PROJECT CONCEPT NOTE

CARBON OFFSET UNIT (CoU) PROJECT

Title: "Waste Heat Recovery based captive power generation by SKS Ispat Ltd"

Version 1.0
Date: 10/09/2025
First CoU Issuance Period: 07 Years, 0 months, 0 days
Date: 01/01/2017 to 31/12/2023

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

BASIC INFORMATION	
Title of the project activity	"Waste Heat Recovery based captive power generation by SKS Ispat Ltd"
Scale of the project activity	Large Scale
Completion date of the PCN	10/09/2025
Project participants	Project Proponent: Sks Ispat & Power Ltd UCR Aggregator**:** Viviid Emissions Reductions Universal Pvt. Ltd.
Host Party	India
Applied methodologies and standardized baselines	Methodology Applied follows UNFCCC CDM Methodologies: ACM0012 Waste Energy Recovery Version 6.0 UCR Protocol Standard Baseline
Sectoral scopes	01 Energy industries (Renewable/Non Renewable Sources) 04. Manufacturing industries
Estimated amount of total GHG emission reductions	5,15,672 CoUs (5,15,672 tCO_{2eq})

SECTION A. Description of project activity

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

The project activity titled, "Waste Heat Recovery based captive power generation by SKS Ispat Ltd" is located in Village: Siltara, District: Raigarh, State: Chhattisgarh, Country: India.

The details of the registered project are as follows:

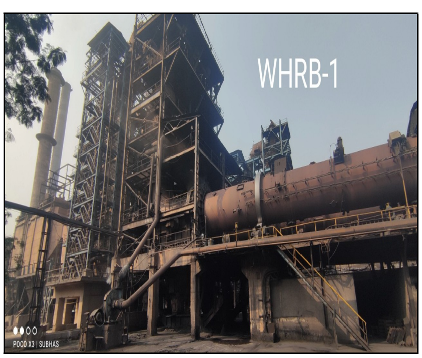
Purpose of the project activity:

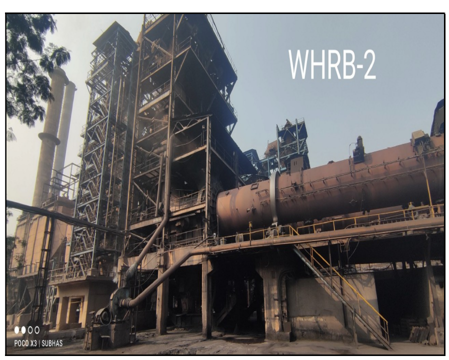
The purpose of this activity is to enhance energy efficiency, ensure operational continuity, and promote environmental responsibility by utilizing Waste Heat Recovery (WHR) systems. As industries face increasing power demands and grid supply constraints, self-sufficiency in energy generation has become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

There are 2 X 350 TPD Kiln and 2 X 100 TPD Kiln installed for sponge iron production. Waste gas coming out from 2x350 TPD DRI Kilns and 2x100 TPD DRI Kilns are recovered through 2x38 TPH and 2x12 TPH Waste Heat Recovery Boiler (WHRBs) respectively. Combined capacity of all 04 WHRBs produces about 25 MW of Electrical Power. Harnessing this Power by establishing a suitably designed Captive Power Plant at the tail end of the 4 numbers of DRI Kilns enables SKSIL to be self-reliant in the arena of Power requirement for production of Steel and to reduce emissions of greenhouse gases into the atmosphere by displacing grid power use as the case was prior project activity which is primarily fossil fuel based.

The DRI Gas, as it comes out of the After Burning Chamber, contains sufficient quantity of Heat Energy. This energy waste could be abated by installing Waste Heat Recovery Boiler at the tail end of each DRI Kiln which in fact works as a cooler for the high temperature gas. Heat that is extracted from the hot gas is utilised in transforming water to high temperature – high pressure Steam to run conventional condensing type Steam Turbo – Generator. There is a 25 MW Turbo generator to be fed by 2 x 12 TPH and 2 x 38 TPH WHRB Boilers. The temperature and pressure maintained in the boiler are 495°C and 66 kg/cm2. It has been envisaged that the Captive Power Plant will operate in synchronous mode with 132 kV grid of Chhattisgarh State Electricity Board.





