PROJECT CONCEPT NOTE

CARBON OFFSET UNIT (CoU) PROJECT

Title: 38.5 MW TIL Waste Heat to Power project, Singrauli, Madhya Pradesh, India

Version 1.0

Date: 01/03/2025

1st First CoU Issuance Period: 11 Years

Date: 01/01/2014 to 31/12/2024 (11 years)

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

BASIC INFORMATION	
Title of the project activity	38.5 MW TIL Waste Heat to Power project, Singrauli, Madhya Pradesh, India
Scale of the project activity	Large Scale
Completion date of the PCN	18/03/2025
Project participants	**Project Proponent**: Innovators infratech LLP (IIL) **UCR Aggregator**: Yojan Solutions Pvt Ltd.
Host Party	INDIA
Applied methodologies and standardized baselines	**UNFCCC Methodology *ACM0012*** Waste energy recovery Version 6.0 UCR Protocol Standard Baseline
Sectoral scopes	01 Energy industries (Renewable/Non-renewable Sources) 04 Manufacturing industries
SDG Impacts:	**SDG 7**:Affordable and Clean Energy **SDG 8**: Decent Work and Economic Growth **SDG 9**: Industry, Innovation, and Infrastructure **SDG 12**: Responsible Consumption and Production **SDG 13**: Climate Action
Estimated amount of total GHG emission reductions	**458272** COUs , 458272 tCO2e

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SECTION A. Description of project activity

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

M/s Trimula Industries Ltd. (TIL) is a leading manufacturer of structural steel in India, equipped with fully integrated facilities including a power plant, steel melting shop, sponge iron unit, rolling mills, and coal washery. To meet the growing energy requirements of its operations, **TIL** has installed a **38.5 MW** Waste Heat Recovery Boiler (WHRB)-based Captive Power Plant (CPP) at its manufacturing site located in Village: Gondwali, Tehsil: Deosar, District: Singrauli, Madhya Pradesh, India.

The project was commissioned in two phases:

- The first phase became operational on 1st January 2014, with the installation of a **12 MW** turbine.
- The second phase commenced on 14th May 2015, with the addition of a **26.5 MW** turbine, increasing the total installed capacity to 38.5 MW.

This WHRB-based CPP utilizes waste heat from industrial processes, enhancing overall energy efficiency and reducing environmental impact.

Purpose of the project activity:

The purpose of this activity is to enhance energy efficiency, ensure operational continuity, and promote environmental responsibility by utilizing Waste Heat Recovery (WHR) systems. As industries face increasing power demands and grid supply constraints, self-sufficiency in energy generation has become a necessity.

This project focuses on recovering the sensible heat content from waste gases emitted by Direct Reduced Iron (DRI) kilns through Waste Heat Recovery Boilers (WHRB) to generate cleaner electricity. By capturing and repurposing this otherwise lost energy, the facility reduces its dependency on grid power, lowers operational costs, and minimizes its carbon footprint. This initiative reflects a strong commitment to sustainability, aligning industrial growth with environmental stewardship while ensuring energy security and long-term economic stability.

By recycling waste heat through the WHRB system, the operational load on primary equipment is significantly reduced. This not only enhances overall energy efficiency but also extends the lifespan of the machinery and lowers maintenance costs, as components are exposed to reduced thermal stress and mechanical wear.

The project activity results in **greenhouse gas (GHG) emission reductions** by displacing electricity that would otherwise be generated using conventional fossil fuel-based sources.

As per the approved UNFCCC CDM methodology, the useful energy generated from the utilization of waste energy carried in the project activity is for:

(a) Generation of electricity

The project activity is an approved positive activity as per the revised guidelines and updates of UCR, (source of update). Regulations do not require the **PP** to recover and/or utilize the waste energy prior to the implementation of the project activity.

Figure: Captive Power Plant

The project activity is displacing an estimated annual net electricity generation i.e., 517694 MWh from the Indian grid system, which otherwise would have been generated by the operation of fossil fuel-based grid-connected power plant. The estimated annual average CO2e emission reductions by the project activity is expected to be 458272 tCO2e, whereas actual emission reduction achieved during the first CoU period shall be submitted as a part of the initial UCR monitoring and verification activity.

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

The project offers significant **social, environmental, economic, and technological** benefits that align with national and global sustainable development goals. These co-benefits extend beyond energy generation and directly contribute to community wellbeing, environmental protection, and long-term economic resilience.

1. **Social Benefits**

- **Employment Generation:** The project creates direct and indirect employment opportunities in the region, offering roles for both skilled and unskilled workers during construction, operation, and ongoing maintenance of the WHRB and turbine systems.
- **Skill Development & Workforce Enhancement:** By employing local manpower and offering higher-value, long-term roles, the project fosters workforce development and contributes to the growth of technical skills and industrial expertise within the region.
- **Energy Security:** By reducing the facility's dependence on fossil fuel-based grid electricity, the project enhances local and national energy resilience and contributes to the conservation of finite energy resources.
- **Technological Exposure:** The deployment of advanced cogeneration technology builds local capacity, fosters technological learning, and promotes a culture of innovation and industrial modernization.

