PROJECT CONCEPT NOTE (PCN)

CARBON OFFSET UNIT (CoU) PROJECT

Title: 28 MW Biomass Based Grid Supply Power Project by Shree Chhatrapati Shahu SSK Ltd.

Date of PCN Version 02: 09/07/2024

First 1st Issuance period: 01/01/2016 to 31/12/2023 (8 years, 00 Months)

1st Crediting period: 01/01/2016 to 31/12/2023 (8 years, 00 Months)

7 AFFORDABLE AND CLEAN ENERGY
8 DECENT WORK AND ECONOMIC GROWTH
9 INDUSTRY, INNOVATION AND INFRASTRUCTURE
13 CLIMATE ACTION

[1] *Crediting period is considered referring to UCR August 2022, Version 6.0, Page no. 6*

Project Concept Note (PCN)
CARBON OFFSET UNIT (CoU) PROJECT

BASIC INFORMATION	
Title of the project activity	28 MW Biomass Based Grid Supply Power Project by Shree Chhatrapati Shahu SSK Ltd.
Scale of the project activity	Large scale
Completion date of PCN	27/06/2024
Project participants	**Project Proponent**: M/s. Shree Chhatrapati Shahu Sahakari Sakhar Karkhana Ltd., Kagal, Maharashtra, India. **UCR Aggregator**: Progressive Management Consultants. **UCR ID**: 110736904
Host party	India
Applied methodologies and standardized baselines	**CDM UNFCCC Methodology** **ACM0006**: Electricity and heat generation from biomass --- Version 16.0 UCR Standard for Baseline Grid Emission Factor
Type	Renewable Energy Projects (Large Scale)
SDG Impacts:	SDG 7: Affordable and Clean energy SDG 8: Decent work and economic growth SDG 9: Industries, Infrastructure and Innovation SDG13: Climate Action
Sectoral scopes	01 Energy industries (Renewable/Non-Renewable sources)
Estimated total amount of average GHG emission reductions per year	**29,108** CoUs (**29,108** tCO_{2eq})
Estimated total amount of average GHG emission reduction for the entire monitoring period (2016-2023)	**29,108** CoUs (**29,108** tCO_{2eq})

SECTION A. Description of project activity

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

The Project titled "28 MW Biomass Based Grid Supply Power Project by Shree Chhatrapati Shahu SSK Ltd., is situated in Taluka Kagal, District Kolhapur, Maharashtra, India, commissioned by Maharashtra State Electricity Distribution Co Ltd. (MSEDCL).

The details of the project activity is as follows:

The Purpose of the project activity is to generate electricity using renewable biomass (Bagasse) and thereby reduce GHG emissions by displacing the fossil fuel dominated grid-based electricity with biomass based renewable electricity. The electricity produced by the project is directly contributing to climate change mitigation by reducing the anthropogenic emissions of greenhouse gases (GHGs) into the atmosphere by displacing an equivalent amount of fossil power at grid. The project activity is a 28 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 Maharashtra India; and, fostering sustainable economic growth through promoting energy self-sufficiency and resource conservation in India's sugarcane industry.

In September 2015 the PP expanded the Sugar Factory from 4950 TCD to 7000 TCD, Co-generation from 12.5 MW to 28 MW & Molasses based Distillery unit from 45 KLPD up to 60 KLPD. In July 2022 the PP was granted consent for expansion of the Sugar Factory from 7000 TCD to 10000 TCD by the Maharashtra Pollution Control Board and in Dec 2022 the PP was also granted consent for expansion for Distillery unit from 60 KLPD to 340 KLPD and installation of dryer.

The project activity employs 28 MW aggregated generators along with two boilers of 60 TPH and 70 TPH with high pressure and temperature configuration.

Boiler	**70 TPH**	**60 TPH**
Commissioning date	15/03/2008	25/11/2012
Turbine	**12.5 MW**	**9 MW**
Commissioning date	15/03/2008	25/11/2012

The first commercial supply of power to the grid by this UCR project activity was established in **January 2013 however the crediting period is from 01/01/2016 to 31/12/2023**

Purpose of the Project Activity:

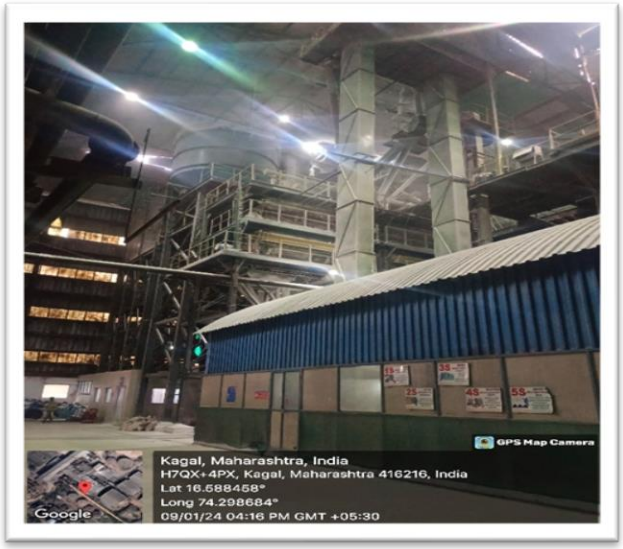
The Project activity focuses on utilizing biomass (Bagasse) to generate electricity for both captive use and surplus sale to the state grid, thereby reducing emissions by substituting fossil fuel-dependent electricity generation with renewable energy sources.

In the absence of biomass (Bagasse), coal is utilized for electricity generation. The use of fossil fuel is restricted to 15% of the total fuel consumption, (adhering to the regulations of the Ministry of New and Renewable Energy) except for the month of March 2017, because of which data for that month has not been considered. According to the ACM0006 CDM methodology booklet of the UNFCCC, the amount of fossil fuel co-fired does not exceed 20% of the total fuel fired on an energy basis. Therefore, the project qualifies for UCR CoUs.

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 Maharashtra State Electricity Distribution Co. Ltd., grid (MSEDCL). **UCR carbon credits are being claimed on the emission reductions due to power exported to the grid only**.

Bagasse, a sugar manufacturing byproduct, is primarily used to power high-pressure boilers for steam generation, which drives turbines to produce electricity. The Project integrates power generation with alcohol distillation. Bagasse-based power generation aligns with existing industry practices, supplying electricity to the grid is voluntary due to the absence of specific mandates in Indian policy.