Commissioning dates of WHRBs (dd/mm/yyyy)	
WHRB-1	20/04/2006
WHRB-2	20/04/2006
WHRB-3	30/06/2006
WHRB-4	30/06/2006
AFBC	02/06/2007
CFBC	06/02/2010
TG1	27/02/2006
TG2	01/09/2007
TG3	17/02/2007

The start date of the project activity is the commissioning date of the initial **WHRB** which is **27/02/2006.**

This power, from the WHRB plant, displaces equivalent amount of power from the Chhattisgarh State Electricity Board (CSEB) grid, which is part of Western Region (WR) grid in India and is primarily fossil fuel based. The project activity results in reduced carbon emissions by avoiding generation of this power in grid connected power stations.

This waste heat of flue gases is utilised in the generation of steam in (WHRB), which is further expanded in three turbines with total installed capacity 85MW (25 MW + 30 MW + 30 MW) to generate power. Steam from 04 nos. WHRBs is taken to the turbines through a common header.

The project activity is displacing an estimated annual net electricity generation i.e., **5,72,969.70** 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 are expected to be **5,15,672 tCO2e**, whereas actual emission reduction achieved during the first CoU period shall be submitted as a part of the initial UCR monitoring Period.

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

There is no reported negative impact on the groundwater table or adverse impacts on the surrounding villages of the project activity.

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.

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.

- **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.

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.

Technological Well-being

- The project serves as an example for other industries to adopt similar initiatives and achieve self-sufficiency in their power needs.

- Its success encourages technology providers and manufacturers to invest in developing and improving equipment and machinery, helping to overcome existing technological barriers for such projects.

In the absence of the project activity equivalent amount of power generation would have taken place through fossil fuel-dominated power-generating stations. The project supports clean energy and contributes positively to the following Key Sustainable Development Goals:

• SDG13: Climate Action
• SDG 7: Affordable and Clean Energy
• SDG 8: Decent Work and Economic Growth

Development Goal	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, reducing reliance on conventional energy sources. This contributes to affordable and clean energy availability, supporting 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 stimulate job creation and economic growth within industries, supporting sustained development and decent work opportunities.
Goal 13: Climate Action	13.2.1: Number of countries with national adaptation plans	By reducing greenhouse gas emissions and fuel consumption, WHR directly supports climate action initiatives aimed at combating climate change and its impacts.

A.3. Location of project activity >>

India is the host party for the project activity.
Region: Raipur
Village: Siltara
District: Raipur
State: Chhattisgarh

Total Capacity	Date of Commissioning	Site	State	Latitude	Longitude
85 MW	27/02/2006	SKSIL	Chhattisgarh	21°23'29"N	81°39'08"E

The plant is located at Siltara, which is a well-developed industrial area. The plant site is situated at about 1km from NH-6 on Bilaspur-Raipur route. Nearest railway station (7km from site) is Mandhar on Southeastern railway between Mumbai and Kolkata route.

