Replicable technology, environmental, and sustainable development benefits also result from the project activity. These include: introducing efficient high pressure cogeneration technology to the Indian sugar industry; reducing power shortages in the state of Uttar Pradesh (UP) India; and, fostering sustainable economic growth through promoting energy self-sufficiency and resource conservation in India's sugarcane industry.

The commissioning date or start date of this UCR project activity is **04/12/2004 (**the date on which power export and grid synchronization to the 132 KV substation was started as per UCR guidelines). The project activity uses bagasse as fuel in its cogeneration power unit, which is a renewable bio-mass fuel and does not add any net carbon-dioxide to the atmosphere because of the carbon recycling during growth of sugar cane. Therefore, the project activity leads to zero CO_2 on-

site emissions associated with bagasse combustion.

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 by-product 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. **Unlike other carbon offset projects using biomass for cogeneration of power/heat, in this project activity the precise mix of power generation and export to the grid can be measured directly with meters installed within the project boundary**.

The project activity involves the renewable biomass (bagasse) based electricity generation within the Triveni Engineering & Industries Ltd (TEIL) plant located at Village: Deoband, District: Saharanpur, State: Uttar Pradesh. The purpose of the UCR project activity is to utilize the available sugar mill generated bagasse to generate steam and electricity for internal use and to export the surplus electricity to the Uttar Pradesh Power Corporation Limited (UPPCL) grid (part of Northern regional grid). **UCR carbon credits are being claimed on the emission reductions due to power exported to the grid only**.

At the time of commissioning, this project activity was unique in India due to its use of high efficiency boilers for optimizing the energy produced per unit of bagasse burned. While many sugar mills burnt their bagasse wastes, in 2003-04 less than 14% of the mills sold electricity to the state grid and less than 1% of the approximately 500 sugar mills in the country have high pressure boiler systems (87 kg/cm^2). With the goal of obtaining carbon revenues from the avoidance of grid-based greenhouse gas (GHG) emissions, the company took the investment risks to secure financing to invest in such high efficiency cogeneration systems, thereby demonstrating the attractiveness of clean power systems to the sugar manufacturing industry in India.

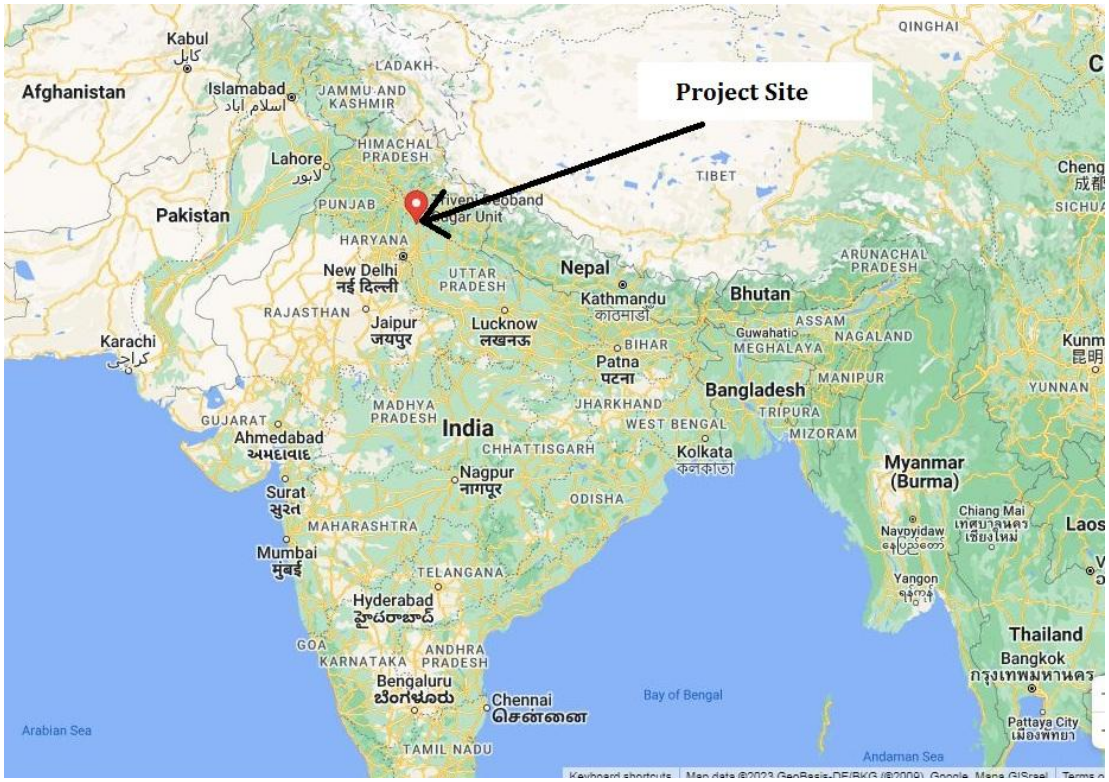
The project activity is highly replicable as the country's sugar mills produce vast quantities of bagasse wastes that could be far more efficiently burned to generate energy for on-and off-site

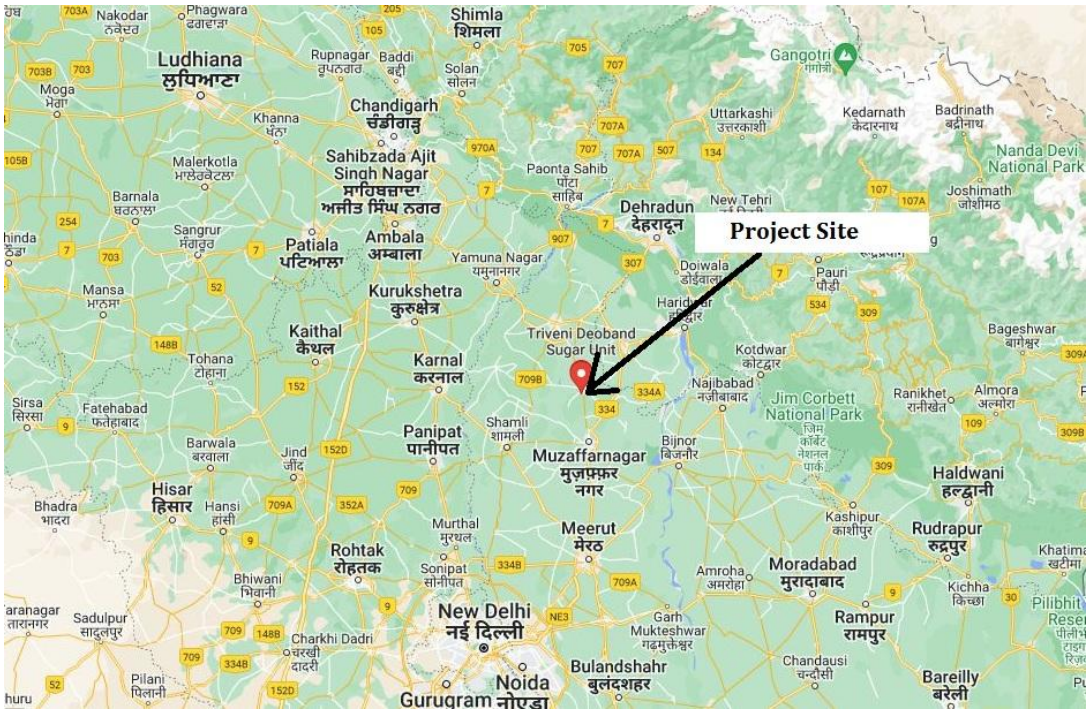
use while also reducing grid based GHG emissions, which result from the country's overwhelming (70%) dependency on coal. The majority of the total electricity produced, is exported to the Uttar Pradesh Power Corporation Limited (UPPCL), with **16.17 MW** being exported from the plant during the cane crushing season and **19.16 MW** during the off-season period. The emission reductions from the project activity come from the **avoidance** of carbon dioxide emissions from fossil fuel use in Northern grid. The project activity supplied approximately **561065 MWh** of renewable power to the grid during this monitored period.

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.

A.2. Location of project activity >>

Country: India
Village: Deoband,
District: Saharanpur,
State: Uttar Pradesh,
Country: India
Longitude: 77º 40’ 6’’ E
Latitude: 29º 40’ 30’’ N





A.3. Technologies/measures>>

The turbine has been designed for a condition called valve wide open condition, wherein the flow in turbine can vary 3-5% more than MCR turbine flow, which may result in slightly higher power generation than the nominal capacity.

The technology for the boilers and turbines is well established and the project activity does not involve any transfer of technology. The technology being used is environmentally safe and sound. 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 consists of the boiler, turbo-generator, auxiliary systems, and switchyard etc., located adjacent to the sugar plant. The other requirements of the project activity including water requirement, infrastructure facilities etc. are also available at site. The grid electrical substation of 132 kV for power export is only 3 km from the site.

The project activity is designed to operate a 120 tonnes per hour (tph) nominal capacity boiler with the super heater outlet steam parameters of 87 kg/cm^2 & 515 ^{0}C and a double extraction cum condensing type turbogenerator of 22 MW capacity, using bagasse as the fuel.

