PROJECT CONCEPT NOTE

CARBON OFFSET UNIT (CoU) PROJECT

Title: 20.5 MW Waste Heat to Power Bundled Project by M/s. Panoli Intermediates (India) Pvt Ltd. in Gujarat, India

Version 1.0

Date 29/07/2024

First CoU Issuance Period: 06 Years

Date: 24/05/2018 to 30/06/2024

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

BASIC INFORMATION	
Title of the project activity	20.5 MW Waste Heat to Power Bundled Project by M/s. Panoli Intermediates (India) Pvt Ltd. in Gujarat, India
Scale of the project activity	Large Scale
Completion date of the PCN	29/07/2024
Project participants	Advait Greenergy Private Limited (Represntator) M/s. Panoli Intermediates (India) Pvt Ltd. (Developer)
Host Party	India
Applied methodologies and standardized baselines	Applied Methodologies: UNFCCC Approved Large Scale Consolidated Methodology "ACM0012, Waste Energy Recovery", Version – 06.0 Standardized Baselines: N/A
Sectoral scopes	01 Energy industries (Renewable/NonRenewable Sources) 04 Manufacturing Industries
Estimated amount of total GHG emission reductions	80,811 CoUs/Year (80,811 tCO_2e/Year)

SECTION A. Description of project activity

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

The project activity titled, "20.5 MW Waste Heat to Power Bundled Project by M/s. Panoli Intermediates (India) Pvt Ltd. (PIPL) in Gujarat, India", is in Nandesari Village of Vadodara District of Gujarat State of India. The project is an operational activity with continuous reduction of GHG, currently being applied under "Universal Carbon Registry" (UCR).

Purpose of the project activity:
The project activity is developed by M/s. Panoli Intermediates (India) Pvt Ltd., which will recover waste heat from sulphuric acid production process to produce electricity, displacing part of electricity supplied by the Indian Grid which predominantly relies on fossil fuel-fired power plants for power generation.

A Heat Recovery System (HRS) will be installed to recover the waste heat, and the steam generated by HRS will be exported to turbine to generate electricity. The power generation capacity is 20.5 MW, and 89,790 MWh/yr electricity is generated, and it is expected to reduce the GHG emissions about 80,811 tCO_2e over the full crediting period of the project activity by avoiding CO_2 emissions from electricity generation in fossil fuel power plants connected into the Indian Grid.

The project activity is a bundled project activity of total capacity of 20.5 MW (6.5 MW 14 MW), and was installed & operated in Nandesari Village of Vadodara district in the Indian state of Gujarat are per details listed below:

Project Developer	Capacity (MW_{AC})	Commissioning Date	Location
M/s. Panoli Intermediates (India) Pvt. Ltd.	6.5	24/05/2018	Nandesari Village, Vadodara District
	14	18/08/2021	

The start date of the project activity is the earliest commissioning date among both WHRS's, which is 24/05/2018. The power generated from the waste heat recovery system, displaces equivalent amount of power from the Indian grid. The project activity results in reduced carbon emissions by avoiding generation of this power in coal-based (fossil fuel based) grid connected power stations.

Type of GHG emissions mitigation action	**Energy efficiency: Waste energy recovery to displace more-carbon intensive energy/ technology.**

The generation of power from waste heat recovery system is a clean technology as there is no fossil fuel fired or no GHG gases are emitted during the process. Thus, project activity leads to reduce the GHG emissions. As per the ex-ante estimate, the project will generate approximately 89,790 MWh of electricity per annum. The estimated annual average and the total CO_2e emission reduction by the project activity is expected to be 80,811 tCO_2e per annum for the full crediting period of the project activity, whereas actual emission reduction achieved during the first CoU period shall be submitted as a part of first monitoring and verification.

Since the project activity generates electricity through waste heat recovery system, a clean renewable energy source it will not cause any negative impact on the environment and thereby contributes to climate change mitigation efforts.

Project's Contribution to Sustainable Development

This project is a greenfield activity where grid power is the baseline. Indian grid system has been predominantly dependent on power from fossil fuel powered plants. The renewable power generation is gradually contributing to the share of clean & green power in the grid; however, grid emission factor is still on higher side which defines grid as distinct baseline.

Being an environmentally sound project, the Project will not only supply carbon-free electricity by means of utilization of waste gas, but also contribute to sustainable development of the local community, the host country and the world by means of:

- Reducing GHG emissions compared to a business-as-usual scenario;
- Reducing energy waste and facilitating the technology development of integrated resource utilization in sulfuric acid industry;
- Reducing the emission of other pollutants resulting from the power generation industry in India, compared to a business-as-usual scenario;
- Generated employment for local people during construction and operation of the Project.