2. Environmental Benefits

- **Utilization of Waste Heat as Clean Energy:** The project qualifies as a renewable energy initiative by using waste heat as a sustainable energy input. This proactive measure goes beyond existing compliance requirements, reflecting voluntary environmental responsibility.
- **Reduction in Fossil Fuel Consumption:** By offsetting grid-based electricity demand—largely generated from fossil fuels—the project contributes to the conservation of natural resources such as coal and oil.
- **GHG Emissions Reduction:** The displacement of fossil fuel-based electricity reduces greenhouse gas emissions (CO_2, NO_x, SO_x), contributing to both global climate mitigation and improved local air quality.
- **Avoidance of Ash Generation & Landfill Use:** Unlike coal-fired boilers, the WHRB system avoids ash production, eliminating the need for disposal infrastructure and reducing associated environmental pollution.
- **Strengthening of Local Grid Infrastructure:** As the captive power system reduces the facility's draw on the public grid, it allows surplus electricity to be redirected to other consumers, supporting regional energy access and grid stability.
- **Catalyst for Industry-wide Best Practices:** The project acts as a scalable demonstration model for similar sponge iron plants, encouraging wider adoption of high-capacity WHRB systems across the industry.

3. Economic Benefits

- **Boost to Local and Regional Economies:** Economic activity during the construction and operational phases of the project drives local development through the purchase of materials, services, and manpower, stimulating regional economies.
- **Reduced Operating Costs:** By utilizing waste heat—an otherwise discarded by-product—as a fuel source, the project significantly reduces energy costs for the plant, enhancing overall operational efficiency.
- **Long-term Resource Conservation:** The project reduces dependency on fossil fuel imports, promoting national resource efficiency and contributing to long-term economic resilience.
- **Alignment with National Climate Goals:** As an example of indigenous clean technology deployment, the project supports India's commitments under the Paris Agreement by contributing to national GHG mitigation targets and climate adaptation strategies.

United Nations Sustainable Development Goals:

Development Goals	Targeted SDG	SDG Indicator
SDG 7: Affordable and Clean Energy	7.2.1: Renewable energy share in the total energy mix	WHR plants enhance energy efficiency by capturing and repurposing waste heat, which reduces reliance on conventional energy sources. This contributes to the availability of affordable and clean energy, supporting efforts to ensure access to reliable energy for all.
Goal 8: Decent Work and Economic Growth	8.2.1: Annual growth rate of real GDP per capita	By reducing operational costs and enhancing productivity, WHR plants can lead to job creation and economic growth within industries. This supports sustained economic development while promoting decent work opportunities.
Goal 9: Industry, Innovation, and Infrastructure	9.4.1: CO2 emission per unit of value added	WHR technologies foster innovation within industrial processes by improving energy efficiency and sustainability. This aligns with the goal of building resilient infrastructure, promoting inclusive and sustainable industrialization, and fostering innovation.
Goal 12: Responsible Consumption and Production	12.2.1: Material footprint per capita	By maximizing the use of generated heat and minimizing waste, WHR systems promote sustainable consumption and production patterns. They help industries reduce operational costs and environmental impact, aligning with the goal of ensuring sustainable practices in production processes.
Goal 13: Climate Action	13.2.1: Number of countries with national adaptation plans	The reduction of greenhouse gas emissions achieved through waste heat recovery directly supports climate action initiatives. By lowering the need for additional fuel consumption, WHR contributes to efforts aimed at combating climate change and its impacts.

A.3. Location of project activity >>

Country: India
State: Madhya Pradesh
District: Singrauli
Tehsil: Deosar
Village: Gondwali
Pin Code: 486892
Geo Coordinates: 24.207919°, 82.529147°