The boiler is of modern design with membrane furnace walls, electrostatic precipitators for dust collection, spreader stoker and travelling grate type. The inlet feed water is at 170 ^{0}C, with the feed water heated in a high pressure feed water heaters. The deaerator outlet water temperature is 115^{0}C.

The cogeneration turbine is a double extraction cum condensing machine. There is one controlled extraction at 3.0 kg/cm^2 and one uncontrolled extractions at 9 kg/cm^2 . The power is generated at 11 kV level. The internal consumption requirements for auxiliaries and equipment of the sugar plant and the cogen plant are met by stepping down voltage level to 415V. The exportable power needs to be stepped upto 132 kV and paralleled with the Northern grid at the sub-station in Deoband.

OFFICE OF THE
EXECUTIVE ENGINEER
ELECTERICITY DISTRIBUTION DIVISION-DEOBAND,
Distt.-Saharanpur.

(Fax No.)-01336-225355
☎-01336 - 225355

Corporate Identification No.-U31200UP2003SGC027458 Email I.D. eeedddeoband@gmail.com

NO.: -3041 /E.D.D./DEOBAND/ DATED: -19/12/2015

"CERTIFICATE OF COMMISSIONING"

It is Certified that as per record **M/s Triveni Engineering & Industries Limited, unit Deoband, District-Saharanpur (U.P.)** of 22 MW Bagasse based Co-generation Project has started power evacuation from **Date 04.12.2004** as per **Power Purchase Agreement Dated 29th Oct. 2003** to **132 KV Sub - Station Deoband.**

(Naresh Kumar)
Executive Engineer,
Electricity Distribution Division,
Deoband, Distt.-Saharanpur.

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.

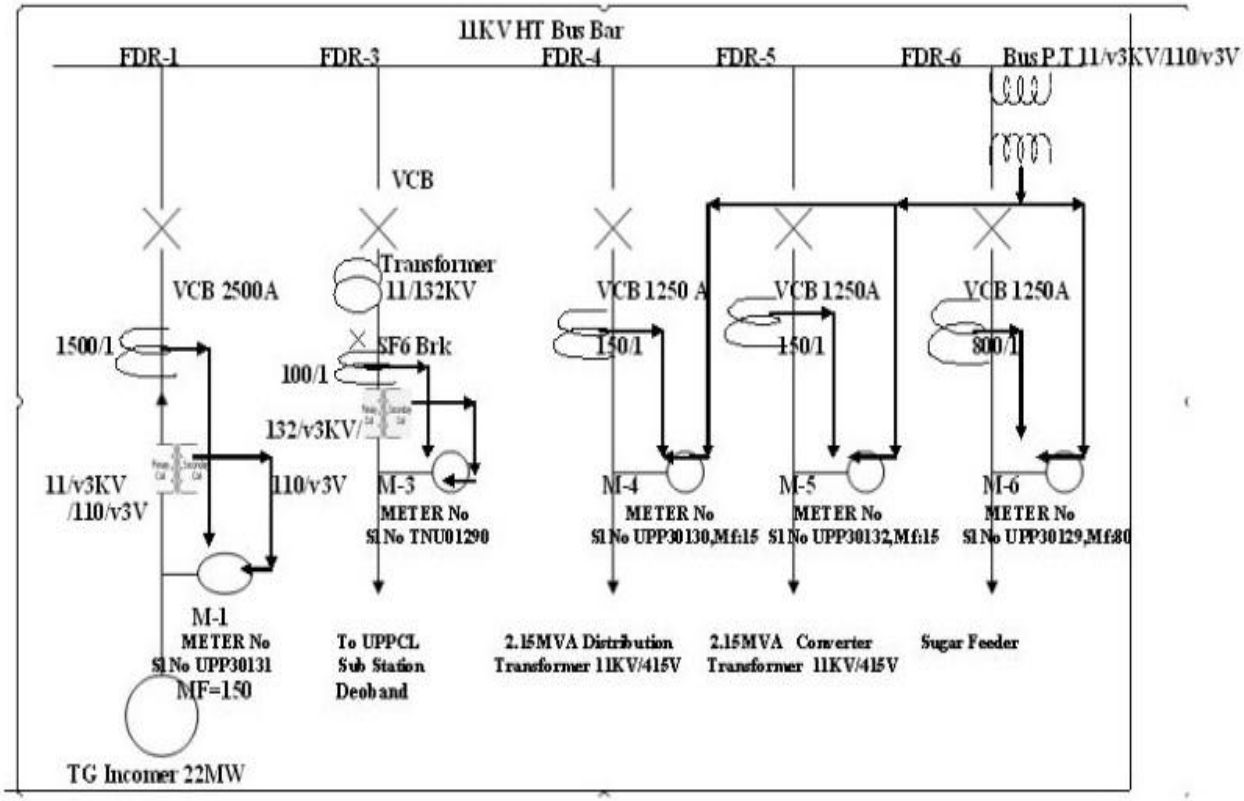
Boiler Details

Description	**1 number of Water tube**
Steam generating capacity (tons per hour)	120
Steam pressure (kg/cm2)	87
Steam temperature (° C)	515

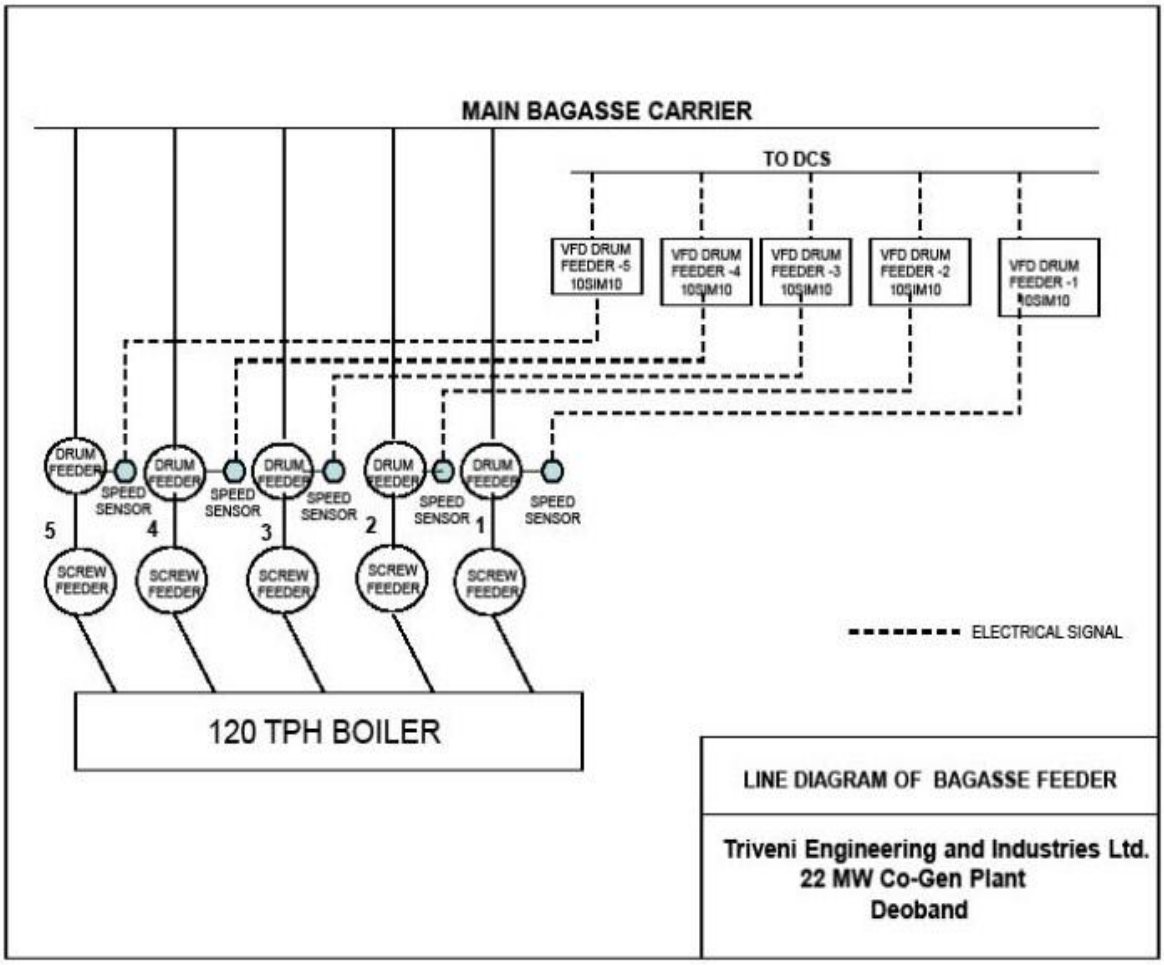
Turbine details:

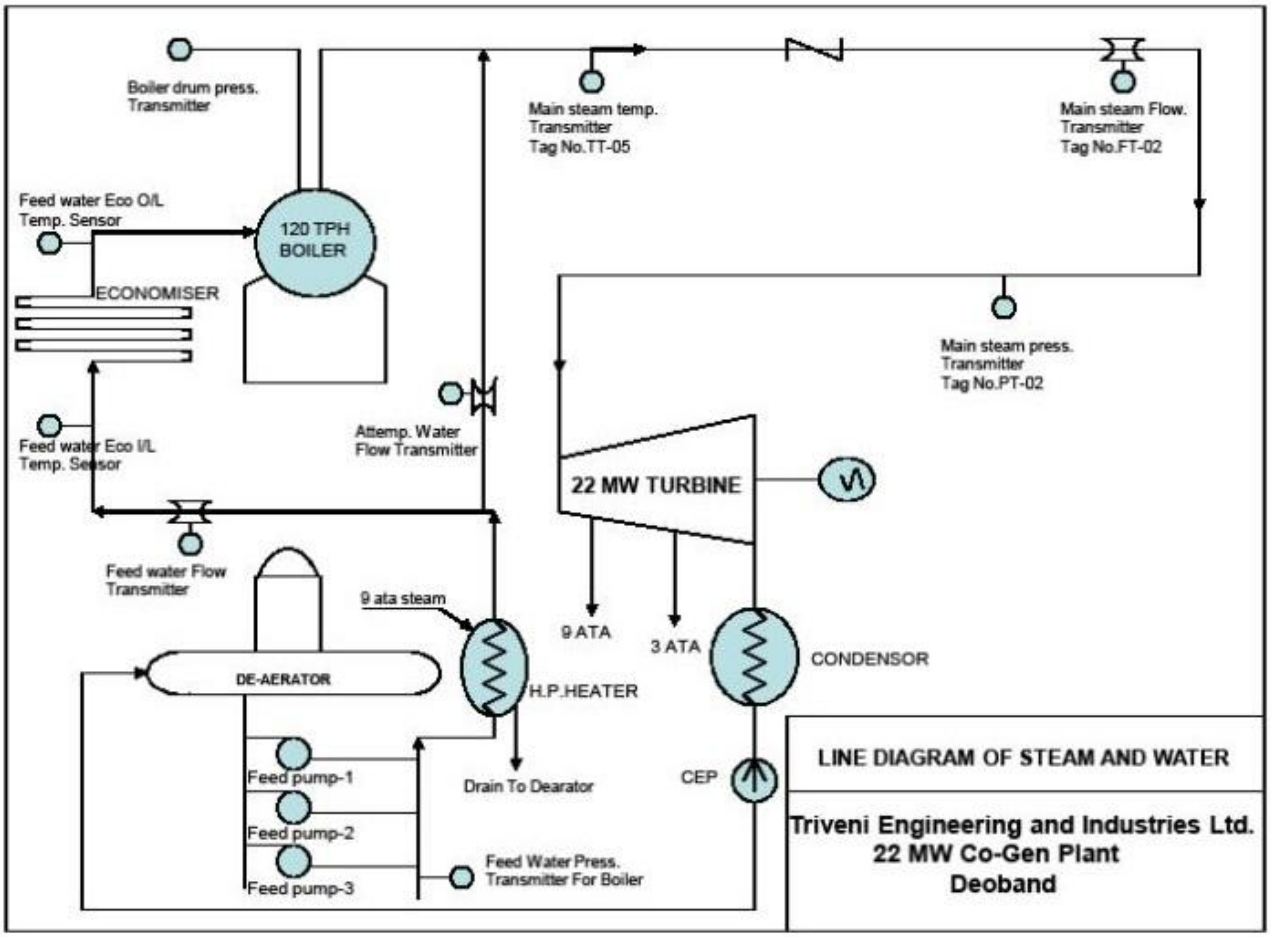
Description	**1 number of extraction cum condensing turbine**
Power (kW)	22000
Steam inlet pressure (kg/cm2)	84

22 MW Cogen Power Plant Deoband



S.No	Abb	Meter S.No	Location
1	M1	UPP30131	Generator Energy Meter
2	M3	TNU01290	Export Meter
2	M4	UPP30130	Distribution Transformer Energy Meter(Aux.)
3	M5	UPP30132	Converter Transformer Energy Meter(Aux.)
4	M6	UPP30129	Sugar Distribution Energy Meter


MAIN BAGASSE CARRIER
TO DCS
VFD DRUM FEEDER -5 10SIM10
VFD DRUM FEEDER -4 10SIM10
VFD DRUM FEEDER -3 10SIM10
VFD DRUM FEEDER -2 10SIM10
VFD DRUM FEEDER -1 10SIM10
DRUM FEEDER
SPEED SENSOR
5
4
3
2
1
SCREW FEEDER
ELECTRICAL SIGNAL
120 TPH BOILER
LINE DIAGRAM OF BAGASSE FEEDER
Triveni Engineering and Industries Ltd.
22 MW Co-Gen Plant
Deoband



INSTRUMENT DETAILS	
Steam Flow:	
Make	Emerson
Sr. No	S 0196056
Steam Pressure:	
Make	Emerson
Sr. No	S 0196038
Steam Temperature	
Make	Emerson
Sr. No	S-196303
ENERGY INSTRUMENT DETAILS	
ENERGY METERS	
Make	SECURE
Sr. No	APM04100
Model	APEX
Class	0.2S for active and reactive
Make	SECURE
Sr. No	APM04101
Model	APEX
Class	0.2S for active and reactive

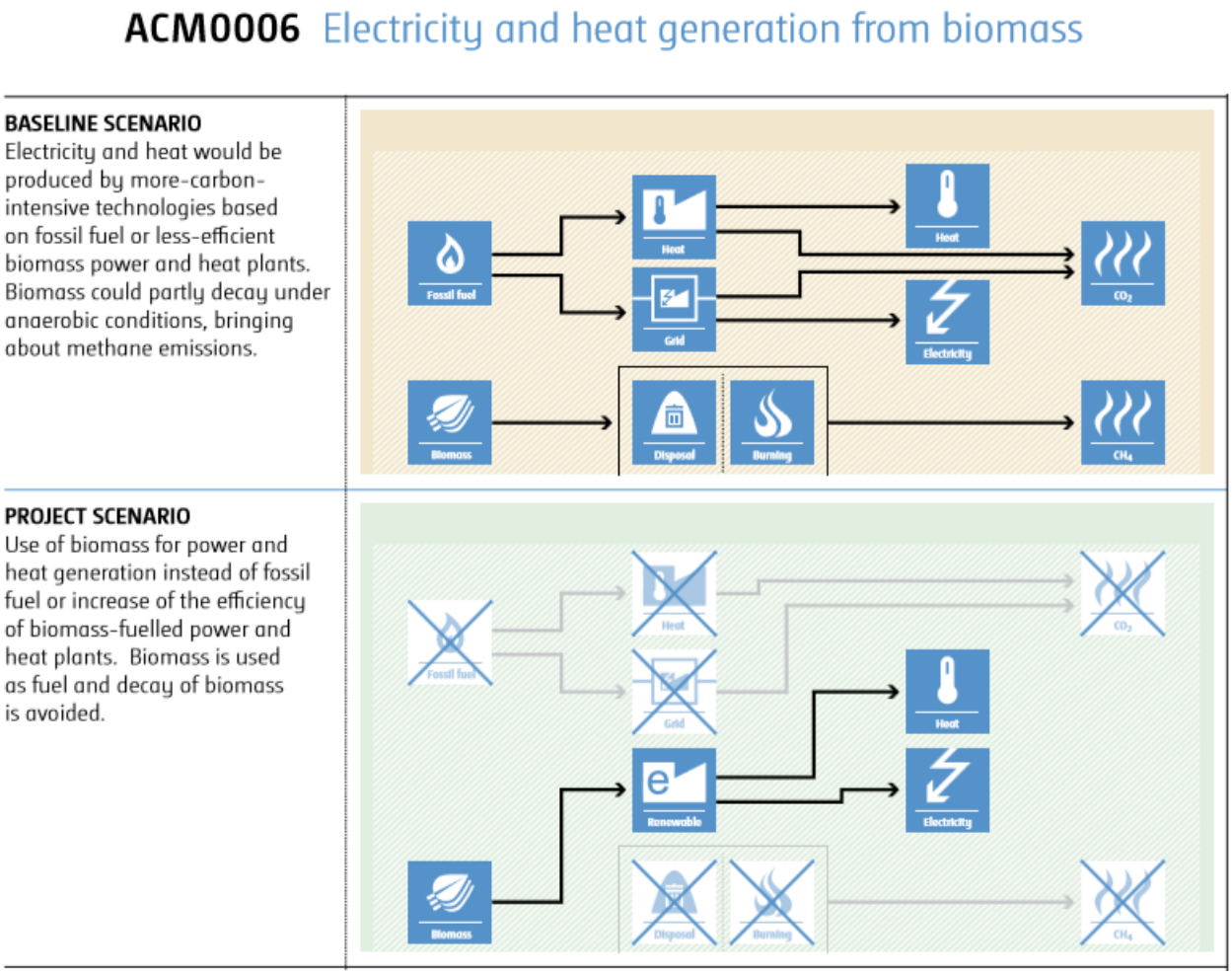
Auxiliary Consumption Meters	
Serial no.	UPP30130
Serial no.	UPP30132
Accuracy class	0.2s
Gross Generation Meter	
Serial No.	UPP30131
Accuracy class:	0.2s

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) Aggregator: Carbon Equalizers, KATNI UCR ID : 660687753 Contact: Mr Vikas Chamadia Email: vikaschamadia@rediffmail.com **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. In the absence of the project activity TEIL would be generating and consuming the power produced in-house and no export of electricity to grid would take place; the grid based power plants would have to generate similar quantum of power in the absence of the project activity.
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 22MW 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. Implementation of the project activity has no direct/ indirect effect on the bagasse production in the facility. The bagasse production is guided by the sugar cane availability and sugar demand in the market. The sugar manufacturing process is driven by market demand and implementation of a Cogeneration power unit has no direct or indirect impact on raw processing.
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 by product 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 double counting emission reductions>>

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 Monitoring Report has the details of the same and will be provided to the UCR verifier during the verification process.