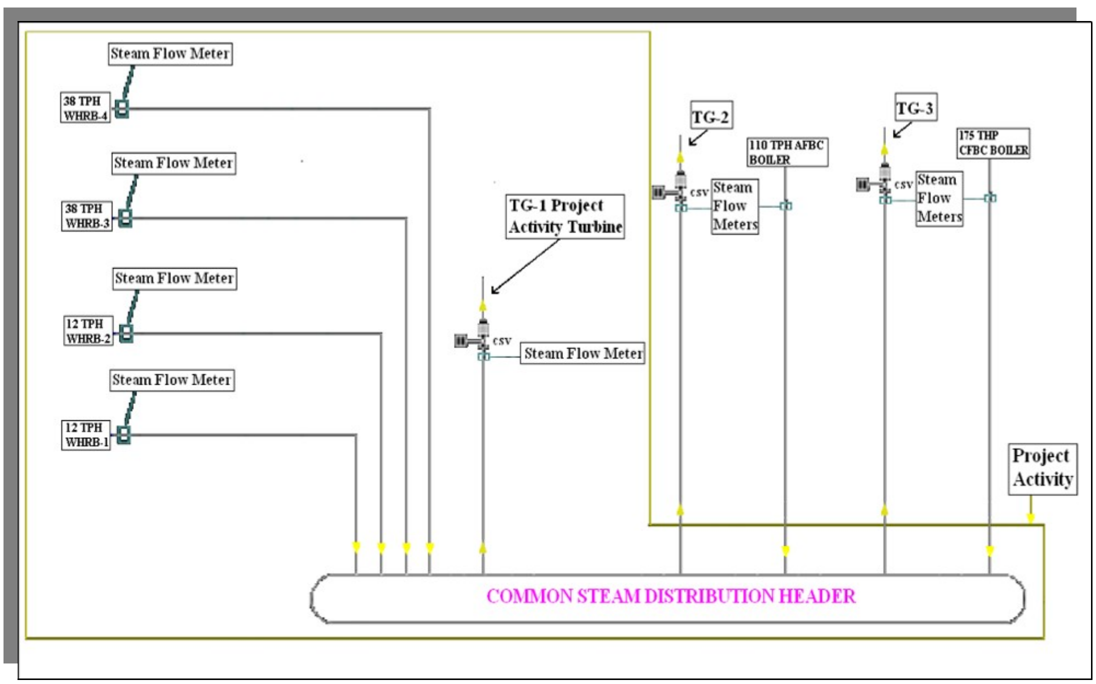
PROJECT ACTIVITY AREA

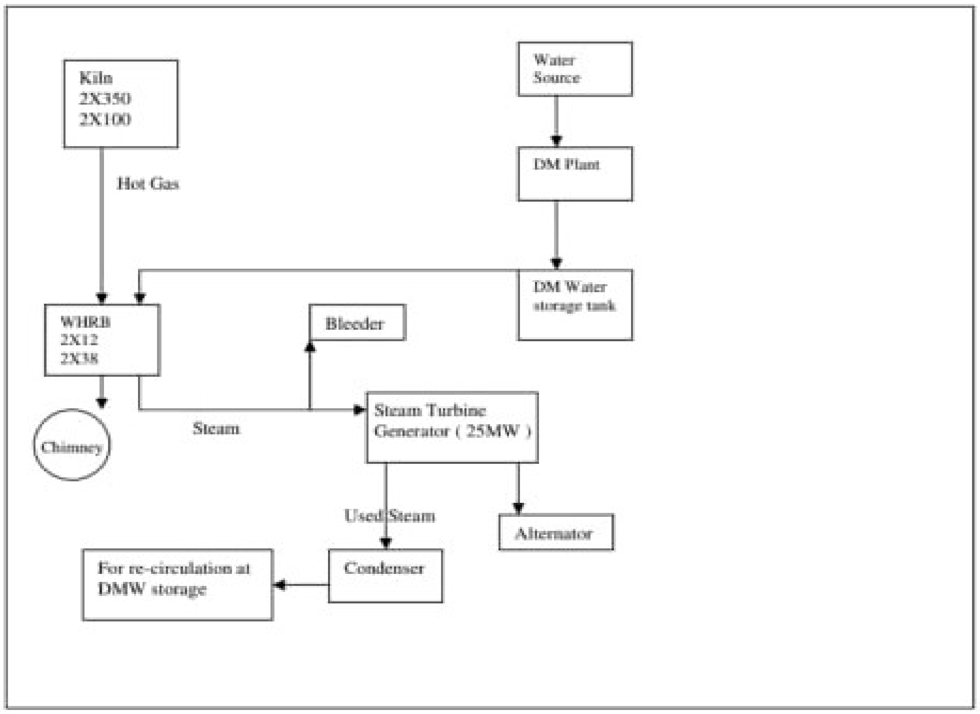
A.4. Technologies/measures >>

The DRI Gas, as it comes out of the After Burning Chamber, contains sufficient quantity of Heat - Energy. This energy waste is abated by installing Waste Heat Recovery Boiler at the tail end of each DRI Kiln which in fact works as a cooler for the high temperature gas. Heat that is extracted from the hot gas is utilised in transforming water to high temperature - high pressure steam to run conventional Condensing type Steam Turbo-Generator. There is a 25 MW Turbo-generator to be fed by 2 x 12 TPH and 2 x 38 TPH WHRB Boilers. The temperature and pressure maintained in the boiler are 495 °C and 66 Kg/cm2. It has been envisaged that the Captive Power Plant will operate in synchronous mode with 132 KV grid of Chhattisgarh State Electricity Board.