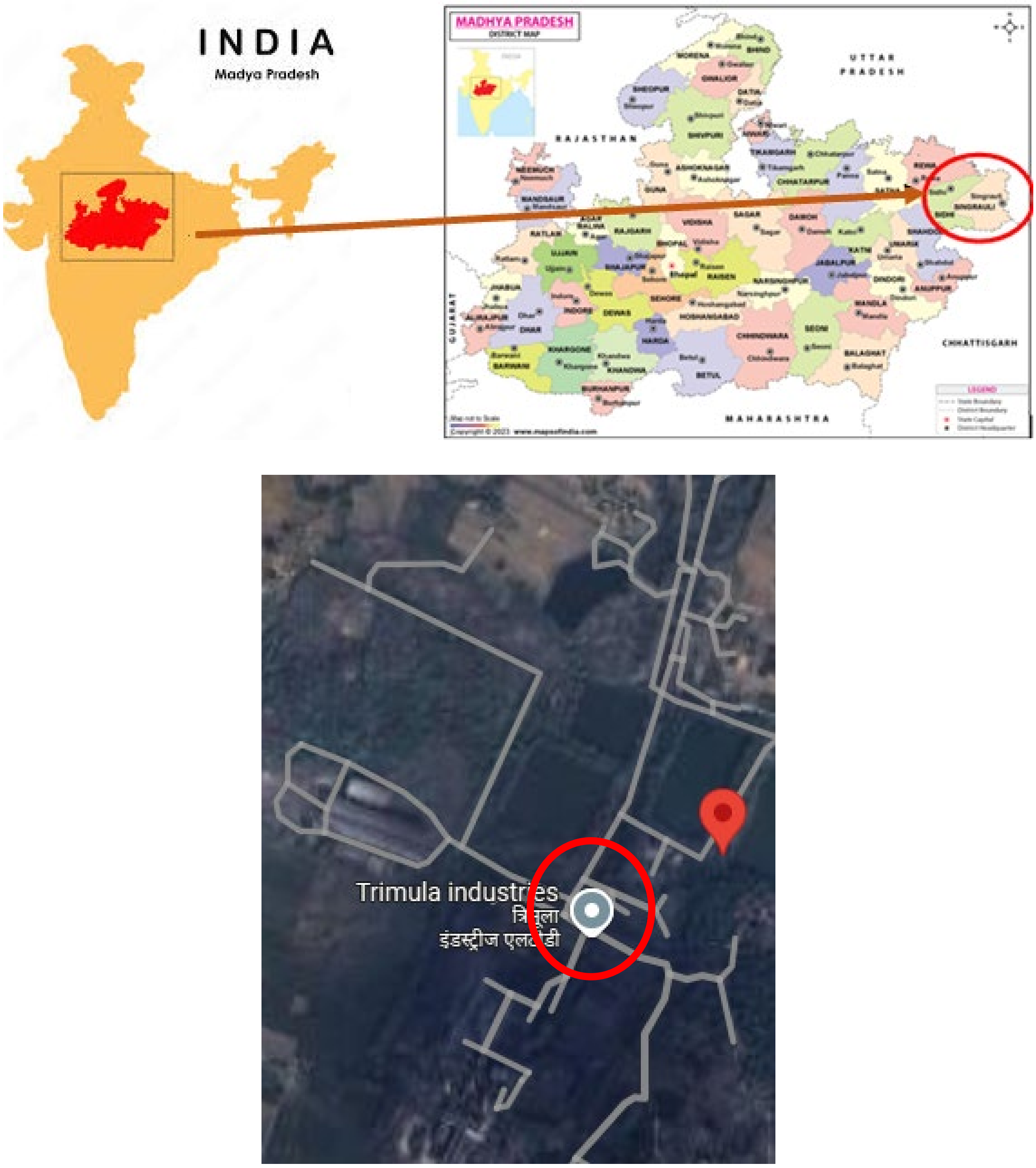


Figure: Project Activity Location

Source: Google Maps

A.4. Technologies/measures >>

PP commissioned its Waste Heat Recovery-based Captive Power Plant on **November 1, 2013**, with an initial **12 MW turbine** powered exclusively by steam generated from two parallel **Waste Heat Recovery Boilers (WHRBs)**. These WHRBs efficiently recover sensible heat from the flue gases emitted by the **Direct Reduced Iron (DRI) kilns**, converting waste energy into valuable steam for electricity generation. To further improve energy efficiency and increase power output, a second turbine with a capacity of **26.5 MW** was added on **May 14, 2015**. This strategic expansion brought the total installed capacity to **38.5 MW**, significantly enhancing the utilization of waste heat and contributing to the plant's sustainability and energy self-sufficiency.

Ambient air quality at the boundary of the industry/unit premises shall be monitored and reported to the Board regularly on quarterly basis: Some of the parameters are as follows:

a. Particulate Matter (less than 10 micron) - 100 µg/m³ (PM10 µg/m³ 24 hrs. basis)
b. Particulate Matter (less than 2.5 micron) - 60 µg/m³ (PM2.5 µg/m³ 24 hrs. basis)
c. Sulphur Dioxide [SO2] (24 hrs. Basis) - 80 µg/m³
d. Nitrogen Oxides [NOx] (24 hrs. Basis) - 80 µg/m³
e. Carbon Monoxide [CO] (8 hrs. Basis) - 2000 µg/m³

The captive power plant at TIL is seamlessly integrated with its two Direct Reduced Iron (DRI) kilns, whose flue gases (900–950 °C, –1 to –5 mmWC) feed into two single-drum, vertical, multi-pass, natural-circulation WHRBs (38 TPH MCR / 33 TPH NCR). These boilers generate superheated steam (76 kg/cm², 485 °C) into a common header, from which steam is throttled to two condensing turbines at 3000 rpm

Together, these turbines deliver a combined 38.5 MW. Power is then fed to an 11 kV bus (with up to 10 % auxiliary draw, ~3.85 MW for pumps, fans and controls) to serve the steel melting shop, DRI units, rolling mills and other on-site loads. Any surplus is stepped up to 132 kV and exported under a PPA with Manikaran Power. The energy meter ensures accurate accounting of gross generation, auxiliary consumption and export volumes.