The UCR project activity had been registered as a CDM project activity under the title: Deoband Bagasse based Co-generation Power Project (CDM Project ID 0578) by the PP.

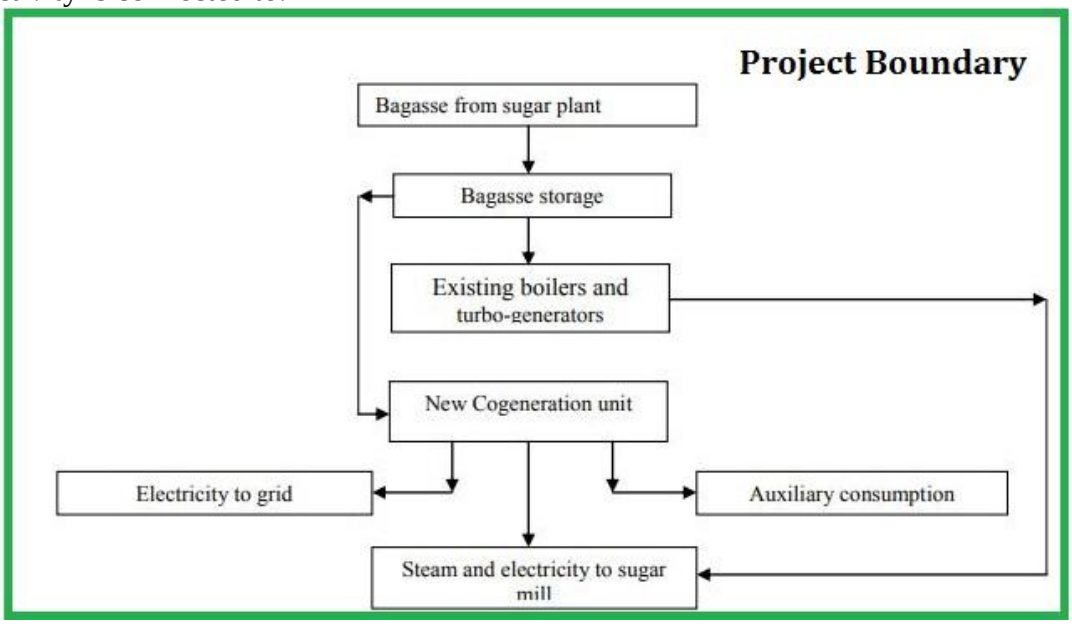
CDM Registration Date	03/11/2006
CDM Crediting Period	01/11/2004-31/10/2014 (Fixed)
CERs Issued (MR Period 1)	190404 CERs (Period 01/11/2004 – 31/03/2007)
CERs Issued (MR Period 2)	82917 CERs (Period 01/04/2007 – 31/03/2008)
CERs Issued (MR Period 3)	87860 CERs (Period 01/04/2008 – 31/05/2010)
CERs Issued (MR Period 4)	34385 CERs (Period 01/06/2010-31/05/2011)
CERs Issued (MR Period 5)	25632 CERs (Period 01/06/2011-29/02/2012)

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. Additionally, the same will be stated in the undertaking provided in the Double Counting Avoidance Assurance Document (DAA) by TEIL. This last CDM (fifth) monitoring report associated with TEIL project activity covered the period from 01/06/2011 to 29/02/2012 (both days included). This UCR monitoring report does not cover any period of time which was part of the previous monitoring report, since 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 $\mathbf{LE_y} = 0$

	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 On-site fossil fuel and electricity consumption due to the project activity (stationary or mobile) Transportation of biomass residue Combustion of biomass residue for electricity and / or heat generation 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.** 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,
$\mathbf{PEFF_{CO2,\,y}} = 0$,
$\mathbf{PE_{EC,\,y}} = 0$ and,
$\mathbf{PE_{Biomass,CH4,y}} = 0$.

B.5. Establishment and description of baseline scenario >>

T

The 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:

$$\mathbf{ERy = BE_y - (PE_y + LE_y)}$$

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

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

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

Where:
$\mathbf{EG_{grid,y}}$ = 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)

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

$\mathbf{PE_y}$ = 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.

$\mathbf{LE_y}$ = 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. 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 transport project 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	Net Power (MWh) supplied to the grid
2013	49125.60
2014	45136.20
2015	45953.76
2016	53242.68
2017	69941.28
2018	67828.68
2019	54273.60
2020	61817.04
2021	56129.11
2022	57617.88

Year	Baseline Emissions y (tCO_2)	Project Emissions, y (tCO_2)	Emission Reductions, y (tCO_2)
2013	44213	4422	39791
2014	40622	4063	36559
2015	41359	4136	37222
2016	47918	4792	43126
2017	62947	6295	56652
2018	61045	6105	54940
2019	48846	4885	43961
2020	55635	5564	50071
2021	50516	5052	45464
2022	51856	5186	46670
Total	**504956**	**50500**	**454456**

B.6. PriorHistory>>

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

There is no change in the start date of the 1st UCR crediting period (01/01/2013-31/12/2022).

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>>

UCR MR Version 1.0

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

B.10.Monitoring plan>>

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.

Measures to ensure the Results / uncertainty analysis

As per the Power Purchase Agreement (PPA), the energy exported to the UPPCL grid is recorded from two independent meters viz., Main Meter and Check Meter and reading of main meter is used for billing. In the event of main meter not in operation / fails, the reading of the check meter is used for billing.

Power Generation, Export & Auxiliary Consumption, fuel consumption are being recorded daily and the same is being verified and approved by Manager (O&M). The calibration of monitoring equipment has been carried out according to the specifications of the equipment (1st calibration in 2 years of installation and thereafter subsequent calibrations at an interval of 1 year).

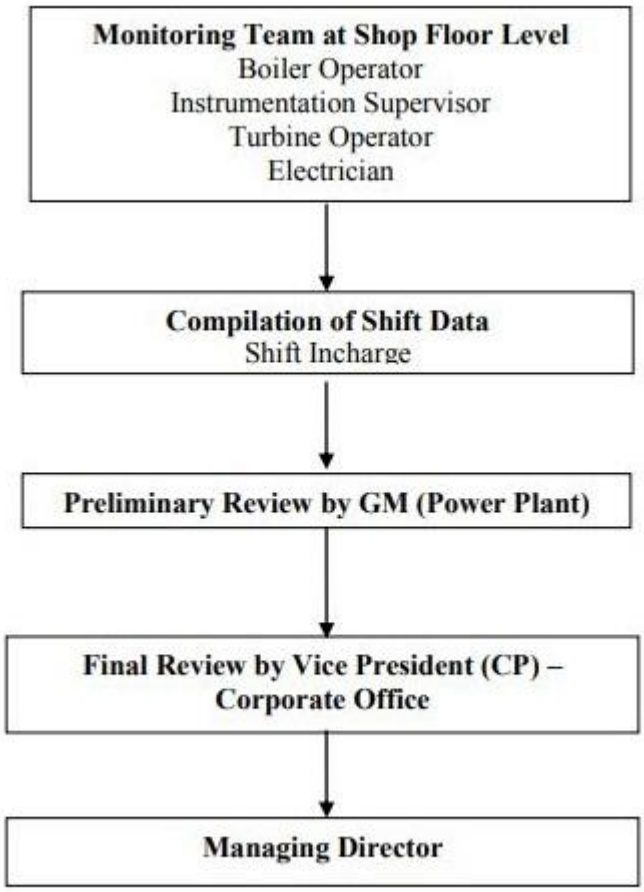
All the meters are tested for accuracy annually by an independent agency, which is accredited with National Accreditation Board for Testing & Calibration Laboratories (NABL), Department of Science & Technology, Government of India. If during the yearly test check, any meter is found to be beyond permissible limits of error, it is calibrated immediately.