Dates of commissioning of various components of the project activity are as follows:

Equipments	Date of commissioning
TG1	27/02/2006
TG2	01/09/2007
TG3	17/02/2010
AFBC	02/06/2007
CFBC	06/02/2010
WHRB # 1	20/04/2006
WHRB # 2	20/04/2006
WHRB # 3	30/06/2006
WHRB # 4	30/06/2006





The total installed capacity of the project activity is 85MW and the auxiliary consumption as per the requirement of the auxiliary equipment at the WHRB plant is a maximum of 10%. The balance of electricity generated by the WHRB plant is captively consumed by the adjoining steel plant owned by the PP which is within the same premises as the WHRB Plant. SKSIL has installed 2 X 350 TPD Kiln and 2 X 100 TPD Kiln Waste Heat Recovery Boilers (WHRBs) for utilising high temperature heat of flue gases from DRI kilns. DRI kilns, known as Direct Reduced Iron kilns by thermal systems, is a type of kiln used in the production of sponge iron where in iron ore is reduced to iron through a rotary kiln at high temperatures (10000C). The reduction process yields carbon dioxide and carbon monoxide. These gases leave the kiln at high temperature and utilize to generate power. Direct reduction refers to processes which reduce iron oxides to metallic iron at temperatures below the melting point of iron. The product of such solid-state processes is called direct reduced iron or sponge iron.

TURBINES

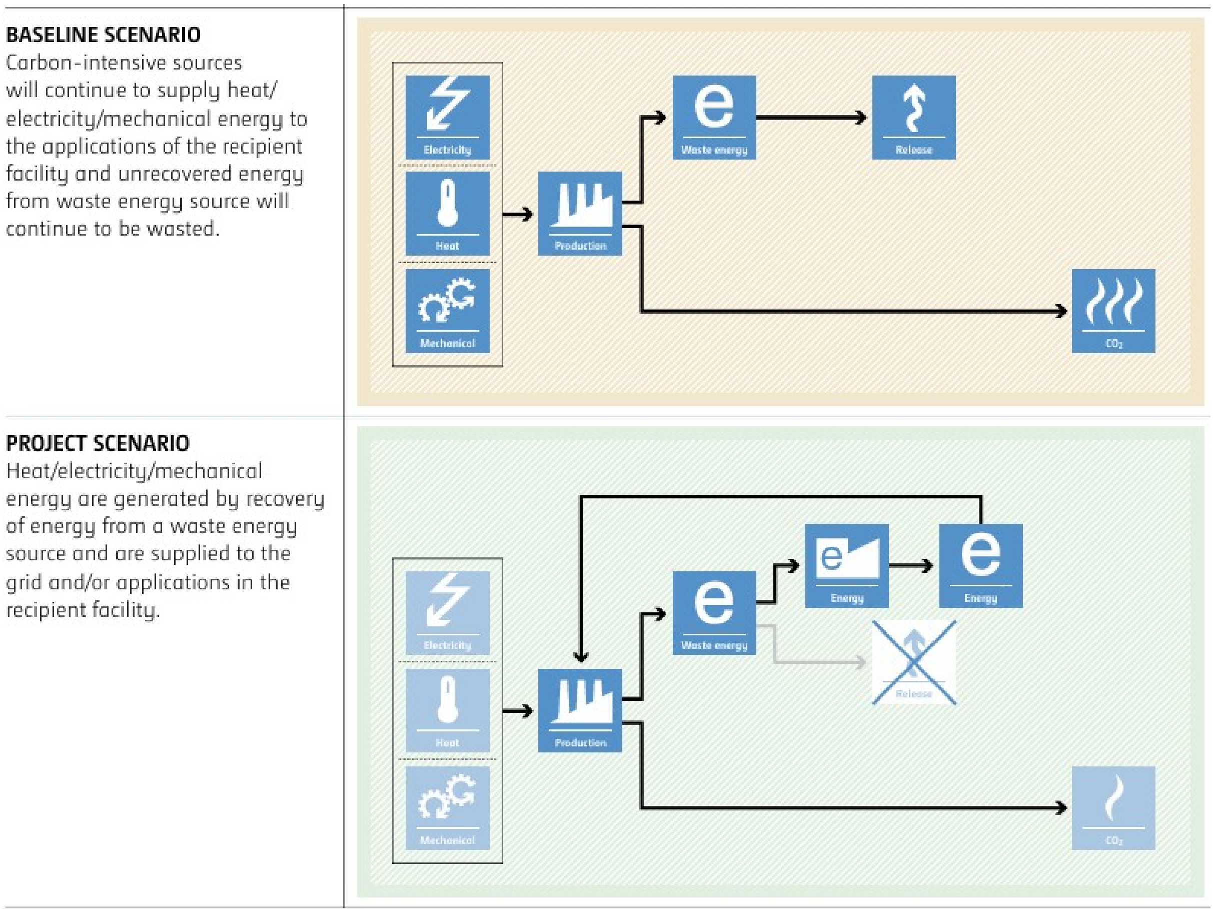
Heat that is extracted from the hot gas is utilized in the transforming water to high temperature to high pressure steam, to run conventional condensing type Steam Turbo Generator for generation of electricity as a part of forward and backward integration process.