The project activity also induces environmental and sustainable development benefits. The project activity has introduced efficient high pressure cogeneration technology to the Indian sugar industry; reducing power shortages in the state of Maharashtra India; and fostering sustainable economic growth through promoting energy self-sufficiency and resource conservation in India's sugarcane industry. The policy to grow in a sustainable manner with a commitment towards the environment has been adopted by M/s. Shree Chhatrapati Shahu SSK Ltd.



The project activity uses a portion of the steam-electricity to run its own cane crushing facility and cogeneration plant. The majority of the total electricity produced, is exported to the

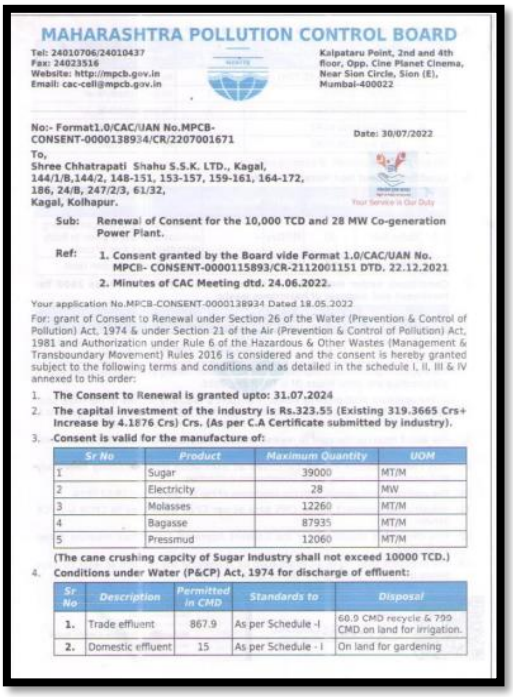
Maharashtra State Electricity Distribution Co. Ltd., grid (MSEDCL), with 9 MW being exported from the plant during the cane crushing season and 3.5 MW during the off-season period. The emission reductions from the project activity come from the avoidance of carbon dioxide emissions from fossil fuel use in Western grid. The project activity supplies approximately 38,058 MWh of renewable power to the grid each year.

A.2 Do no harm or Impact test of the project activity>>

Host party regulations require M/s. Shree Chhatrapati Shahu SSK Ltd. to obtain environmental clearance in the form of "No objection Certificate" from Maharashtra Pollution Control Board. The Site of the project is approved from the environmental angle and that the Environmental Management Plans are prepared and submitted to the pollution control board.

Environmental Impact Assessment has been conducted for the project activity to understand if there are any significant environmental impacts and the study indicates that the impacts are not significant.

Pollution Board Consent



MAHARASHTRA POLLUTION CONTROL BOARD

Tel: 24010706/24010437
Fax: 24023516
Website: http://mpcb.gov.in
Email: cac-cell@mpcb.gov.in

Kalpataru Point, 2nd and 4th floor, Opp. Cine Planet Cinema, Near Sion Circle, Sion (E), Mumbai-400022

No:- Format1.0/CAC/UAN No.MPCB-CONSENT-0000138934/CR/2207001671

Date: 30/07/2022

To,
Shree Chhatrapati Shahu S.S.K. LTD., Kagal, 144/1/B,144/2, 148-151, 153-157, 159-161, 164-172, 186, 24/B, 247/2/3, 61/32, Kagal, Kolhapur.

Sub: Renewal of Consent for the 10,000 TCD and 28 MW Co-generation Power Plant.

Ref: 1. Consent granted by the Board vide Format 1.0/CAC/UAN No. MPCB- CONSENT-0000115893/CR-2112001151 DTD. 22.12.2021
2. Minutes of CAC Meeting dtd. 24.06.2022.

Your application No.MPCB-CONSENT-0000138934 Dated 18.05.2022

For: grant of Consent to Renewal under Section 26 of the Water (Prevention & Control of Pollution) Act, 1974 & under Section 21 of the Air (Prevention & Control of Pollution) Act, 1981 and Authorization under Rule 6 of the Hazardous & Other Wastes (Management & Transboundary Movement) Rules 2016 is considered and the consent is hereby granted subject to the following terms and conditions and as detailed in the schedule I, II, III & IV annexed to this order:

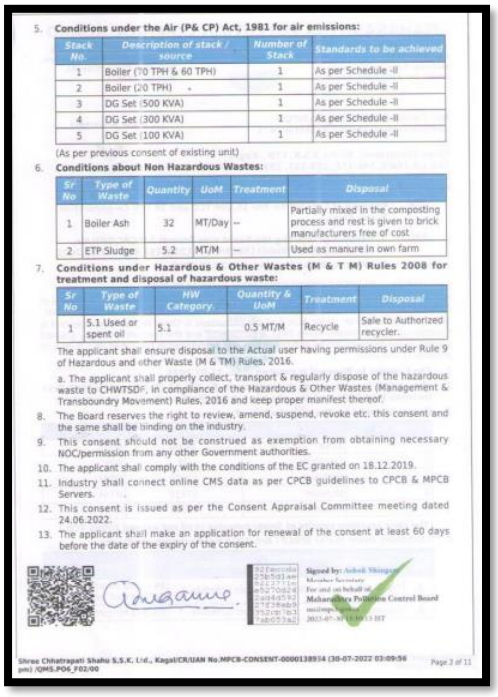
1. **The Consent to Renewal is granted upto: 31.07.2024**
2. **The capital investment of the industry is Rs.323.55 (Existing 319.3665 Crs+ Increase by 4.1876 Crs) Crs. (As per C.A Certificate submitted by industry).**
3. **Consent is valid for the manufacture of:**

Sr No	Product	Maximum Quantity	UOM
1	Sugar	39000	MT/M
2	Electricity	28	MW
3	Molasses	12260	MT/M
4	Bagasse	87935	MT/M
5	Pressmud	12060	MT/M

(The cane crushing capcity of Sugar Industry shall not exceed 10000 TCD.)