Emergency Procedure

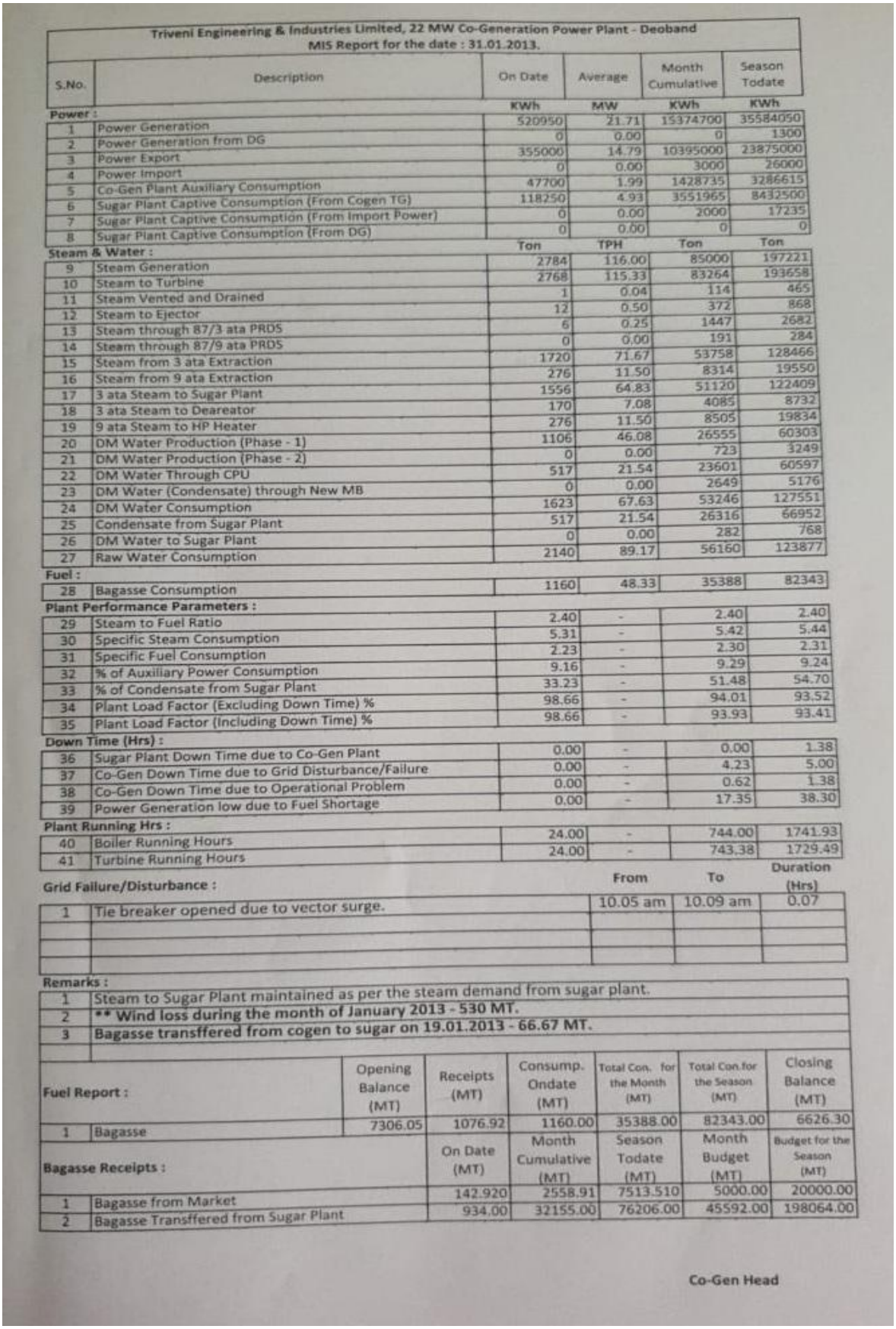
Though, all the measures are taken to avoid erroneous recording of the monitoring parameters, there might be certain situations which may include failure of various metering devices. To minimize the risk of data discrepancy a set of spare for different meters are maintained at the project activity site. Further, regular checking and maintenance of all metering devices is carried out by plant personals at TEIL to maintain highest level of accuracy.

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



The overall project management responsibility remains with the MD. The electricity generation from turbines and auxiliary consumption is recorded continuously on an hourly basis by the operators in the shift. The monthly data reports become a part of the Management Information System (MIS) and are reviewed by the management during the quarterly review meeting.



Triveni Engineering & Industries Limited, 22 MW Co-Generation Power Plant - Deoband
MIS Report for the date : 31.01.2013.

S.No.	Description	On Date	Average	Month Cumulative	Season Todate
Power :		KWh	MW	KWh	KWh
1	Power Generation	520950	21.71	15374700	35584050
2	Power Generation from DG	0	0.00	0	1300
3	Power Export	355000	14.79	10395000	23875000
4	Power Import	0	0.00	3000	26000
5	Co-Gen Plant Auxiliary Consumption	47700	1.99	1428735	3286615
6	Sugar Plant Captive Consumption (From Cogen TG)	118250	4.93	3551965	8432500
7	Sugar Plant Captive Consumption (From Import Power)	0	0.00	2000	17235
8	Sugar Plant Captive Consumption (From DG)	0	0.00	0	0
Steam & Water :		Ton	TPH	Ton	Ton
9	Steam Generation	2784	116.00	85000	197221
10	Steam to Turbine	2768	115.33	83264	193658
11	Steam Vented and Drained	1	0.04	114	465
12	Steam to Ejector	12	0.50	372	868
13	Steam through 87/3 ata PRDS	6	0.25	1447	2682
14	Steam through 87/9 ata PRDS	0	0.00	191	284
15	Steam from 3 ata Extraction	1720	71.67	53758	128466
16	Steam from 9 ata Extraction	276	11.50	8314	19550
17	3 ata Steam to Sugar Plant	1556	64.83	51120	122409
18	3 ata Steam to Deareator	170	7.08	4085	8732
19	9 ata Steam to HP Heater	276	11.50	8505	19834
20	DM Water Production (Phase - 1)	1106	46.08	26555	60303
21	DM Water Production (Phase - 2)	0	0.00	723	3249
22	DM Water Through CPU	517	21.54	23601	60597
23	DM Water (Condensate) through New MB	0	0.00	2649	5176
24	DM Water Consumption	1623	67.63	53246	127551
25	Condensate from Sugar Plant	517	21.54	26316	66952
26	DM Water to Sugar Plant	0	0.00	282	768
27	Raw Water Consumption	2140	89.17	56160	123877
Fuel :					
28	Bagasse Consumption	1160	48.33	35388	82343
Plant Performance Parameters :					
29	Steam to Fuel Ratio	2.40	-	2.40	2.40
30	Specific Steam Consumption	5.31	-	5.42	5.44
31	Specific Fuel Consumption	2.23	-	2.30	2.31
32	% of Auxiliary Power Consumption	9.16	-	9.29	9.24
33	% of Condensate from Sugar Plant	33.23	-	51.48	54.70
34	Plant Load Factor (Excluding Down Time) %	98.66	-	94.01	93.52
35	Plant Load Factor (Including Down Time) %	98.66	-	93.93	93.41
Down Time (Hrs) :					
36	Sugar Plant Down Time due to Co-Gen Plant	0.00	-	0.00	1.38
37	Co-Gen Down Time due to Grid Disturbance/Failure	0.00	-	4.23	5.00
38	Co-Gen Down Time due to Operational Problem	0.00	-	0.62	1.38
39	Power Generation low due to Fuel Shortage	0.00	-	17.35	38.30
Plant Running Hrs :					
40	Boiler Running Hours	24.00	-	744.00	1741.93
41	Turbine Running Hours	24.00	-	743.38	1729.49

Grid Failure/Disturbance :		From	To	Duration (Hrs)
1	Tie breaker opened due to vector surge.	10.05 am	10.09 am	0.07

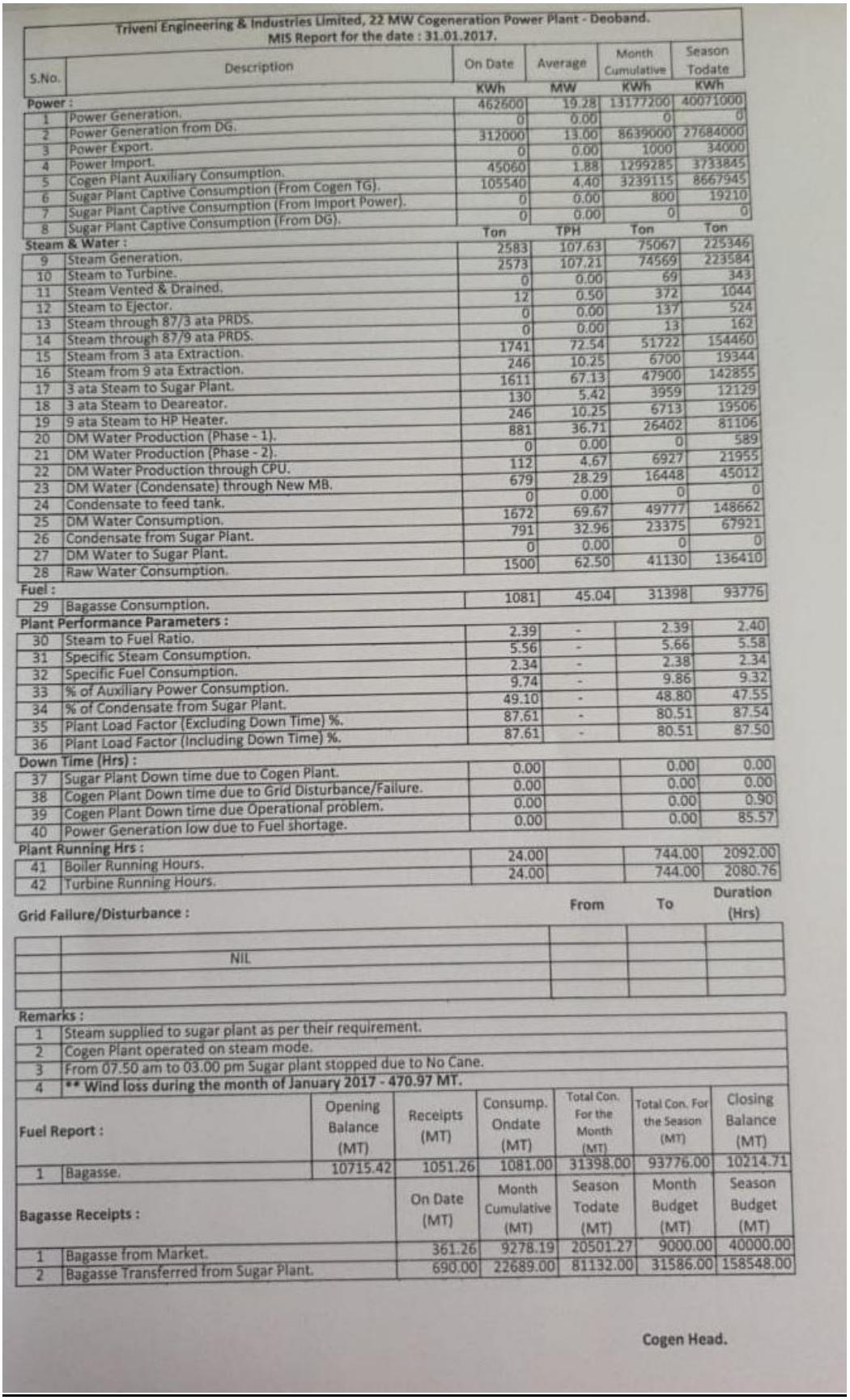
Remarks :