A.5. Parties and project participants >>

Party (Host)	Participants
INDIA	Project Proponent: Sks Ispat & Power Ltd.

A.6. Baseline Emissions>>

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



UNFCCC CDM (CLEAN DEVELOPMENT MECHANISM) approved methodology ACM0012 Large-scale Consolidated Methodology Waste energy recovery Version 06.0

Typical projects
Energy from waste heat, waste gas or waste pressure in an existing or new industrial facility is recovered and used for inhouse 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.”

A coal based AFBC, and coal based CFBC boiler has been implemented in the project boundary. Sometimes in case of kiln stoppage or some other situations steam from AFBC and/or CFBC boiler could be used in the 25 MW WHRB connected turbine. In such a scenario power generation from WHRBs is based on pro-rata basis on the steam supplied by WHRBs to 25 MW turbine.

<u>Type of GHG emissions mitigation action</u>

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

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

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 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.

Thus equation 4 is as follows:

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

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)

f_{WCM} = Fraction of total electricity generated by the project activity using waste gas.

A.7. Debundling>>

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

SECTION B. Application of methodologies and standardized baselines

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

SECTORAL SCOPE – 01 Energy industries (Renewable/NonRenewable 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 >>

The Project Activity 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 85 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 Chhattisgarh Power CSEB, 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.

Baseline	Source	GHG	Included?	Justification/Explanation
	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 the flue gases from DRI kilns for power generation. Project activity does not entail use of fossil fuels in the project activity. The emissions from on-site diesel consumption negligible and are excluded for simplification. This is conservative & Will be monitored at verification.
		CH_4	Excluded	Excluded for simplification. This is conservative
		N_2O	Excluded	Excluded for simplification. This is conservative

PE_y = Project emissions in year y (tCO_2/y)

The project emissions, if any, due to the usage of fossil fuel (diesel) are calculated as follows:

$PE_y = Q_i \cdot COEF_i \cdot NCV_i \cdot OXID$

Where:

PE_y = project emissions in year y, tCO_2e
Q_i = mass of fossil fuel combusted, t
$COEF_i$ = emissions factor of fossil fuel combusted, tCO_2/TJ
NCV_i = net calorific value of fossil fuel combusted, TJ/t
OXID = oxidation factor, %
PE_y = 0 tCO_2

Thus, $ER_y = BE_y – PE_y – LE_y$

Where:

ER_y = Emission reductions in year y (tCO_2/y)
BE_y = Baseline Emissions in year y ($t\ CO_2/y$)
LE_y = Leakage emissions in year y (tCO_2/y

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

Baseline emissions include only CO_2 emissions from electricity generation in power plants that are displaced due to the project activity.

(a) **Case 1 a:** 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.

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

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 (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* ($t\ CO_2/MWh$).

- **F_{WCM}** = Fraction of total electricity generated by the project activity using waste gas.

And

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

Where:

- **$ST_{whr,y}$** = Energy content of the steam generated in waste heat recovery boiler fed to turbine via common steam header.

- **$ST_{other,y}$** = 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 UNFCCC CDM methodology and instead shall be determined following the guidance provided by the UCR

CoU protocol for conservativeness.