Figure: 26.5MW Turbine

Figure: 12MW Turbine

Table: Technical Specifications of the 12 MW Steam Turbine

Parameter	Value
Make	M/s ABB TURBINE NÜRNBERN GmbH, Germany
Type of Turbine	Condensing Turbine, Series VE32
Machine Number	191663/000
Year of Manufacture	1993
Casing Split	Horizontal
Rated Power	12 MW
Rated Speed	8 420 RPM
Critical Maximum Speed	4 180 RPM
Critical Minimum Speed	3 420 RPM
Emergency Trip Speed (OST)	9 260 RPM
Turning-Gear Speed	120 V / 21.5 RPM
Direction of Rotation	Counter-clockwise (CCW)
Inlet Steam (Start-up)	25 bar (abs) / 270 °C
Live-Steam Pressure (Min/Max)	53.3 / 55.84 bar (a)
Live-Steam Temperature (Min/Max)	485 / 512 °C
Extraction Steam Pressure (for Deaerator)	8.0 bar (abs)
Extraction Steam Flow (Normal/Max)	6.0 / 9.2 kg/s
Exhaust Condenser Pressure (Normal/Max)	0.1 / 0.5 bar (abs)
Exhaust Steam Temperature (Max)	110 °C
Exhaust Steam Flow	1 277 kg/s

Table 1- Technical specifications of waste heat recovery boilers

Parameter	Value
Type	Single drum, vertical, multi-pass, Semi outdoor, natural circulation
Steam output, maximum continuous rating (MCR)	38 TPH
Steam output, nominal continuous rating (NCR)	33 TPH
Steam pressure at super-heater outlet	76 Kg/cm^2
Steam temperature at superheated outlet	485°C
Feed water temp. Economizer	126°C
No. of Boilers	02

Table 2- Technical specifications of turbine

Parameter	Value
Rated capacity	38.5 MW (12 MW + 26.5 MW)
Number of cylinders	1
Type of governing	Throttle
Speed (rpm)	3000
Steam inlet pressure	63 Kg/cm^2
Steam inlet temperature	480°C
Bleed pressure for deaerator	2 Kg/cm^2
Steam temperature before emergency stop valve	485+10°C
Steam flow required for tg 38.5 mw (at 0% makeup, 33°c cooling water inlet temp, and 0.1 ata condenser pressure)	160 TPH
Rated pressure at exhaust of lp turbine (ata)	0.1
Number of turbines	02

Table 3- Technical specifications of Energy Meter

Description	Make	TG
ENERGY METER**, CT** 1000/1A**, CL** 0.5, DM 5240**, FS** 19052-559KWH, PT SUPPLY 11000/110V**, SL.NO**. 1056927- 3906	CONZERV +PLUSE	12MW
ENERGY METER**, CT** 4000/1A**, CL** 0.5, DM 5240, FS 76210-236KWH, PT SUPPLY 11000/110V**, SL.NO**. 165074/88-4508	CONZERV +PLUSE	26.5MW

Process Description: WHRB-Based Captive Power System at Trimula Industries Ltd.

The WHRB-based captive power system at TIL operates as a tightly integrated steam-power loop, driven entirely by the kiln exhaust:

1. **Flue-gas diversion & heat transfer**
   Hot gases from the DRI kilns are bled upstream of the dust-collection train and routed into the WHRB inlet dampers. Inside each boiler, water flows by natural circulation through economizer, evaporation and superheater coil circuits, extracting thermal energy without auxiliary firing.

2. **Steam modulation & header management**
   Superheated steam is collected in a common header. A pressure-control valve (PCV) array maintains header pressure within set limits, and flow-control valves split steam between the 12 MW and 26.5 MW turbines according to real-time load demands.

3. **Turbine generation & condensate recovery**
   Each throttle-governed turbine converts steam enthalpy into shaft power, driving the alternator. Exhaust steam discharges into a surface condenser held at vacuum; condensate is pumped back to the deaerator, completing the water-steam cycle.

4. **Electrical synchronization & distribution**
   Generator voltage and frequency are regulated by an automatic synchronizer and excitation system, tying in to the 11 kV bus. Auxiliary loads (boiler feed pumps, forced-draft fans, control systems) draw up to 10 % of gross output. Excess power is stepped up to 132 kV for export under the PPA.

5. **Control & protection**
   - A PLC/DCS network oversees start-up/shutdown sequences, inter-unit load sharing, and turbine tripping logic. Protective relays on the generator and transformer guard against over-current, under/over voltage, and loss of excitation.

All key parameters—flow, pressure, temperature and electrical output—are monitored via calibrated transmitters and meters, ensuring precise heat-to-power conversion and reliable captive/export operation.