1. Steam to Sugar Plant maintained as per the steam demand from sugar plant.
2. ** Wind loss during the month of January 2013 - 530 MT.
3. Bagasse transffered from cogen to sugar on 19.01.2013 - 66.67 MT.

Fuel Report :		Opening Balance (MT)	Receipts (MT)	Consump. Ondate (MT)	Total Con. for the Month (MT)	Total Con.for the Season (MT)	Closing Balance (MT)
1	Bagasse	7306.05	1076.92	1160.00	35388.00	82343.00	6626.30
Bagasse Receipts :			On Date (MT)	Month Cumulative (MT)	Season Todate (MT)	Month Budget (MT)	Budget for the Season (MT)
1	Bagasse from Market		142.920	2558.91	7513.510	5000.00	20000.00
2	Bagasse Transffered from Sugar Plant		934.00	32155.00	76206.00	45592.00	198064.00

Co-Gen Head

Sample MIS reports on file



Triveni Engineering & Industries Limited, 22 MW Cogeneration Power Plant - Deoband.
MIS Report for the date : 31.01.2017.

S.No.	Description	On Date	Average	Month Cumulative	Season Todate
	Power :	KWh	MW	KWh	KWh
1	Power Generation.	462600	19.28	13177200	40071000
2	Power Generation from DG.	0	0.00	0	0
3	Power Export.	312000	13.00	8639000	27684000
4	Power Import.	0	0.00	1000	34000
5	Cogen Plant Auxiliary Consumption.	45060	1.88	1299285	3733845
6	Sugar Plant Captive Consumption (From Cogen TG).	105540	4.40	3239115	8667945
7	Sugar Plant Captive Consumption (From Import Power).	0	0.00	800	19210
8	Sugar Plant Captive Consumption (From DG).	0	0.00	0	0
	Steam & Water :	Ton	TPH	Ton	Ton
9	Steam Generation.	2583	107.63	75067	225346
10	Steam to Turbine.	2573	107.21	74569	223584
11	Steam Vented & Drained.	0	0.00	69	343
12	Steam to Ejector.	12	0.50	372	1044
13	Steam through 87/3 ata PRDS.	0	0.00	137	524
14	Steam through 87/9 ata PRDS.	0	0.00	13	162
15	Steam from 3 ata Extraction.	1741	72.54	51722	154460
16	Steam from 9 ata Extraction.	246	10.25	6700	19344
17	3 ata Steam to Sugar Plant.	1611	67.13	47900	142855
18	3 ata Steam to Deareator.	130	5.42	3959	12129
19	9 ata Steam to HP Heater.	246	10.25	6713	19506
20	DM Water Production (Phase - 1).	881	36.71	26402	81106
21	DM Water Production (Phase - 2).	0	0.00	0	589
22	DM Water Production through CPU.	112	4.67	6927	21955
23	DM Water (Condensate) through New MB.	679	28.29	16448	45012
24	Condensate to feed tank.	0	0.00	0	0
25	DM Water Consumption.	1672	69.67	49777	148662
26	Condensate from Sugar Plant.	791	32.96	23375	67921
27	DM Water to Sugar Plant.	0	0.00	0	0
28	Raw Water Consumption.	1500	62.50	41130	136410
	Fuel :				
29	Bagasse Consumption.	1081	45.04	31398	93776
	Plant Performance Parameters :				
30	Steam to Fuel Ratio.	2.39	-	2.39	2.40
31	Specific Steam Consumption.	5.56	-	5.66	5.58
32	Specific Fuel Consumption.	2.34	-	2.38	2.34
33	% of Auxiliary Power Consumption.	9.74	-	9.86	9.32
34	% of Condensate from Sugar Plant.	49.10	-	48.80	47.55
35	Plant Load Factor (Excluding Down Time) %.	87.61	-	80.51	87.54
36	Plant Load Factor (Including Down Time) %.	87.61	-	80.51	87.50
	Down Time (Hrs) :				
37	Sugar Plant Down time due to Cogen Plant.	0.00		0.00	0.00
38	Cogen Plant Down time due to Grid Disturbance/Failure.	0.00		0.00	0.00
39	Cogen Plant Down time due Operational problem.	0.00		0.00	0.90
40	Power Generation low due to Fuel shortage.	0.00		0.00	85.57
	Plant Running Hrs :				
41	Boiler Running Hours.	24.00		744.00	2092.00
42	Turbine Running Hours.	24.00		744.00	2080.76

Grid Failure/Disturbance :		From	To	Duration (Hrs)
	NIL			

Remarks :

1	Steam supplied to sugar plant as per their requirement.
2	Cogen Plant operated on steam mode.
3	From 07.50 am to 03.00 pm Sugar plant stopped due to No Cane.
4	**** Wind loss during the month of January 2017 - 470.97 MT.**

Fuel Report :		Opening Balance (MT)	Receipts (MT)	Consump. Ondate (MT)	Total Con. For the Month (MT)	Total Con. For the Season (MT)	Closing Balance (MT)
1	Bagasse.	10715.42	1051.26	1081.00	31398.00	93776.00	10214.71

Bagasse Receipts :		On Date (MT)	Month Cumulative (MT)	Season Todate (MT)	Month Budget (MT)	Season Budget (MT)
1	Bagasse from Market.	361.26	9278.19	20501.27	9000.00	40000.00
2	Bagasse Transferred from Sugar Plant.	690.00	22689.00	81132.00	31586.00	158548.00

Cogen Head.

Sample MIS reports on file

These monthly reports are made available to the UCR verification team for 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 average values of the temperature of steam were 488-511 ^{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 3350-3422 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 **665-703 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. 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. Energy meters have been calibrated as per standard procedures by third party agencies which are also according to the monitoring plan. The latest calibration certificates provided during the UCR verification process is as below:

The thermal efficiency of the boiler (69% to 71%) is found comparable to the rated efficiency as per the manufacturer (71.2%).

2013	**Power Export in Mwh**	**2014**	**Power Export in Mwh**
Jan	10428.36	Jan	10832.76
Feb	7197.6	Feb	9280.56
Mar	8647.68	Mar	9374.4
Apr	10131.24	Apr	4349.16
May	500.88	May	0
June	0	June	0
July	3894.72	July	0
Aug	0	Aug	0
Sept	0	Sept	0
Oct	0	Oct	0
Nov	0	Nov	779.4
Dec	8325.12	Dec	10519.92
Total	**49125.6**	**Total**	**45136.2**
2015	**Power Export in Mwh**	**2016**	**Power Export in Mwh**
Jan	9614.76	Jan	9649.68
Feb	9712.56	Feb	9638.52
Mar	10357.32	Mar	11226.84
Apr	7270.08	Apr	3697.44
May	0	May	0
June	0	June	0