Power Gen Cap Capacity	MW	85
Auxillary power Consumption	%	10%

Estimated Annual Baseline Emission Reductions: $BE_{EL,j,y} = fw_{CM} (EG_{BL,y} \times EF, CO_{2}, GRID, y)$

$BE_{EL,j,y}$ = 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)
fw_{CM} = Fraction of total electricity generated by the project activity using waste gas.

EF_{Grid}, CO_2, y = CO_2 emission factor of the grid in year y (t CO2/MWh) as determined by the UCR Standard for the 2015-2022 period

A "grid emission factor" refers to a CO_2 emission factor (tCO_2/MWh) which will be associated with each unit of electricity provided by an electricity system. The UCR recommends an emission factor of 0.9 tCO_2/MWh for the 2015-2021 years as a fairly conservative estimate for Indian projects not previously verified under any GHG program. Also, for the vintage 2021-22, the combined margin emission factor calculated from CEA database in India results into same emission factors as that of the default value. Hence, the same emission factor has been considered to calculate the emission reduction.

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 have been submitted:

	Net Electricity Generation	**Emission factor**	**Estimated Baseline Emission**	**Estimated Project Emission**	**Estimated Lekage Emission**	**Estimated Emission Reduction**
	EGy (MWh)	**EFy (tCO2/MWh)**	**in tones of CO_2 e**	**in tones of CO_2 e**	**in tones of CO_2 e**	**in tones of CO_2 e**
Year 1	5,72,970	0.9	5,15,672	535	0	5,15,137
Year 2	5,72,970	0.9	5,15,672	535	0	5,15,137
Year 3	5,72,970	0.9	5,15,672	535	0	5,15,137

Year 4	5,72,970	0.9	5,15,672	535	0	5,15,137
Year 5	5,72,970	0.9	5,15,672	535	0	5,15,137
Year 6	5,72,970	0.9	5,15,672	535	0	5,15,137
Year 7	5,72,970	0.9	5,15,672	535	0	5,15,137
Year 8	5,72,970	0.9	5,15,672	535	0	5,15,137
Year 9	5,72,970	0.9	5,15,672	535	0	5,15,137
Year 10	5,72,970	0.9	5,15,672	535	0	5,15,137
Total estimated reductions (tCO_{2e})	**57,29,697**	0.9	**51,56,727**	**5350**	**0**	51,51,370
Annual Average	**5,72,969.70**		**5,15,672**	**973**	**0**	5,15,137

Estimated annual baseline emission reductions (BEy) (2017-2023) =**5,72,969.70 MWh**/year * 0.9 tCO2/MWh ≈ **5,15,672 tCO_2/year**

B.6. Prior History>>

"The project activity was previously registered as a UNFCCC CDM Project activity ID 0674[1] until 2016. Under the UCR program, the project is now being considered for the crediting period from 01/01/2017.

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 01/01/2017

1st monitoring period: 01/01/2017 to 31/12/2023 (07 Years)

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>>

First Issuance Period: 7 years 0 months 0 days – 01/01/2017 To 31/12/2023

[1] CDM: "Waste Heat Recovery based captive power generation by SKS Ispat Ltd"

B.8. Monitoring plan>>

Data and Parameters fixed ex ante:

Data / Parameter :	EF $_{elec,i,j,y}$
Data unit :	tCO_2/MWh
Description	CO_2 emission factor for the electricity source (pet coke-based power plant), displaced due to the project activity, during year y in tons CO2/MWh
Measured/calculated/ default	Calculated
Value applied	0.9
Source of data	Measured
Calculation method (if applicable)	Not Applicable
QA/QC procedures	Not Applicable
Purpose of data/parameter	For the calculation of baseline emissions

Data parameter	EF $_{CO2,\ is,j}$
Data unit	tCO2/TJ
Description	The CO2 emission factor per unit of energy of the fossil fuel in the baseline generation source (pet coke-based power plant)
Measured/calculated/ default	Default
Source of data	The IPCC default value for the emission factor of petroleum coke has been applied. Site specific data is not applied as there has been no assessment of emission factor for the fuel procured by the project participant. Country specific data for emission factor of petroleum coke is also not available.
Value(s) of monitored parameter	97.5
Calculation method (if applicable)	Not Applicable