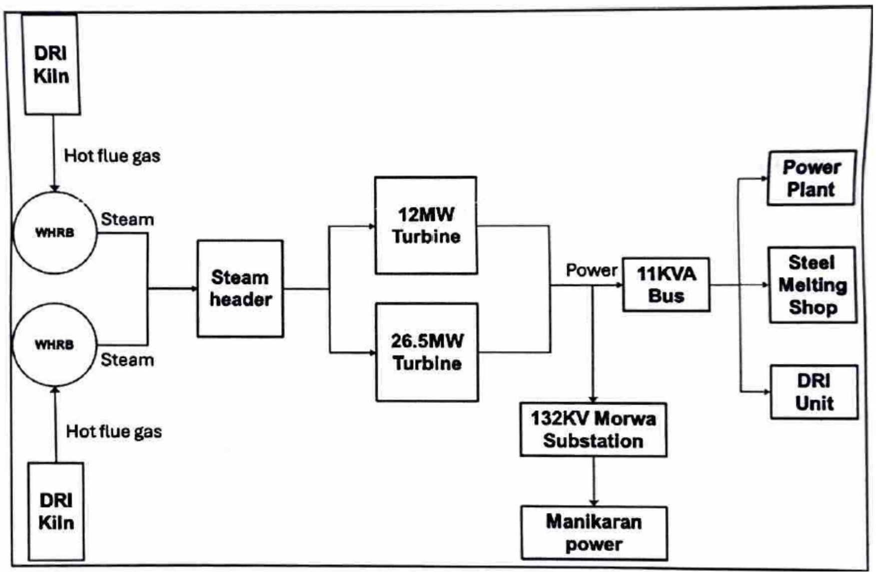
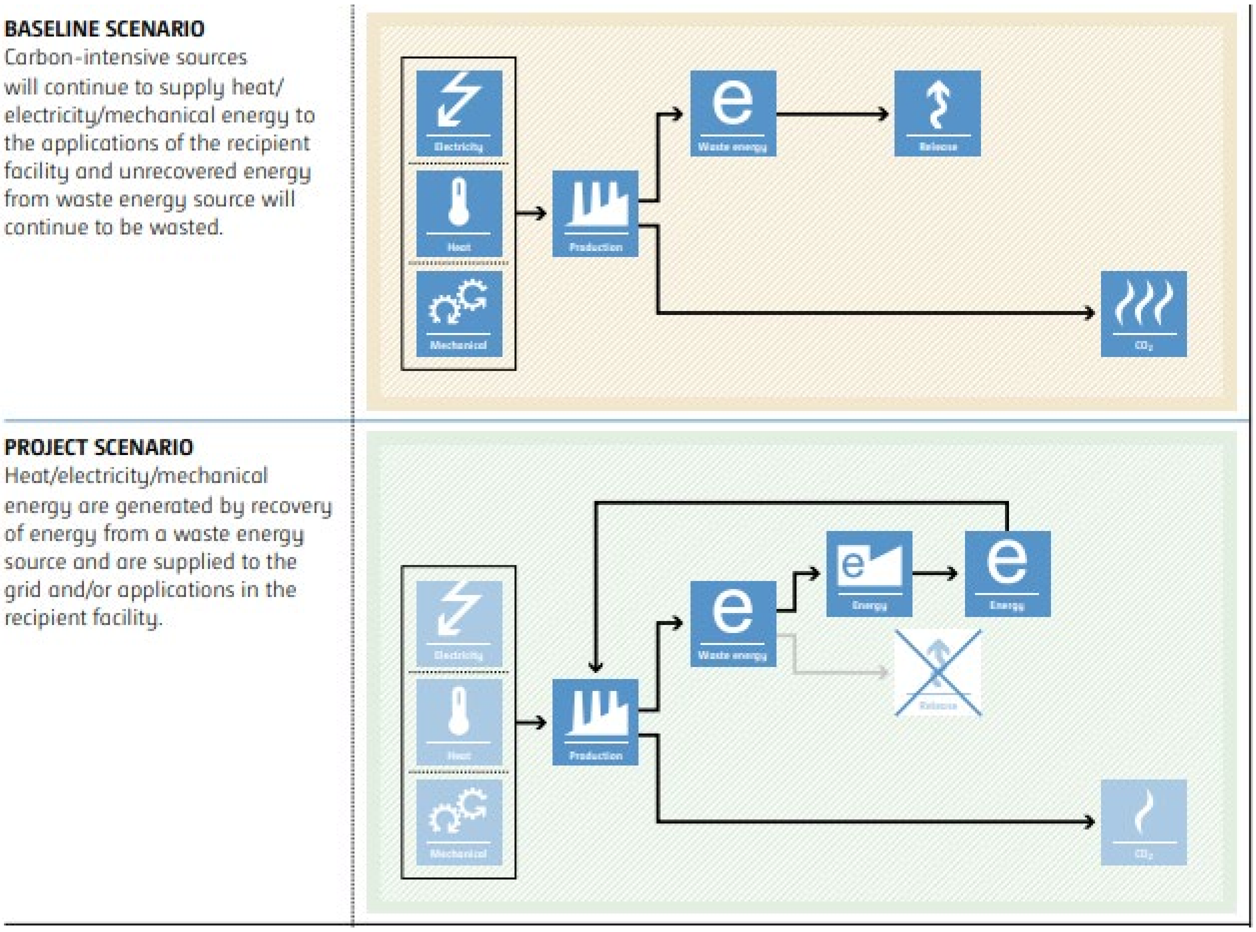


Figure: Process flow diagram of Trimula Industries WHRB captive power plant system

A.5. Parties and project participants >>

Party (Host)	Participants
India	**Project Proponent:** Trimula Industries Limited (TIL) **Aggregator**: Yojan Solutions Pvt. Ltd.