July	0	July	0
Aug	0	Aug	0
Sept	0	Sept	0
Oct	0	Oct	0
Nov	39.6	Nov	7840.68
Dec	8959.44	Dec	11189.52
Total	**45953.76**	**Total**	**53242.68**
2017	**Power Export in Mwh**	**2018**	**Power Export in Mwh**
Jan	8598.72	Jan	11049.36
Feb	8753.64	Feb	9681.24
Mar	10027.68	Mar	10401
Apr	11519.28	Apr	9794.64
May	6722.04	May	10393.56
June	3583.8	June	0
July	0	July	0
Aug	0	Aug	0
Sept	0	Sept	0
Oct	671.4	Oct	14.52
Nov	10098.48	Nov	6579
Dec	9966.24	Dec	9915.36
Total	**69941.28**	**Total**	**67828.68**
2019	**Power Export in Mwh**	**2020**	**Power Export in Mwh**
Jan	8550.96	Jan	9051.48
Feb	7574.76	Feb	8791.56
Mar	8537.76	Mar	8951.52
Apr	8798.04	Apr	8739.12
May	4674	May	7863.72
June	0	June	3010.08
July	0	July	0
Aug	0	Aug	0
Sept	0	Sept	0
Oct	0	Oct	22.8
Nov	6635.04	Nov	7106.52
Dec	9503.04	Dec	8280.24
Total	**54273.6**	**Total**	**61817.04**
2021	**Power Export in Mwh**	**2022**	**Power Export in Mwh**
Jan	8296.8	Jan	8212.68
Feb	8013.6	Feb	7418.52

Mar	8678.04	Mar	8883.72
Apr	7810.08	Apr	8187.6
May	6769.2	May	7820.64
June	0	June	1458.96
July	0	July	0
Aug	0	Aug	0
Sept	629.949	Sept	0
Oct	139.56	Oct	0
Nov	5933.64	Nov	7541.04
Dec	9858.24	Dec	8094.72
Total	**56129.11**	**Total**	**57617.88**

ata/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 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
Uncertainty level of data	Low

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 Value(s) applied	Plant records and log books receipts. 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. Data type: Measured Responsibility: Boiler Operator
Monitoring frequency	Daily
Uncertainty level of data	Low

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. Quantity of biomass type combusted in the project plant is measured on wet basis through conveyor belt which are calibrated on annual basis. The quantity of biomass combusted can be cross checked by performing an energy balance.

Conveyor No. BC-2

Belt Scale		**Load Cell**	
Model no.	Serial no	Model no.	Serial no
BCW55LO	091/05	BR071H0	160505, 160606, 160705, 160805 160505, 160606, 160705, 160805

Conveyor No. BC-4

Belt Scale		**Load Cell**	
Model no.	Serial no	Model no.	Serial no
BCW55LO	202/06	BR071H0	064206, 064306, 064506, 238007

Conveyor No. BC-7

Belt Scale		**Load Cell**	
Model no.	Serial no	Model no.	Serial no
BCW55LO	092/05	BR071H0	157405, 157505, 182205, 055204

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. For auxiliary consumption at the project site, the total was calculated by adding the auxiliary consumption of all power generating units. For each individual power generating unit auxiliary consumption has been monitored by energy meters. Energy meters were calibrated annually as per standard procedures internally.
Uncertainty level of data	Low

Data/Parameter	**$EF_{grid,y}$**
Data unit	Grid Emission Factor
Description	tCO_2/MW_h
Source of data Value(s) applied	UCR CoU Standard Default for Indian grid 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
Uncertainty level of data	Low

Data/Parameter	**EG $_{grid,y}$**
Data unit	MWh
Description	Net quantity of electricity supplied to the grid
Source of data Value(s) applied	JMR and/or Monthly Meter Readings
Measurement methods and procedures	Type: Calculated Data type: Monitored 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. Please note that even though meters with accuracy class of 0.5s are typically required to be installed, however, the PP has installed meters with accuracy class of 0.2s, when the meters were required to be changed, which are more accurate than envisaged accuracy class of 0.5s.
Purpose of data	To estimate baseline emissions
Uncertainty level of data	Low

Latest Energy Meter Calibration Certificate

MICRO CALIBRATION LAB

F.C.A. 2980, GALI NO. 2, S.G.M. NAGAR, N.I.T. FARIDABAD - 121 001 (HARYANA)
Mobile : 9212566694, E-mail : microcallab@gmail.com

CC-2981

Calibration Certificate

8. Description of reference standards used :-

Reference standard	Calibration valid up to	Traceability	Parameters
3 Phase Multifunction Standard Meter ID No. : MCL/ET/12 Sr.No. : 202101006 Model : SY-3102C	5-May-2023	YMPL, Udaipur	Active Energy, Reactive Energy

9. Calibration Procedure: WI(ETS)/11

Warm up Time:- Approx. Half an Hour.

For Calibration of UUC, Voltage and Current were applied from Electronic Source and fed to UUC and Standard for measurement of Active/ Reactive Energy. The metrological pulse output was used for Calibration of Active/ Reactive Energy measurement. The Errors were reported directly calculated and displayed by Standard. At least 3 measurements were made for each Calibration point and an average of these were reported in Certificate.

10. Electro Technical Calibration:
Results as given below.

(i). 3P4W balance mode Import Active Energy Measurement :-

UUC Range	Applied Voltage	Applied Current (A)	Cos φ	Error (%)	± Allowed Limits (%)	± Expanded Uncertainty (%)	Coverage Factor (k)
63.5Vp-n 1-1.2A 50 Hz	63.5Vp-n	1.2	UPF	-0.0067	0.20	0.028	2.00
			0.5 Ind	0.0778	0.30	0.048	2.00
			0.8 Cap	-0.0645	0.30	0.028	2.00
		1	UPF	-0.0118	0.20	0.027	2.00
			0.5 Ind	0.0377	0.30	0.044	2.00
			0.8 Cap	-0.0295	0.30	0.028	2.00
		0.5	UPF	-0.0104	0.20	0.027	2.00
			0.5 Ind	0.0922	0.30	0.044	2.00
			0.8 Cap	-0.0442	0.30	0.028	2.00
		0.1	UPF	-0.0147	0.20	0.027	2.00
			0.5 Ind	-0.0442	0.30	0.044	2.00
			0.8 Cap	-0.0327	0.30	0.028	2.00
		0.05	UPF	-0.0679	0.20	0.027	2.00
		0.02	0.5 Ind	-0.0371	0.50	0.061	2.00
			0.8 Cap	-0.0565	0.50	0.026	2.00
		0.01	UPF	-0.0452	0.40	0.027	2.00
		0.20	0.1 Ind	0.1908	-	0.845	2.00
			0.1 Cap	-0.1068	-	0.845	2.00
			0.3 Ind	0.0231	-	0.138	2.00
			0.3 Cap	-0.0442	-	0.138	2.00
		0.04	0.1 Ind	-0.1313	-	0.845	2.00
			0.1 Cap	0.0775	-	0.845	2.00
			0.3 Ind	-0.0855	-	0.138	2.00
			0.3 Cap	-0.0985	-	0.138	2.00

Calibrated by
Calibration Engineer
Manveer Kasana

MICRO CALIBRATION LAB FARIDABAD

Approved by
Technical Manager
Shashi Kumar

MICRO CALIBRATION LAB

F.C.A. 2980, GALI NO. 2, S.G.M. NAGAR, N.I.T. FARIDABAD - 121 001 (HARYANA)
Mobile : 9212566694, E-mail : microcallab@gmail.com

CC-2061

Calibration Certificate

Certificate/ULR No.: ULR-CC266122000001286F

1.	Customer Name and Address	:-	M/s. Triveni Engineering & Industries Ltd., Co-Gen. Power Plant, Sugar Unit- Deoband, Village Noorpur, Deoband, Saharanpur-247554
2.	Reference		
	Service request no. & Date	:-	2022/162 & 7-Sep-2022
	Date of receipt of UUC	:-	7-Sep-2022
	Condition of UUC on receipt	:-	Satisfactory
3.	Location of Calibration	:-	132kV Sub-Station Deoband, Saharanpur
4.	Calibration Details		
	Date of issue	:-	12-Sep-2022
	Date of Calibration	:-	7-Sep-2022
	Due Date of Calibration	:-	6-Sep-2023
5.	Description of Unit Under Calibration		
	Name	:-	Three Phase Energy Meter
	Make	:-	Secure Meters Limited
	Serial Number	:-	APM04101
	Rack No.	:-	APS00848
	Model	:-	APEX
	Type	:-	R3M021-234, 3Ph, 4W,re
	Voltage (p-n)	:-	3x63.5 V
	Current	:-	Ib 1A Imax 1.2A
	Voltage Ratio	:-	-/110V/V3
	Current Ratio	:-	-/1A
	Class	:-	0.2S For Active and Reactive
	Meter constant	:-	160 Pulses/Unit
	Unit	:-	Wh, VArh
	Frequency	:-	50 Hz
6.	Environmental conditions		
	Temperature	:-	30.5-31.5°C
	Relative Humidity	:-	60-65%
	Weather	:-	Clear
7.	Witnessed by		
i)	Er. Vipin Gupta (EE) T&C, Muzaffarnagar		
ii)	Er. Aditya Gautam (AE) T&C, UPPTCL		
iii)	Er. Mohit (JE) T&C, UPPTCL		
iv)	Er. Dharmender Singh (EE) Transmission, Div.II, UPPTCL		
v)	Er. Rakesh Mourya (AE) Transmission, Div.II, UPPTCL		
vi)	Er. Sudhakar Ji (EE) Distribution, UPPCL		
vii)	Mr. Mukesh Kumar (Manager Elect.) M/s. Triveni Engineering & Industries Ltd., Deoband		
viii)	Mr. Pradeep Kumar (JE Elect.) M/s. Triveni Engineering & Industries Ltd., Deoband		