4. **Conditions under Water (P&CP) Act, 1974 for discharge of effluent:**

Sr No	Description	Permitted in CMD	Standards to	Disposal
1.	Trade effluent	867.9	As per Schedule -I	60.9 CMD recycle & 799 CMD on land for irrigation.
2.	Domestic effluent	15	As per Schedule - I	On land for gardening



5. **Conditions under the Air (P& CP) Act, 1981 for air emissions:**

Stack No.	Description of stack / source	Number of Stack	Standards to be achieved
1	Boiler (70 TPH & 60 TPH)	1	As per Schedule -II
2	Boiler (20 TPH)	1	As per Schedule -II
3	DG Set (500 KVA)	1	As per Schedule -II
4	DG Set (300 KVA)	1	As per Schedule -II
5	DG Set (100 KVA)	1	As per Schedule -II

(As per previous consent of existing unit)

6. **Conditions about Non Hazardous Wastes:**

Sr No	Type of Waste	Quantity	UoM	Treatment	Disposal
1	Boiler Ash	32	MT/Day	--	Partially mixed in the composting process and rest is given to brick manufacturers free of cost
2	ETP Sludge	5.2	MT/M	--	Used as manure in own farm

7. **Conditions under Hazardous & Other Wastes (M & T M) Rules 2008 for treatment and disposal of hazardous waste:**

Sr No	Type of Waste	HW Category.	Quantity & UoM	Treatment	Disposal
1	5.1 Used or spent oil	5.1	0.5 MT/M	Recycle	Sale to Authorized recycler.

The applicant shall ensure disposal to the Actual user having permissions under Rule 9 of Hazardous and other Waste (M & TM) Rules, 2016.

a. The applicant shall properly collect, transport & regularly dispose of the hazardous waste to CHWTSDF, in compliance of the Hazardous & Other Wastes (Management & Transboundry Movement) Rules, 2016 and keep proper manifest thereof.

8. The Board reserves the right to review, amend, suspend, revoke etc. this consent and the same shall be binding on the industry.
9. This consent should not be construed as exemption from obtaining necessary NOC/permission from any other Government authorities.
10. The applicant shall comply with the conditions of the EC granted on 18.12.2019.
11. Industry shall connect online CMS data as per CPCB guidelines to CPCB & MPCB Servers.
12. This consent is issued as per the Consent Appraisal Committee meeting dated 24.06.2022.
13. The applicant shall make an application for renewal of the consent at least 60 days before the date of the expiry of the consent.

Signed by: Ashok Shingare
Member Secretary
For and on behalf of
Maharashtra Pollution Control Board

Shree Chhatrapati Shahu S.S.K. Ltd., Kagal/CR/UAN No.MPCB-CONSENT-0000138934 (30-07-2022 03:09:56 pm) /QMS.F04_F02/00

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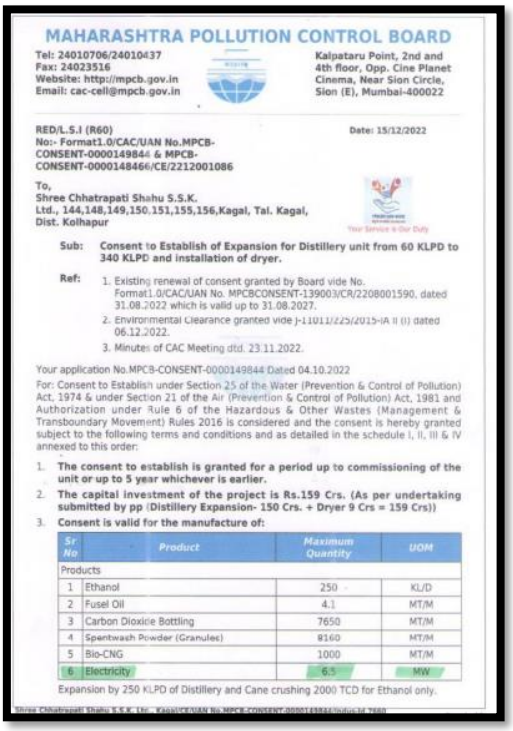

MAHARASHTRA POLLUTION CONTROL BOARD

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Website: http://mpcb.gov.in
Email: cac-cell@mpcb.gov.in

Kalpataru Point, 2nd and 4th floor, Opp. Cine Planet Cinema, Near Sion Circle, Sion (E), Mumbai-400022

RED/L.S.I (R60)
No:- Format1.0/CAC/UAN No.MPCB-CONSENT-0000149844 & MPCB-CONSENT-0000148466/CE/2212001086

Date: 15/12/2022

To,
Shree Chhatrapati Shahu S.S.K. Ltd., 144,148,149,150.151,155,156,Kagal, Tal. Kagal, Dist. Kolhapur

Sub: Consent to Establish of Expansion for Distillery unit from 60 KLPD to 340 KLPD and installation of dryer.

Ref: 1. Existing renewal of consent granted by Board vide No. Format1.0/CAC/UAN No. MPCBCONSENT-139003/CR/2208001590, dated 31.08.2022 which is valid up to 31.08.2027.
2. Environmental Clearance granted vide J-11011/225/2015-IA II (I) dated 06.12.2022.
3. Minutes of CAC Meeting dtd. 23.11.2022.

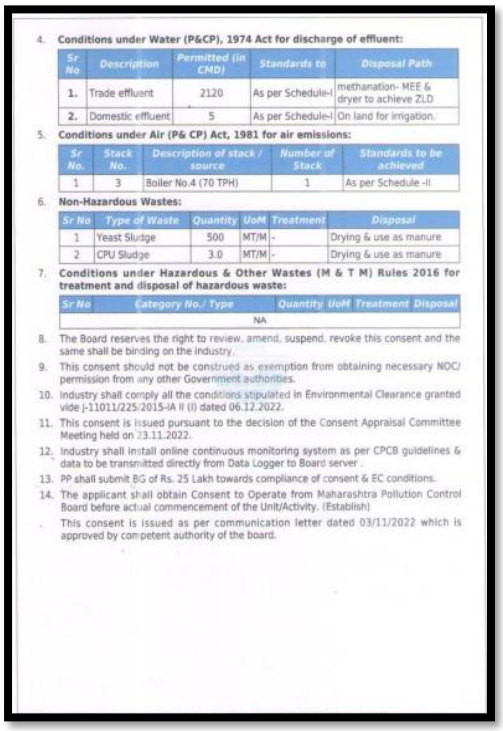
Your application No.MPCB-CONSENT-0000149844 Dated 04.10.2022

For: Consent to Establish under Section 25 of the Water (Prevention & Control of Pollution) Act, 1974 & under Section 21 of the Air (Prevention & Control of Pollution) Act, 1981 and Authorization under Rule 6 of the Hazardous & Other Wastes (Management & Transboundary Movement) Rules 2016 is considered and the consent is hereby granted subject to the following terms and conditions and as detailed in the schedule I, II, III & IV annexed to this order:

1. **The consent to establish is granted for a period up to commissioning of the unit or up to 5 year whichever is earlier.**
2. **The capital investment of the project is Rs.159 Crs. (As per undertaking submitted by pp (Distillery Expansion- 150 Crs. + Dryer 9 Crs = 159 Crs))**
3. **Consent is valid for the manufacture of:**

Sr No	Product	Maximum Quantity	UOM
Products			
1	Ethanol	250	KL/D
2	Fusel Oil	4.1	MT/M
3	Carbon Dioxide Bottling	7650	MT/M
4	Spentwash Powder (Granules)	8160	MT/M
5	Bio-CNG	1000	MT/M
6	Electricity	6.5	MW

Expansion by 250 KLPD of Distillery and Cane crushing 2000 TCD for Ethanol only.