A.6. Baseline Emissions>>



Typical projects

Energy from waste heat, waste gas or waste pressure in an existing or new industrial facility is recovered and used for in-house consumption or for export, by installation of a new power and/or heat and/or mechanical energy generation equipment, by installation of a more-efficient useful energy generation equipment than already existing, or by upgrade of existing equipment but with better efficiency of recovery.

Type of GHG emissions mitigation action

Energy efficiency: Waste energy recovery in order to displace more-carbon intensive energy/technology.

In the absence of the project activity, the equivalent amount of electricity would have been imported from the regional grid (which is connected to the unified Indian Grid system).Hence, baseline scenario of the project activity is

"(a) the electricity obtained from the grid."

Baseline emissions from electricity (*BE Elec, y*)

The baseline emissions corresponding to electricity supplied by the project activity to recipient facilities shall be estimated for each recipient facility in accordance with the case it belongs to as follows:

(a) Case 1a:

Recipients whose project level electricity consumption is less than or up to the maximum capacity of the existing pre-project equipment at the recipient facility to use Equation 4

$$BE_{EL,j,y} = \sum_{i}(EG_{i,j,y} \times EF_{Elec,i,j,y}) \quad \text{Equation (4)}$$

Where:

$EG_{i,j,y}$	=	The power supplied by the project activity to the recipient facility *j*, which in the absence of the project activity would have been sourced from baseline source *i* (e.g. '*gr*' for the grid or '*is*' for an identified source) during the year *y* as per the identified baseline scenario for recipient facility *j* (MWh)
$EF_{Elec,i,j,y}$		The CO_2 emission factor for the baseline electricity source *i* (e.g. '*gr*' for the grid, and '*is*' for an identified source), corresponding to baseline scenario for the recipient facility *j*, during the year *y* (t CO_2/MWh)

Since extra steam has been added in the project activity from one Atmospheric Fluidised Bed Combustion (AFBC) based boiler, thus fraction of total electricity generated by the project activity using waste gas has been multiplied with the total electricity generation by the project activity and that electricity has been considered for baseline emission.

A.7. Debundling>>

TIL Waste Heat to Power project, India, 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)
04. Manufacturing industries
TYPE III - Energy Efficiency

CATEGORY- ***ACM0012*** Large-scale Consolidated Methodology - ***Waste energy recovery Version 06.0***
The consolidated methodology is applicable to project activities implemented in an existing or Greenfield waste energy generation (WEG) facility converting waste energy carried in identified waste energy carrying medium (WECM) stream(s) into useful energy (i.e. power, mechanical or thermal) consumed in an existing or Greenfield recipient facility(ies) and/or supplied to the grid in the case of electricity generation. The WEG facility may be one of the recipient facilities.

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

This project is included under this methodology since it applies to project activities that generate electricity from waste heat or the combustion of waste gases in industrial facilities. It's also included within the UCR Standard Positive List of technologies (updated) and is within the large -scale CDM thresholds under the applied methodology
Project activity involves power generation with installed capacity of 38.5 MW (12 MW + 26.5 MW). Regulations do not require the project activity to recover and/or utilize the waste energy prior to the implementation of the project activity; The methodology is applicable where waste pressure is used to generate electricity only and the electricity generated from waste pressure is measurable;
The proposed project activity is a power generation project from waste heat from DRI kilns in a sponge iron plant. The project activity displaces Madhya Pradesh Power Generating Company Limited (MPPGCL), part of WR grid, which is predominantly fossil fuel based
The methodology allows for the recipient facility to be same as the waste energy generation facility. The project site is the waste energy generation facility and the facility itself receives useful energy generated using waste energy under the project activity.

B.3. Applicability of double counting emission reductions >>

There is no double accounting of emission reductions in the project activity due to the following reasons:

• Project is uniquely identifiable based on its location coordinates,
• Project has dedicated commissioning certificate and connection point and plant operation data on power generation in project activity is taken from energy meters installed at project site
• Project is associated with distinct and unique energy meters which are dedicated to the consumption point for PP.

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

The spatial extent of the project boundary comprises the waste heat or gas sources, captive power generating equipment, any equipment used to provide auxiliary heat to the waste heat recovery process, and the power plants connected physically to the electricity grid that the proposed project activity will affect. In line with the methodology the project boundary encompasses emissions of the project activity associated with the CO_2 emissions from the combustion of auxiliary fossil.