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Calibration Certificate

(iii) 3P4W balance mode Export Active Energy Measurement :-

UUC Range	Applied Voltage	Applied Current (A)	Cos φ	Error (%)	± Allowed Limits (%)	± Expanded Uncertainty (%)	Coverage Factor (k)
63.5Vp-n 1-1.2A 50 Hz	63.5Vp-n	1.2	UPF	-0.0274	0.20	0.028	2.00
			0.5 Ind	0.1052	0.30	0.044	2.00
			0.8 Cap	-0.0366	0.30	0.028	2.00
		1	UPF	-0.0417	0.20	0.027	2.00
			0.5 Ind	-0.0174	0.30	0.044	2.00
			0.8 Cap	-0.0237	0.30	0.028	2.00
		0.5	UPF	-0.0265	0.20	0.028	2.00
			0.5 Ind	0.0881	0.30	0.044	2.00
			0.8 Cap	-0.0615	0.30	0.028	2.00
		0.1	UPF	-0.0536	0.20	0.028	2.00
			0.5 Ind	0.0829	0.30	0.044	2.00
			0.8 Cap	-0.1033	0.30	0.028	2.00
		0.05	UPF	-0.0702	0.20	0.027	2.00
		0.02	0.5 Ind	-0.0394	0.50	0.051	2.00
			0.8 Cap	-0.1779	0.50	0.028	2.00
		0.01	UPF	-0.1170	0.40	0.027	2.00
		0.20	0.1 Ind	0.6435	-	0.845	2.00
			0.1 Cap	-0.6408	-	0.845	2.00
			0.3 Ind	0.1991	-	0.138	2.00
			0.3 Cap	-0.2033	-	0.140	2.00
		0.04	0.1 Ind	0.4575	-	0.845	2.00
			0.1 Cap	-0.5419	-	0.845	2.00
			0.3 Ind	0.1096	-	0.138	2.00
			0.3 Cap	-0.2433	-	0.138	2.00

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Calibration Certificate

(iii) 3P4W balance mode Import Reactive Energy Measurement :-

UUC Range	Applied Voltage	Applied Current (A)	Sin φ	Error (%)	± Allowed Limits (%)	± Expanded Uncertainty (%)	Coverage Factor (k)
63.5Vp-n 1-1.2A 50 Hz	63.5Vp-n	1.2	1	-0.0057	0.20	0.028	2.00
			0.5 Ind	-0.1205	0.30	0.044	2.00
			0.8 Cap	0.0548	0.30	0.028	2.00
		1	1	-0.0055	0.20	0.028	2.00
			0.5 Ind	-0.0353	0.30	0.044	2.00
			0.8 Cap	0.0135	0.30	0.028	2.00
		0.5	1	-0.0055	0.20	0.027	2.00
			0.5 Ind	-0.0340	0.30	0.044	2.00
			0.8 Cap	0.0251	0.30	0.028	2.00
		0.1	1	-0.1050	0.20	0.028	2.00
			0.5 Ind	-0.0985	0.30	0.044	2.00
			0.8 Cap	-0.0067	0.30	0.028	2.00
		0.05	1	-0.0905	0.20	0.027	2.00
		0.02	0.5 Ind	-0.0879	0.50	0.051	2.00
			0.8 Cap	0.0768	0.50	0.026	2.00
		0.01	1	-0.0834	0.40	0.027	2.00
		0.20	0.1 Ind	-0.3277	-	0.845	2.00
			0.1 Cap	0.5313	-	0.848	2.00
			0.3 Ind	-0.0996	-	0.138	2.00
			0.3 Cap	0.1901	-	0.138	2.00
		0.04	0.1 Ind	-0.1052	-	0.845	2.00
			0.1 Cap	0.9523	-	0.849	2.00
			0.3 Ind	-0.1652	-	0.153	2.00
			0.3 Cap	0.1952	-	0.144	2.00

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Calibration Certificate

8. Description of reference standards used :-

Reference standard	Calibration valid up to	Traceability	Parameters
3 Phase Multifunction Standard Meter ID No. : MCL/ET/12 Sr.No. : 202101006 Model : SY-3102C	5-May-2023	YMPL, Udaipur	Active Energy, Reactive Energy

9. Calibration Procedure: WI(ETS)/11

Warm up Time:- Approx. Half an Hour.

For Calibration of UUC, Voltage and Current were applied from Electronic Source and fed to UUC and Standard for measurement of Active/ Reactive Energy. The metrological pulse output was used for Calibration of Active/ Reactive Energy measurement. The Errors were reported directly calculated and displayed by Standard. At least 3 measurements were made for each Calibration point and an average of these were reported in Certificate.

10. Electro Technical Calibration:

Results as given below.

(i). 3P4W balance mode Import Active Energy Measurement :-

UUC Range	Applied Voltage	Applied Current (A)	Cos φ	Error (%)	± Allowed Limits (%)	± Expanded Uncertainty (%)	Coverage Factor (k)
63.5Vp-n 1-1.2A 50 Hz	63.5Vp-n	1.2	UPF	0.0075	0.20	0.027	2.00
			0.5 Ind	0.1332	0.30	0.044	2.00
			0.8 Cap	-0.0272	0.30	0.028	2.00
		1	UPF	0.0070	0.20	0.027	2.00
			0.5 Ind	0.1018	0.30	0.044	2.00
			0.8 Cap	-0.0187	0.30	0.028	2.00
		0.5	UPF	0.0102	0.20	0.027	2.00
			0.5 Ind	0.1231	0.30	0.044	2.00
			0.8 Cap	-0.0353	0.30	0.028	2.00
		0.1	UPF	-0.0187	0.20	0.027	2.00
			0.5 Ind	0.0675	0.30	0.044	2.00
			0.8 Cap	-0.0787	0.30	0.028	2.00
		0.05	UPF	-0.0226	0.20	0.027	2.00
		0.02	0.5 Ind	0.0699	0.50	0.051	2.00
			0.8 Cap	-0.0279	0.50	0.028	2.00
		0.01	UPF	-0.0505	0.40	0.027	2.00
		0.20	0.1 Ind	0.4187	-	0.845	2.00
			0.1 Cap	-0.2662	-	0.845	2.00
			0.3 Ind	0.0999	-	0.138	2.00
			0.3 Cap	-0.0624	-	0.138	2.00
		0.04	0.1 Ind	0.6214	-	0.845	2.00
			0.1 Cap	-0.5728	-	0.874	2.00
			0.3 Ind	0.0624	-	0.138	2.00
			0.3 Cap	-0.3203	-	0.138	2.00

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Mobile : 9212566694, E-mail : microcallab@gmail.com

CC-2661

Calibration Certificate

Certificate/ULR No.: ULR-CC266122000001285F

1.	**Customer Name and Address**	:-	M/s. Triveni Engineering & Industries Ltd., Co-Gen. Power Plant, Sugar Unit- Deoband, Village Noorpur, Deoband, Saharanpur-247554
2.	**Reference**		
	Service request no. & Date	:-	2022/182 & 7-Sep-2022
	Date of receipt of UUC	:-	7-Sep-2022
	Condition of UUC on receipt	:-	Satisfactory
3.	**Location of Calibration**	:-	132kV Sub-Station Deoband, Saharanpur
4.	**Calibration Details**		
	Date of issue	:-	12-Sep-2022
	Date of Calibration	:-	7-Sep-2022
	Due Date of Calibration	:-	6-Sep-2023
5.	**Description of Unit Under Calibration**		
	Name	:-	Three Phase Energy Meter
	Make	:-	Secure Meters Limited
	Serial Number	:-	APM04100
	Rack No.	:-	APS00847
	Model	:-	APEX
	Type	:-	R3M021-234, 3Ph, 4Wire
	Voltage (p-n)	:-	3x63.5 V
	Current	:-	Ib: 1A Imax: 1.2A
	Voltage Ratio	:-	-/110V/V3
	Current Ratio	:-	-/1A
	Class	:-	0.2S For Active and Reactive
	Meter constant	:-	160 Pulses/Unit
	Unit	:-	Wh, VArh
	Frequency	:-	50 Hz
6.	**Environmental conditions**		
	Temperature	:-	30.5-31.5°C
	Relative Humidity	:-	60-65%
	Weather	:-	Clear
7.	**Witnessed by**		
i)	Er. Vipin Gupta (EE) T&C, Muzaffarnagar		
ii)	Er. Aditya Gautam (AE) T&C, UPPTCL		
iii)	Er. Mohit (JE) T&C, UPPTCL		
iv)	Er. Dharmender Singh (EE) Transmission, Div.II, UPPTCL		
v)	Er. Rakesh Mourya (AE) Transmission, Div.II, UPPTCL		
vi)	Er. Sudhakar Ji (EE) Distribution, UPPCL		
vii)	Mr. Mukesh Kumar (Manager Elect.) M/s. Triveni Engineering & Industries Ltd., Deoband		
viii)	Mr. Pradeep Kumar (JE Elect.) M/s. Triveni Engineering & Industries Ltd., Deoband		

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