4. **Conditions under Water (P&CP), 1974 Act for discharge of effluent:**

Sr No	Description	Permitted (in CMD)	Standards to	Disposal Path
1.	Trade effluent	2120	As per Schedule-I	methanation- MEE & dryer to achieve ZLD
2.	Domestic effluent	5	As per Schedule-I	On land for irrigation.

5. **Conditions under Air (P& CP) Act, 1981 for air emissions:**

Sr No.	Stack No.	Description of stack / source	Number of Stack	Standards to be achieved
1	3	Boiler No.4 (70 TPH)	1	As per Schedule -II

6. **Non-Hazardous Wastes:**

Sr No	Type of Waste	Quantity	UoM	Treatment	Disposal
1	Yeast Sludge	500	MT/M	-	Drying & use as manure
2	CPU Sludge	3.0	MT/M	-	Drying & use as manure

7. **Conditions under Hazardous & Other Wastes (M & T M) Rules 2016 for treatment and disposal of hazardous waste:**

Sr No	Category No./ Type	Quantity	UoM	Treatment	Disposal
NA					

8. The Board reserves the right to review, amend, suspend, revoke this consent and the same shall be binding on the industry.
9. This consent should not be construed as exemption from obtaining necessary NOC/ permission from any other Government authorities.
10. Industry shall comply all the conditions stipulated in Environmental Clearance granted vide J-11011/225/2015-IA II (I) dated 06.12.2022.
11. This consent is issued pursuant to the decision of the Consent Appraisal Committee Meeting held on 23.11.2022.
12. Industry shall install online continuous monitoring system as per CPCB guidelines & data to be transmitted directly from Data Logger to Board server .
13. PP shall submit BG of Rs. 25 Lakh towards compliance of consent & EC conditions.
14. The applicant shall obtain Consent to Operate from Maharashtra Pollution Control Board before actual commencement of the Unit/Activity. (Establish)

This consent is issued as per communication letter dated 03/11/2022 which is approved by competent authority of the board.

The **Social, Environmental, Economic, And Technological** benefits that contribute to the sustainable development are as follows:

Social benefits:

- The Project activity contributes to employment generation in the local area for both skilled & unskilled people for operation and maintenance of the equipment. M/s. Shree Chhatrapati Shahu SSK Ltd., has focused on continuing to work closely with the thousands of farmers who rely on M/s. Shree Chhatrapati Shahu SSK Ltd., for their sustenance and livelihoods. M/s. Shree Chhatrapati Shahu SSK Ltd., has further stepped-up efforts towards better cane development and farm management, through adoption of techniques such as intercropping, conservation of energy and water resources through drip irrigation, waste-water management, and rain-water harvesting. By generating employment for both skilled and unskilled workers, the project contributes significantly to the local economy while ensuring the efficient operation and maintenance of its equipment.
- It has created steady higher value jobs and skilled workers at the facility. The project activity is contributing to the national energy security by reducing consumption of fossil fuels.
- The technology being used in the project is proven and safe for power generation. An increase in such kind of projects shall enable all the technology suppliers to continuously innovate and modernize on the technology front. The local people will know the technological advancement and will help in capacity building.

Environmental benefits:

- The Project activity is a renewable energy project, which utilizes b i o m a s s as a fuel for grid power generation, a move that is voluntary and not mandated under current environmental laws of India. Since this project activity generates green energy in the form of power, it has positively contributed towards the reduction in (demand) use of finite natural resources like coal and oil, minimizing depletion and in turn increasing its availability to other important purposes. Therefore, this project activity helps to environment sustainability by reducing GHG emission in the atmosphere.
- Avoids global and local environmental pollution, leading to reduction of GHG emissions.
- Enabling regional grid to divert the electricity displaced by the project activity to the nearby needy areas.
- Indirect capacity building by providing a case example to other sugar mills in the region for switching to high-capacity cogeneration configuration, for exporting electricity to grid. In addition to the reduction in carbon dioxide (CO_2) emissions the project implementation will result in reduction of other harmful gases (NOx and SO_x) that arise from the combustion of

coal used in power generation. The project activity also leads to reduce ash generation since the ash content in bagasse is lower than that of Indian coal.

Economic benefits:

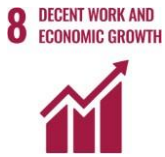
- The Project activity creates employment opportunities during the project stage and operation and maintenance of the boiler and turbines.
- The project activity helps in conservation of fast depleting natural resources like coal and oil thereby contributing to the economic well-being of country as a whole.
- The various other benefits due to the project activity ensure that the project is contributing to the sustainable development of the region by bringing in green technologies and processes to a backward region. The technology is indigenous and by implementing such projects the country is showcasing its GHG mitigation actions in its efforts to combat climate change

United Nations Sustainable Development Goals:

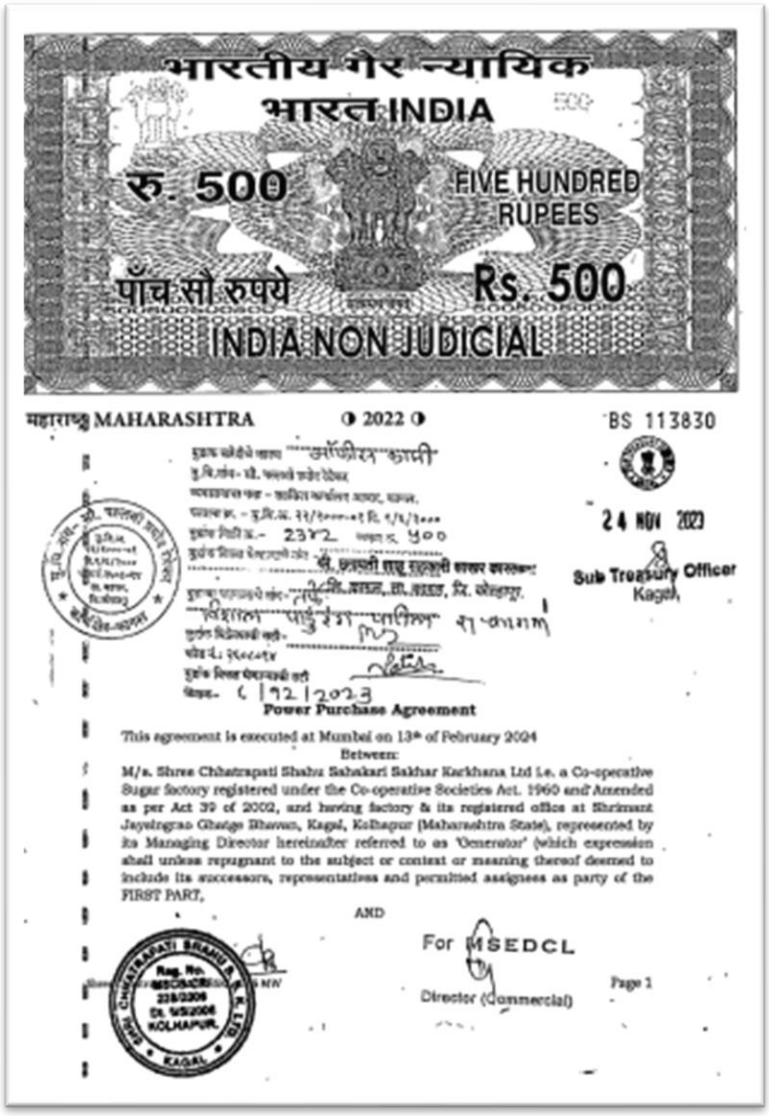
The Project activity generates electrical power using Biomass (Bagasse), thereby displacing non-renewable fossil resources resulting in sustainable, economic and environmental development. In the absence of the project activity an equivalent amount of power generation would have taken place through fossil fuel dominated power generating stations.

Thus, the renewable energy generation from project activity will result in reduction of the greenhouse gas emissions.

Positive contribution of the project to the following **Sustainable Development Goals (SDG) outcomes:**

Development Goals Targeted	SDG Target	Indicator (SDG Indicator)
SDG 7: Affordable and CleanEnergy 	**7.2:** By 2030, increase substantially the share of renewable energy in theglobal energy mix **Target: Renewable Power in 38,058 MWh/yr**	**7.2.1**: Renewable energy share in the total final energy consumption
SDG 8: Decent Work andEconomic Growth 	**8.5** By 2030, achieve full and productive employment and decent work for all women and men, including for young people and persons with disabilities, and equalpay for work of equal value. **Target:** • Training staff annually • Employment of staff	**8.5.1**: Average hourly earnings offemale and male employees, by occupation, age and persons withdisabilities.
SDG 09: Industries, Infrastructure and Innovation 	**9.2:** Promote inclusive and sustainable industrialization and, by 2030, significantly raise industry's share of employment and gross domestic product, in line with national circumstances, and double its share in least developed countries	The project activity provides employment to people 115 villagesin the area. **9.1.1:** It measures the proportion of the rural population who live within 2 km of an all-season road. This indicator helps assess access to infrastructure and connectivity.
SDG 13: Climate Action 	**13.2**: Integrate climate change measures into national policies, strategies and planning **Target: 29,108 quantity of tCO2 reduced /yr**	**13.2.1**: Number of countries that have communicated the establishment or operationalizationof an integrated policy/ strategy

Power Purchase Agreement



भारतीय गैर न्यायिक
भारत INDIA
रु. 500 FIVE HUNDRED RUPEES
पाँच सौ रुपये Rs. 500
INDIA NON JUDICIAL

महाराष्ट्र MAHARASHTRA ◑ 2022 ◑ BS 113830

24 NOV 2023

Sub Treasury Officer
Kagal

Power Purchase Agreement

This agreement is executed at Mumbai on 13th of February 2024

Between:

M/s. Shree Chhatrapati Shahu Sahakari Sakhar Karkhana Ltd i.e. a Co-operative Sugar factory registered under the Co-operative Societies Act, 1960 and Amended as per Act 39 of 2002, and having factory & its registered office at Shrimant Jayasingrao Ghatge Bhavan, Kagal, Kolhapur (Maharashtra State), represented by its Managing Director hereinafter referred to as 'Generator' (which expression shall unless repugnant to the subject or context or meaning thereof deemed to include its successors, representatives and permitted assignees as party of the FIRST PART,

AND

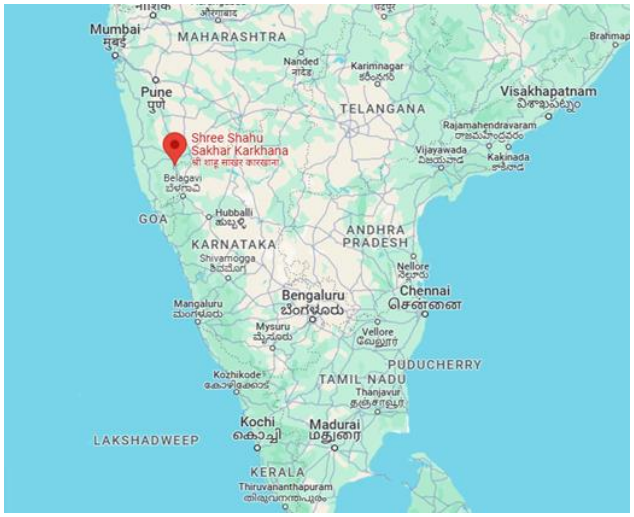
For MSEDCL

Director (Commercial)

Page 1

A.3. Location of project activity >>

Country : India
District : Kolhapur
Tehsil : Kagal
State : Maharashtra
Longitude : 74°17'53.2"E
Latitude : 16°35'23.2"N



A.4. Technologies/measures >>

The UCR project activity is a grid-connected cogeneration power plant powered by bagasse, utilizing a high-pressure steam-turbine setup. This Project involves generating electricity and installing facilities to export electricity to the regional grid. It includes a boiler, turbo-generator, auxiliary systems, and a switchyard, all located next to the sugar plant. Additionally, the necessary water supply and infrastructure facilities are available on-site.