	Source	GHG	Included?	Justification/Explanation
Baseline	Grid-connected electricity	CO_2	**Included**	Major source of emission
		CH_4	Excluded	Excluded for simplification. This is conservative
		N_2O	Excluded	Excluded for simplification. This is conservative
Project Activity	On-site fossil fuel consumption due to project activity Combustion of waste gas for electricity generation	CO_2	Excluded	Project activity entails use of waste heat of from DRI kilns for power generation. Project activity does not entail use of fossil fuels in the project activity. The emissions from onsite diesel consumption negligible and are excluded for simplification. This is conservative and will be monitored at verification.
		CH_4	Excluded	Excluded for simplification. This is conservative
		N_2O	Excluded	Excluded for simplification. This is conservative

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

Baseline emissions include only CO2 emissions from electricity generation in power plants that are displaced due to the project activity. The case established for the power required by the project activity, since it requires 19.5% for its auxiliary use, is less than the installed capacity of the equipment as per the methodology and its associated emissions quantification formula to be selected. The baseline emissions corresponding to electricity supplied by the project activity to recipient facilities is estimated for each recipient facility in accordance with the case established as above and in the case of the project activity is as follows:

(a) Case 1a: recipients whose project level electricity consumption is less than or up to the maximum capacity of the existing pre-project equipment at the recipient facility to use the following modified Equation

$$BE_{EL,j,y} = f_{WCM} \sum_i (EG_{i,j,y} \times EF_{Elec,i,j,y})$$

Where:

$EG_{i,j,y}$ = The power supplied by the project activity to the recipient facility *j*, which in the absence of the project activity would have been sourced from baseline source *i* (e.g. '*gr*' for the grid or '*is*' for an identified source) during the year *y* as per the identified baseline scenario for recipient facility *j* (MWh)

$EF_{Elec,i,j,y}$ The CO_2 emission factor for the baseline electricity source *i* (e.g. '*gr*' for the grid, and '*is*' for an identified source), corresponding to baseline scenario for the recipient facility *j*, during the year *y* (t CO_2/MWh)

fWCM = Fraction of total electricity generated by the project activity using waste gas. And

Where:

$$f_{WCM} = \frac{ST_{whr,y}}{ST_{whr,y} + ST_{other,y}}$$

STwhr,y = Energy content of the steam generated in waste heat recovery boiler fed to turbine via common steam header

STother,y = Energy content of steam generated in other boiler (AFBC) fed to turbine via common steam header

(b) If the electricity displaced by the project activity in the recipient facility is supplied by a connected grid system, the CO_2 emission factor of the electricity is modified from the

Power Gen Cap Capacity	MW	38.5
Auxiliary Power Consumption	%	19.5

Estimated Annual Baseline Emission Reductions:

BE EL, j,y = fWCM (EG BL,y x EF, CO2, GRID, y)

BE EL, j,y = Baseline emission reductions in a year y at project site/recipient plant (j).

Where:

EG BL,y is calculated based on daily gross power generation and auxiliary power consumption in the power generation plant (recipient plant)

EG BL,y = EG GEN,y– EG AUX,y.
Where,

EG BL,y = Net power generation from turbine in year y (MWh/yr)

EG GEN,y= Gross power generation from turbine in year y (MWh/yr)

EG AUX,y= Auxiliary power consumption in power generation plant in year y (MWh/yr)

fWCM = Fraction of total electricity generated by the project activity using waste gas.

The "grid emission factor" refers to the CO_2 emission factor (tCO_2/MWh) associated with each unit of electricity supplied by an electricity system. The UCR recommends an emission factor of 0.9 tCO_2/MWh as a fairly conservative estimate for Indian projects that have not been previously verified under any GHG program for the vintage years 2013–2023.

For the 2024 vintage year, a grid emission factor of 0.757 tCO_2/MWh has been considered. The combined margin emission factor calculated from the CEA database in India results in higher emissions than the default value. Hence, the same emission factor has been used to calculate the emission reduction under a conservative approach.

No leakage is applicable under this methodology, hence, LEy= 0

The actual emission reduction achieved during the first crediting period shall be submitted as a part of first monitoring and verification. However, for the purpose of an ex-ante estimation, following estimates has been submitted:

Net GHG Emission Reductions and Removals:

Thus,

ERy = BEy – PEy – LEy

Where:

ERy = Emission reductions in year y (tCO_2/y)BEy = Baseline Emissions in year y (tCO_2/y)PEy = Project emissions in year y (tCO_2/y) LEy = Leakage emissions in year y (tCO_2/y)

Baseline emissions include only CO_2 emissions from electricity generation in power plants that are displaced due to the project activity. The methodology assumes that all project electricity generation above baseline levels would have been generated by existing grid-connected power plants and the addition of new grid- connected power plants. The baseline emissions are to be calculated as follows:

BEy = EGPJ,y × EFgrid,y

Where,

BEy = Baseline emissions in year y (t CO_2)

EGPJ,y = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the project activity in year y (MWh)

EFgrid,y =UCR recommended emission factor of 0.9 tCO_2/MWh has been considered.