Data / Parameter:	CO$_{EFi}$
Data unit	tCO2/TJ
Description:	Emission factor of fossil fuel combusted (Diesel in DG sets)
Source of data:	Measured

Value/Measurement procedures (if any):	IPCC 2006 (Table 1.4, page 1.23) 74.80 20. 2 =20.2 * 44/12 =74.1 tCO2/TJ For calculation of project emission the upper value (95% confidence level) i.e. 74.80 is taken
Monitoring frequency:	Yearly
QA/QC procedures:	Data from IPCC
Purpose of Data	-Calculation of Project emissions

Data / Parameter:	NCVi
Data unit:	TJ/kt
Description:	Net calorific value of fossil fuel combusted (Diesel in DG sets)
Source of data:	IPCC value has been used since Indian National communication refers to IPCC. IPCC 2006 (Table 1.2, page 1.18)
Value/Measurement procedures (if any):	43.3
Monitoring frequency:	Monthly
QA/QC procedures:	Data from IPCC
Purpose of Data	-Calculation of Project emissions

Data / Parameter:	Q OE,BL
Data unit:	TJ
Description:	Output/intermediate energy that can be produced (TJ), to be determined on the basis of maximum recoverable energy from the WECM, which would have been released (or WECM would have been flared or energy content of WECM would have been wasted) in the absence of CDM project activity.
Value applied	0.1681
Source of data:	Technical assessment
Any comment:	-
Purpose of Data	For Calculation of baseline emissions

Data and parameters ex-post:

Data / Parameter	Qi
Data unit:	Tonnes
Description:	Mass of fossil fuel consumed (Diesel in DG sets)
Source of data:	Measured
Measurement procedures (if any):	Diesel stock registers. The fossil fuel consumed is measured in litres which are then converted to tonnes using the density of diesel as 0.00086 tonnes/litre Source of density: http://www.iocl.com/Products/DieselSpecifications.pdf
Monitoring frequency	Recording frequency: Monthly litre*0.00086 tonnes/litre
QA/QC procedures:	Data is taken from purchase records, adjustments made for stock of fuel onsite
Purpose of Data	-Calculation of Project emissions

Data / Parameter:	$Quantity_{other}$
Data unit:	Tonnes
Description:	Quantity of steam from AFBC/CFBC boiler
Source of data:	Measured
Measurement procedures (if any):	Plant Records
Monitoring frequency:	Type: Differential pressure transmitter, Calibration frequency: Annually
QA/QC procedures:	Taken from calibrated meters through the DCS system. DCS records actual temperature (for steam and feedwater) and pressure (for the steam only) every second and this data is archived for the verifier to test the results of the DCS
Purpose of Data	-Calculation of Baseline emissions

Data / Parameter	$Quantity_{whr1,\ whr2,\ whr3,\ whr4}$
Data unit:	Tonnes
Description:	Quantity of steam from waste heat boiler 1,2,3 & 4
Source of data:	Measured
Monitoring frequency:	Type: Differential pressure transmitter,

	Calibration frequency: Annually
QA/QC procedures:	Taken from calibrated meters through the DCS system. DCS records actual temperature (for steam and feedwater) and pressure (for the steam only) every second and this data is archived for the Verifier to test the results of the DCS
Additional comments	Total Generation will get considered

Data/Parameter	QT_{G1}, QT_{G2}, QT_{G3}, QT_{G4}
Unit	Tonnes
Description	Steam Quantity supplied by WHRB1, WHRB2, WHRB3, WHRB4 ,AFBC & CFBC
Measured/calculated/ default	Measured
Source of data	Plant Data
Value(s) of monitored parameter	-
Measuring/reading/recording frequency	Measuring Frequency: Continuously Recording: Daily Reporting: Monthly
QA/QC procedures	Steam flow meter is calibrated annually.
Additional comments	Steam flow meter is installed at TG1, TG2, TG3, TG4 inlet.