Technical details of the project activity

BOILER CAPACITY	**60TPH**	**70TPH**
Manufacture	**Thyssenkrup Industries Ltd, Pune**	**S.S. Engineers, Pune**
Boiler ID	MR-15404	MR-14170
Boiler MCR (steam generation capacity)	60000 kg/hr	70000 kg/hr
Steam temperature at superheater outlet (Deg C)	510± Deg C	485 ± Deg C
Super heater control Pressure at main steam stopvalue (kg/cm$^{2)}$	67 kg/cm^2	67 kg/cm^2
Peak Capacity of Boiler (Kg/hr)	66000 kg/hr	77000kg/hr
Minimum possible duration for peakcapacity/Shift (8 hrs)	30 minutes	30 minutes

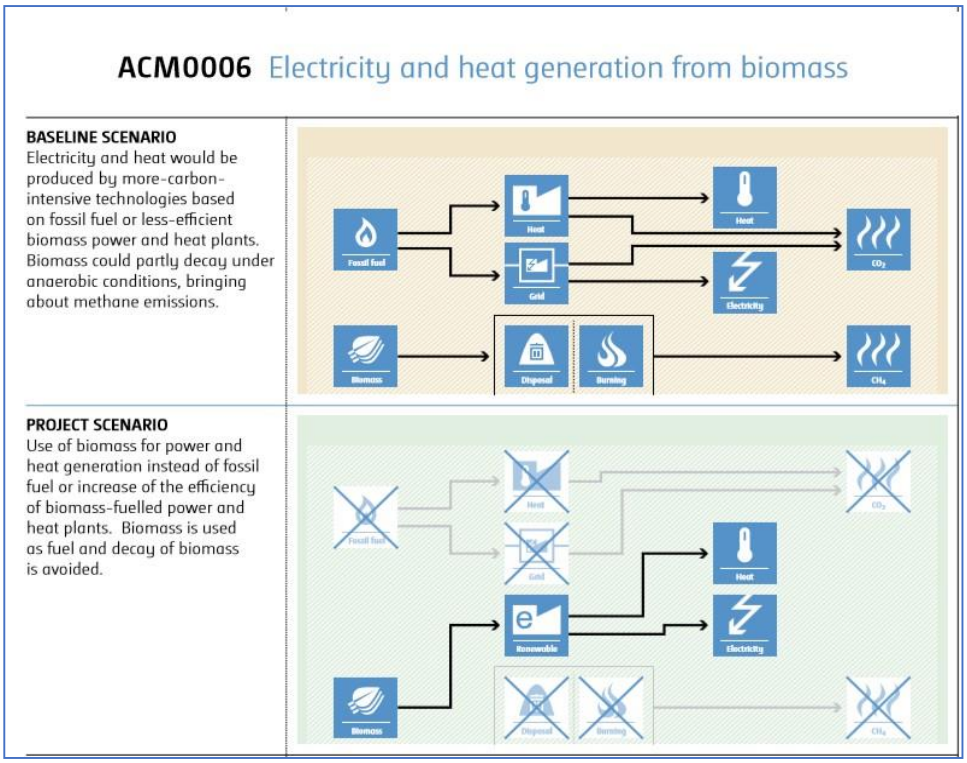
TURBINE

Capacity	12.5 MW	9 MW
Make	Siemens Ltd.	Triveni Turbine India Ltd.
Type	DECR	Back Pressure
Speed	7500 RPM	8300 RPM
Inlet Steam Condition	64 ATA / 480 Deg C	64 ATA / 480 Deg C

A.5. Parties and project participants >>

Party (Host)	Participants
India	**Project Proponent**: M/s. Shree Chhatrapati Shahu Sahakari Sakhar Karkhana Ltd. **UCR Aggregator**: Progressive Management Consultants **UCR ID** # 110736904 **Email**: info@progressive-iso.com

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 UCRStandard emission factor is 0.9 tCO_2/MWh for the period 2016-2023.

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** *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 is the current UCR project activity.

UCR CoU Standard emission factors are used to determine the baseline grid emission factor for the 2016-2023 period.

B.2. Applicability of methodologies and standardized baselines >>

The Project activity is a power generation project using biomass (bagasse) and displaces CO_2 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 UCR and UNFCCC CDM methodology project eligibility parameters. In the absence of the project activity M/s. Shree Chhatrapati Shahu Sahakari Sakhar Karkhana Ltd., 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 is also included in the positive list of approved types of activities of the UCR CoU Standard.
The Project activity is a power-and-heat plant that encompasses cogeneration plants, i.e. a 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 28 MW which is acceptable as per the applied large-scale methodology.
The installation of a new biomass residue fired power generation unit, which replaces existing power generation capacity fired with fossil fuel 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 facilitygenerating the residues) raw input (e.g., sugar) or in other substantial changes (e.g. product change) in this process.
The Project activity unit does co-fire fossil fuel and it does not exceed the limit of 15% co-firing fossil fuelcriteria 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 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.

Biomass used by the project plant is limited to biomass residue (bagasse).
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.

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 Monitoring Reportwill have 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: Shree Chhatrapati Shahu RE Project (CDM Project ID 1297) by the PP.

CDM Registration Date	22/12/2006
CDM Crediting Period	01/04/2007 - 31/03/2014 (Fixed)
CERs Issued (MR Period 1)	n/a (Project was rejected)

Hence the UCR project activity has never been issued voluntary carbon credits for the current 2016-2023 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 M/s. Shree Chhatrapati Shahu Sahakari Sakhar Karkhana Ltd.

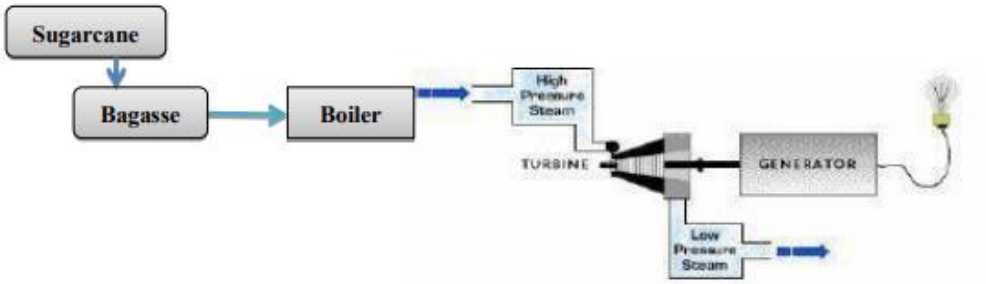
B.4. Project boundary, sources and greenhouse gases (GHGs)>>

The spatial extent of the Project boundary encompasses:

a) All plants generating power and/or heat located at the project site, whether fired with biomass, fossil fuels or a combination of both.

b) All power plants connected physically to the electricity system (grid) that the projects plant is connected to.

c) The means of transportation of biomass to the project site if the feedstock is biomass residues, the site where the biomass residues would have been left for or dumped.