(Reference: General Project Eligibility Criteria and Guidance, UCR Standard, page 4)

No leakage is applicable under this methodology, hence, LEy= 0

The actual emission reduction achieved during the first CoU period shall be submitted as a part of first monitoring and verification. However, for the purpose of an ex-ante estimation, following calculation has been submitted:

Estimated annual baseline emission reductions (BEy) = 517694 MWh/year * 0.9 tCO_2/MWh ≈ 458272 tCO_2/year

Total emission reductions during the 1st crediting period: 458272 tCO_2

B.6. Prior History>>

The project activity is a large-scale solar project, and this project was never applied under any other GHG mechanism prior to this registration with UCR.
The capacity or the total project as a whole has not been applied for any other environmental crediting or certification mechanism. Hence project will not cause double accounting of carbon credits (i.e., COUs)

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

There is no change in the start date of crediting period. The start date of crediting under UCR is considered as 01/01/2014.
1st monitoring period: 01/01/2014 to 31/12/2024 (11 years)

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

Not Applicable

B.9. Monitoring period number and duration>>

UCR Monitored Period: 01
1st UCR Monitoring Period: 01/01/2014 to 31/12/2024 (11 years)
1st UCR Crediting Period: 01/01/2014 to 31/12/2024 (11 years)

B.10. Monitoring plan>>

Organizational & Monitoring Framework for TIL's WHRB Captive Power Plant
Trimula Industries Ltd. (TIL) has established a clear departmental and QA/QC structure to ensure accurate, transparent monitoring of its Waste Heat Recovery Boiler (WHRB) captive power system.

1. **Departmental Structure**

- **Head of Departments (HODs):** Each major function—Mechanical, Electrical & Instrumentation, Production, Quality Control, and Administration—is led by an HOD, supported by shift in-charges and support staff.
- **Mechanical & Electrical Teams:** Tasked with routine maintenance, troubleshooting and upkeep of boilers, turbines, auxiliary systems and instrumentation.
- **QA/QC Cell:** Oversees data integrity, meter calibration, audit trails and document archiving.

2. Monitoring Plan & Responsibilities

TIL's monitoring plan captures daily power generation, auxiliary consumption and net power supplied to on-site units. All raw data have been archived electronically since commissioning in January 2014. Key roles include:

- **Plant Director:** Overall accountability for adherence to the monitoring plan and quarterly review of performance reports.
- **Power Plant In-Charge:** Ensures completeness and accuracy of all metered data, oversees monthly report preparation, and coordinates with QA/QC for meter calibration.
- **Shift In-Charge:** Records hourly data in daily logs, verifies instrument operation, and flags anomalies in real time.

3. QA/QC & Data Reliability

- **Annual Calibration:** All energy meters and critical transmitters undergo yearly calibration in line with State Electricity Board guidelines. Calibration certificates are filed by the Electrical & Instrumentation Department.
- **Daily Checks:** Shift teams conduct pre-shift inspections of boilers, turbine instruments and flow meters; any deviations trigger corrective-action tickets.
- **Monthly Audits:** Data reports are reviewed by senior project engineers; discrepancies are escalated for root-cause analysis and resolution.

4. Maintenance of Monitoring Instruments

- **Instrument Upkeep:** The Electrical & Instrumentation Department maintains logs of preventive maintenance, functional tests and any corrective repairs.
- **Corrective Action Workflow:** Malfunctions are logged, assigned to responsible teams, rectified, and documented with timelines and parts replaced.

5. Emergency Preparedness

The WHRB system operates without auxiliary firing; there are no pathways for unintentional stack emissions. As such, no dedicated emissions-related emergency procedures are required beyond standard plant safety and shutdown protocols.

Data and Parameters to be monitored

Data / Parameter	EGy
Data Unit	MWh
Description	Net power supplied to manufacturing facility due to waste heat recovery
Source of Data	Calculated
Measurement Procedures (if any)	Plant operation data on power generation in project activity
Monitoring Frequency	Recording Frequency: Monthly
	Calculated based on daily gross power generation and auxiliary power consumption in the power generation plant
QA/QC Procedures	As per B.10

Data / Parameter	EG_GEN
Data Unit	MWh
Description	Gross power generation from project activity
Source of Data	Measured
Measurement Procedures (if any)	Gross power generation is measured directly using energy meter installed at the site
Monitoring Frequency	Frequency of measurement – Continuous
QA/QC Procedures	Energy meter is calibrated as per schedule
Purpose of Data	Calculation of baseline emissions

Data / Parameter	EG_AUX
Data Unit	MWh
Description	Auxiliary power consumption in project activity
Source of Data	Measured
Measurement Procedures (if any)	Auxiliary power consumption in the project activity is measured directly
Monitoring Frequency	Frequency of measurement – Continuous
QA/QC Procedures	Energy meter is calibrated as per schedule
Purpose of Data	Calculation of baseline emissions

Data / Parameter	EF_CO2,GRID,y
Data Unit	tCO_2/MWh
Description	Fixed Ex-Ante
Value(s) Applied	UCR Standard Protocol
Measurement Methods and Procedures	As per Standard
Monitoring Frequency	NA
Purpose of Data	To estimate baseline emissions
Data / Parameter	EF_CO2,GRID,y