Data / Parameter:	$Quantity_{csh}$
Data unit	Tonnes
Description:	Quantity of steam entering the common steam header from AFBC boiler
Source of data:	Calculated
Monitoring frequency:	Monthly
QA/QC procedures:	Calculated as Quantity other – Quantity 10 MW
Purpose of Data	-Calculation of Baseline emissions

Data / Parameter:	EG ,y
Data unit:	Mwh
Description:	Net power supplied in project activity
Source of data:	Calculated
Value/Measurement procedures (if any):	Plant operation data on power generation in project activity
Monitoring frequency:	Frequency of measurement – countinous
QA/QC procedures:	-
Purpose of Data	-Calculation of baseline emissions = EG GEN-EG AUX

Data/Parameter	EG $_{i,j,y}$
Unit	MWh
Description	Quantity of electricity supplied to the recipient j by generator, which in the absence of the project activity would have sourced from pet coke-based power plant during the year y in MWh
Measured/calculated/ default	Calculated
Monitoring equipment	Default values for Carbon Emission Factor of Natural Gas as per Table 1.3 2006 IPCC Guidelines for National Greenhouse Gas Inventories, (Chapter 1, Volume 2, Energy) has been considered. This is also in conformity with the recommendations of the Initial National Communication (Chapter 2) where in it is mentioned that in the case of petroleum products and natural gas, the use of default emissions would be fairly accurate due to relatively low variation in quality of these fuels across the globe, as compared to coal. This data is recorded annually based on latest IPCC information available and archived in electronic/paper form. Archived data will be kept up to two years from the end of crediting period or the last issuance, whichever occurs later.
Value applied	657854.1 Mwh
Measuring/reading/recording frequency	Daily
Calculation method (if applicable)	The quantity of electricity supplied would be calculated from measured values as follows: EG i,j,y = EG gross,y – E aux,,y Where: EG gross,,y = Gross electricity generated by the project activity in year y in

	MWh E aux,y = Auxiliary electricity consumed by the project activity in year y in MWh Energy meters of 0.2 accuracy class or better, would be used for monitoring of gross electricity generated and auxiliary electricity consumed. The data would be monitored on a daily basis and monthly records would be maintained in power plant log books
QA/QC procedures	The energy meters used for monitoring of gross electricity generation and auxiliary electricity generation are calibrated on an annual basis. The total electricity generated would be cross checked by accounting for the total electricity received by the recipient facility.
Purpose of data/parameter	For the calculation of baseline emissions
Source of data	Power Plant logbooks
Additional comments	The data will be archived until 2 years after the end of crediting. This will be monitored ex-ante. Since the electricity generated would be used for captive consumption, sales records / purchase receipts cannot be used for cross checking purposes

Data/Parameter	**EG** $_{gross,y}$
Unit	MWh
Description	Electricity generated by the project activity in year y
Measured/calculated/ default	Measured
Source of data	Power plant logbooks
Value(s) of monitored parameter	-
Monitoring equipment	Energy Meters
Measuring/reading/recording frequency	Monitoring: Daily Recording: Monthly
Calculation method (if applicable)	Not Applicable
QA/QC procedures	The energy meters used for monitoring of gross electricity are calibrated on an annual basis.

Purpose of data/parameter	For the calculation of baseline emissions

Data/Parameter	$E_{aux, y}$
Unit	MWh
Measured/calculated/ default	Measured
Source of data	Power plant logbooks
Value(s) of monitored parameter	70,737.00
Monitoring equipment	Energy Meters
Measuring/reading/recording frequency	Monitoring: Daily Recording: Monthly
Calculation method (if applicable)	Not Applicable
QA/QC procedures	The energy meters used for monitoring of auxiliary electricity consumption are calibrated on an annual basis
Purpose of data/parameter	For the calculation of baseline emissions

Data/Parameter	$Q_{OE, y}$
Unit	TJ
Description	Quantity of output energy generated during year y
Measured/calculated/ default	Measured
Source of data	Plant records
Monitoring equipment	Integrated flow meters would be used to measure the steam flow rate, temperature and pressure of steam generated in waste heat recovery boilers
Value applied	2368.27476
Measuring/reading/recording frequency	Monitoring: Daily Recording: Monthly
Calculation method	The output energy would be calculated using steam tables for determination of steam

	enthalpy. Output energy would be calculated on a daily basis as: Output energy = Steam generated from WHRBs * (Average steam enthalpy - Average feed water enthalpy)
QA/QC procedures	The monitoring meters undergoes maintenance/calibration to the industry standards.
Purpose of data/parameter	For cross checking of baseline emissions