Leakage Emissions (LEy)

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

Hence **LEy = 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
		N2O	Excluded	Excluded for simplification. Thisis conservative
	Uncontrolled burning or decay of surplus biomass residue	CO_2	Excluded	Excluded for simplification. Thisis conservative
		CH_4	Excluded	Excluded for simplification. This is conservative
		N2O	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) Off-site transportation of biomass during cultivation Combustion of biomass residue for electricity and / or heat generation Storage of biomass residue	CO_2	**Included**	Fossil fuel co-fired with biomass is included as a major project emission source. Off-site transportation of biomassduring cultivation using default emission factor as per the methodology
		CH4	Excluded	No fossil fuel / electricity is consumed at the project site due tothe project activity. No biomass residue from off-site will be used for the project activity Excluded for simplification. This is conservative
		N2O	Excluded	Excluded for simplification. This is conservative

Project Emissions (PEy)

The Project emissions (PE_y) under the methodology may include

- CO_2 emissions from transportation of biomass and/or 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 = are the CO_2 emissions during the year y due to transport of the biomass to the project plant in tons of CO_2,

PET_y = Default project emissions as per UCR notification dated 04/10/2023 has been applied following the provisions from the TOOL12,

- *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*.

$PE_{FFCO2,y}$ = are the CO_2 emissions during the year y due to fossil fuels co-fired by the generationfacility in tons of CO_2,

$PE_{EC,y}$ = are the CO_2 emissions during the year y due to electricity consumption at the projectsite 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,

$PEFF_{CO2,y}$ = **$PE_{FC,j,y}$** = are the CO_2 emissions during the year y due to fossil fuels co-fired by the generation facility in tons of CO_2, in process j during the year y (tCO_2 / yr);

$$PE_{FC,j,y} = \sum_i FC_{i,j,y} \times COEF_{i,y}$$

$FC_{i,j,y}$ = the quantity of fuel type i combusted in process j during the year y (mass or volumeunit / yr);

COEF $_{i,y}$ = the CO_2 emission coefficient of fuel type i in year y (tCO_2 / mass or volume unit);

i = the fuel types combusted in process j during the year y.

The coefficient of emission factor of the fuel is calculated in accordance with the option 'B' of the "Tool to calculate project or leakage CO_2 emissions from fossil fuel consumption" which states that "The CO_2 emission coefficient ***COEF i, y*** is calculated based on net calorific value andCO_2 emission factor of the fuel type i as follows:"

$$COEF_{i,y} = NCV_{i,y} \times EF_{CO2,i,y}$$

Where:

COEF $_{i,y}$ = the CO_2 emission coefficient of fuel type i in year y (tCO_2/ mass or volume unit);

NCV $_{i,y}$ = the weighted average net calorific value of the fuel type i in year y (GJ/ mass or volume unit);

EF $_{CO2,i,y}$ = weighted average CO_2 emission factor of fuel type i in y

CO2 emission factor for coal	0.09970 tCO_2e/GJ	Confirmed from IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in table 1.4 of Chapter1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories (99,700kg/TJ)
Hence, the project emission estimate on account of firing of coal fines is calculated as:	COEF $_{I,y}$ = NCV $_{i,,y}$ × EFCO $_{2\,i\,y}$	= 0.0142358 GJ/kg x 0.09970 tCO2e/GJ = 0.001419305 tCO2e/kg

PE $_{EC,y}$ = 0 and,

PE$_{Biomass,CH4,y}$ = 0.

B.5. Establishment & description of baseline scenario (UCR Standard or Methodology) >>

The baseline scenario identified at the PCN stage of the project activity is:

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

The baseline emissions due to the displacement of electricity are determined by the 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 theproject activity during the year y in tCO_2/MWh.
Given that 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 into the grid**. Therefore, the baseline scenario is the emission of GHG from the present electricity generation mix of the electricity grid.

Emission Reductions (ER_y): The emission reductions due to the project activity are calculated asthe difference between the baseline emissions and the sum of the project emissions and the leakage:

$ER_y = BE_y - (PEy + LE_y)$

BE_y = Baseline emissions in year y ($t\ CO_2e$)

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

$BE_y = EG_{PJ,y}$ X EF $grid_{,y}$

Where:

$EG_{grid,y}$ = Quantity of net electricity generation that is fed into the electricity grid as a result ofthe 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 calculatedusing UCR Standard emission factor (0.9 tCO_2/MWh).

PE $FFCO_2$, y= Estimated project activity fossil fuel emissions/yr = **1,713 tCO_2/yr**
PEy = Estimated default (Biomass Cultivation and transport) emissions/yr = **3,425 tCO2/yr**
LEy = Leakage emissions = 0 tCO_2
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.

Estimated annual MWh grid supply = **38,058 MWh/yr**

Estimated Annual baseline emission reductions **(BEy)** = **34,249 tCO2eq /yr**

Estimated Total Annual Emission Reductions (ERy) = **29,108 CoUs /year (29,108 tCO2eq/yr)**

B.6. Prior History>>

The Project has received no public funding.
However the UCR project activity had been registered as a CDM project activity under the title: Shree Chhatrapati Shahu RE Project (CDM Project ID 1297) by the PP but CER's were not issued as the project got rejected.

CDM Registration Date	22/12/2006
CDM Crediting Period	01/04/2007 - 31/03/2014 (Fixed)
CERs Issued (MR Period 1)	n/a (Project was rejected)

Hence the UCR project activity has never been issued voluntary carbon credits for the current 2016-2023 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 M/s. Shree Chhatrapati Shahu Sahakari Sakhar Karkhana Ltd.

B.7. Changes to start date of crediting period >>

There is no change in the start date of the 1st UCR crediting period (01/01/2016 - 31/12/2023)

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>>

Monitored Period: 01
1st Monitoring Dates: 01/01/2016 to 31/12/2023 (08 years, 00 months)
First Issuance Period: 01/01/2016 to 31/12/2023 (08 years, 00 months)

B.10. Monitoring plan>>

The Project Proponent has proposed to sell the surplus power as an exportable capacity from the said Bagasse based Co-generation power generation plant to MSEDCL to the tune of 9 MW in season and 3.5 MW in off season against the installed capacity of 12.5 MW. The electricity will be produced by using bagasse as fuel.

The supply of the surplus power available for export will be made after meeting the consumption of the sugar mill and the auxillary consumption of the co-generation power plant. The generator has proposed to sell surplus power generated from the said plant to MSEDCL as under :-

		Value in MW	
Items		**Season**	**Off- Season**
1	Gross Power Generation Capacity	12.5 MW	7.0 MW
2	i) Power Consumption (For Sugar Mill Cane Crushing & Boiler Auxiliary)	1.0 MW	1.0 MW
	ii) Distilleries & Colonies	2.5 MW	2.5 MW
3	Total Consumption	3.5 MW	3.5 MW
4	Exportable Power at Interconnection point	9.0 MW	3.5 MW

Season means sugar cane crushing period during the year (150 days). Off season means period other than sugar cane crushing during the year (90 days). 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 years 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 project concept note document (PCN) 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.

As per the Power Purchase Agreement (PPA), the energy exported to the MSEDCL 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 shall be 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.

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 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 have been taken care by putting up a fire safety system and a water drainage system in the fuel yard.

Parameters	Description
QS,y	Quantity of steam supplied per year measured at recipient's end
Tsteam,y	Temperature of steam at the recipient's end
Psteam,y	Pressure of steam
Esteam,y	Enthalpy of the saturated steam supplied to the recipient
TFeedwater	Temperature of boiler feed water
EFeedwater	Enthalpy of feed water
EGthermal,y	Net quantity of thermal energy supplied by the project activity during the year y
BBiomass,y	Net quantity of f biomass consumed in year y (on dry basis)
MCbiomass	Moisture content of the biomass

Monthly joint meter reading of main meters installed at interconnection points are taken and signed by authorised officials of M/s. Shree Chhatrapati Shahu Sahakari Sakhar Karkhana Ltd. (PP) and MSEDCL. Records of this joint meter reading are maintained by PP and MSEDCL. 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 MSEDCL has been signed. Reliability of energy data is maintained as per PPA. PP 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. Maharashtra Pollution Control Board (MPCB) and Environment Department of Maharashtra have prescribed standards of environmental compliance and monitor the adherence to the standards. PP has received the 'Consent to Operate' the plant. State's regulatory body of power is MSEDCL and they have issued consent for the installation of co-generation power plant of 28 MW capacity. As a buyer of the power, the MSEDCL is a major stakeholder in the project.

They hold the key to the commercial success of the project.

Data/Parameter:	**Date of commissioning of biomass boilers**
Data unit:	Date as per boiler test report.
Description:	Actual date of commissioning of the project device
Source of data Value(s) applied:	Monitoring Report as and when commissioned
Measurement methods and procedures:	The construction processes for the biogas unit are tracked from initiation to completion. Consequently, the start date of each installed unit is documented in the monitoring report.
Monitoring frequency:	As and when commissioned fixed and recorded in the monitoring report
Purpose of data:	To estimate project eligibility

Data / Parameter:	**NCV_k**
Data unit:	GJ/t
Description:	Net Calorific Value of Biomass Residue Type K
Source of data value(s) applied:	Measurements will be carried out by reputed labs and reported in dry biomass basis.
Measurement methods & procedures:	On site and in labs
Monitoring frequency:	Every 6 months
Purpose of date:	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 value(s) applied:	Plant records and log books receipts
Measurement methods & procedures:	Monitoring: The quantity of biomass fed into the boiler is controlled. Data type: Measured Responsibility: Boiler Operator

Monitoring frequency:	Daily
QA/QC procedures	The amount of biomass used can be cross checked by the purchase orders and stock inventory.

Data / Parameter:	**$EG_{project\ plant,\ y}$**
Data unit:	MWh
Description:	Net quantity of electricity generated in the project
Source of data value(s) applied:	Measured.
Measurement methods & 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 meter attached to turbine generator to determine 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 attendantand entered into logbooks on site. This hourly data is tobe signed off at the end of every shift by an engineer incharge of the shift and again at the end of each day andsigned off by the power plant manager. The energy meters are calibrated every 5 years by an independent third party.
QA/QC procedures:	The parameter is monitored and logged in log sheets.

Data / Parameter:	**EF grid,y**
Data unit:	Grid emission factor
Description:	tCO2/MWh
Source of data value(s) applied:	UCR CoU Standard Default for Indian grid 0.9 tCO2/MWh for the period 2013-2022 and same isused for the period post 2022 as it is found conservative.

Measurement methods & procedures:	NA
Monitoring frequency:	NA
QA/QC procedures:	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 value(s) applied:	JMR and/or Monthly Meter Readings
Measurement methods & 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 procedures:	The parameter is monitored by on site energy metersthat are calibrated on every 5 years. The hourly recordings of data is to be taken from energy meterslocated 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 atthe 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 by an independent third party.
Purpose of data:	To estimate baseline emissions

Data/Parameter	**$FC_{coal,j,y}$**
Data unit	Tonnes/yr
Description	Quantity of coal used in the project activity
Source of data Value(s) applied	Calculated
Measurement methods and procedures	Plant records

Monitoring frequency	Manually
QA/QC	Measured Daily and recorded monthly. The amount of coal used in the project activity is measured via a calibrated weighbridge system as and when consumed on continuous basis. Weigh bridge undergoes maintenance / calibration subject to appropriate industrial standards, at least annually. The data recorded is cross checked againstpurchase receipt. Cross check is also made via the measurements with an annual energy balance that is basedon purchased quantities and stock changes, and the calibration frequency is once in three years.
Purpose of data	To estimate project emissions

Data/Parameter	**EF CO2,coal,y**
Data unit	tCO_2 /GJ
Description	CO2 emission factor for coal
Source of data Value(s) applied	Calculated
Measurement methods and procedures	CEA
Monitoring frequency	Annually
QA/QC	A default value is applied as per IPCC guidelines.
Purpose of data	To estimate project emissions