The Government of India has stipulated following indicators for sustainable development in the interim approval guidelines for such projects which are contributing to GHG mitigations. The Ministry of Environment, Forests & Climate Change (MoEFCC), has stipulated economic, social, environment and technological well-being as the four indicators of sustainable development. It has been envisaged that the project shall contribute to sustainable development using the following ways:

Social well-being:

There have been good employment opportunities created for the local workforce during the project construction phase. The project after implementation has also continued to provide employment opportunities for the local populace in a sustained manner and the same would be continued over the project lifetime. The employment opportunities created will contribute towards alleviation of poverty in the surrounding area throughout the lifetime of the project activity.

Economic well-being:

The project is a clean technology investment decided based on carbon revenue support, which signifies flows of clean energy investments into the host country. The project activity requires temporary and permanent, skilled and semi-skilled manpower at the project location; this will create additional employment opportunities in the region. In addition, success of these kind of project will provide new opportunities for industries and economic activities to be setup in the area. Apart from getting better employment opportunities, the local people will get better prices for their land, thereby resulting in overall economic development.

Technological well-being:

The successful operation of project activity would lead to promotion of waste heat recovery (WHR) based power generation and would encourage other entrepreneurs to participate in similar projects. Increased interest in WHR energy projects will further push R&D efforts by technology providers to develop more efficient and better machinery in future. The project activity leads to the promotion and demonstrates the success of WHR projects in the region which further motivate more investors to invest in these type of power projects. Hence, the project activity leads to technological well-being.

Environmental well-being:

The project activity will generate power using zero emissions WHR based power generation facility which helps to reduce GHG emissions and specific pollutants like SOx, NOx, and SPM associated with the conventional thermal power generation facilities. The project utilizes waste heat energy for generating electricity which is a clean source of energy. It reduces the dependence on fossil fuels and conserves natural resources which are on the verge of depletion. The impact on land, water, air and soil is negligible. Thus, the project causes no negative impact on the surrounding environment contributing to environmental well- being.

With regards to ESG credentials:
At present specific ESG credentials have not been evaluated, however, the project essentially contributes to various indicators which can be considered under ESG credentials. Some of the examples are as follows:

Under Environment:
Environmental criteria may include a company's energy use, waste, pollution, natural resource conservation, and treatment of waste & animals etc. For PP, energy use pattern is now based on clean energy due to the project and it also contributes to GHG emission reduction and conservation of depleting energy sources associated with the project baseline. Also, the criteria can be further evaluated based on any environmental risks which the company might face and how those risks are being managed by the company. Here, as the power generation will be based on waste heat recovery system, the risk of environmental concerns associated with non-renewable power generation and risk related to increasing cost of power etc. are now mitigated. Hence, project contributes to ESG credentials.

Under Social:
Social criteria reflect on the company's business relationships, qualitative employment, working conditions regarding its employees' health and safety, interests of other stakeholders' etc. With respect to this project, the PP has robust policies in place to ensure equitable employment, health & safety measures, local jobs creation etc. Also, the organizational CSR activities directly support local stakeholders to ensure social sustainability. Thus, the project contributes to ESG credentials.

Under Governance:
Governance criteria relate to overall operational practices and accounting procedure of the organization. With respect to this project, the Project Proponent practices a good governance practice with transparency, accountability and adherence to local and national rules & regulations etc. This can be further referred from the company's annual report. Also, the project activity is a waste heat recovery project owned and managed by the PP for which all required NOCs and approvals are received. The electricity generated from the project can be accurately monitored, recorded and further verified under the existing management practice of the company. Thus, the project and the proponent ensure good credentials under ESG.

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

An Environment Impact assessment study for the project activity and facility was done prior to operations commencement. The impact of project activity was considered on the environment.

The project activity will also achieve;

- Improvement of local environment through particulate emission reduction.
- Technological up – gradation.
- Fulfilling power requirement without adding to the transmission and distribution losses of the grid, as the power will be consumed at the place where it will be generated, and PP will not import power from the grid.
- Reducing the difference between demand and supply of power locally.
- Sustainable –economic growth.

A.3. Location of project activity >>

Project Proponent	M/s. Panoli Intermediates (India) Pvt Ltd.	
Project Capacity (MW_{AC})	6.5	14
Country	India	India
District	Vadodara	Vadodara
Village	Nandesari	Nandesari
Tehsil	Vadodara	Vadodara
State	Gujarat	Gujarat
Pin Code	391340	391340

The representative location map is included below:

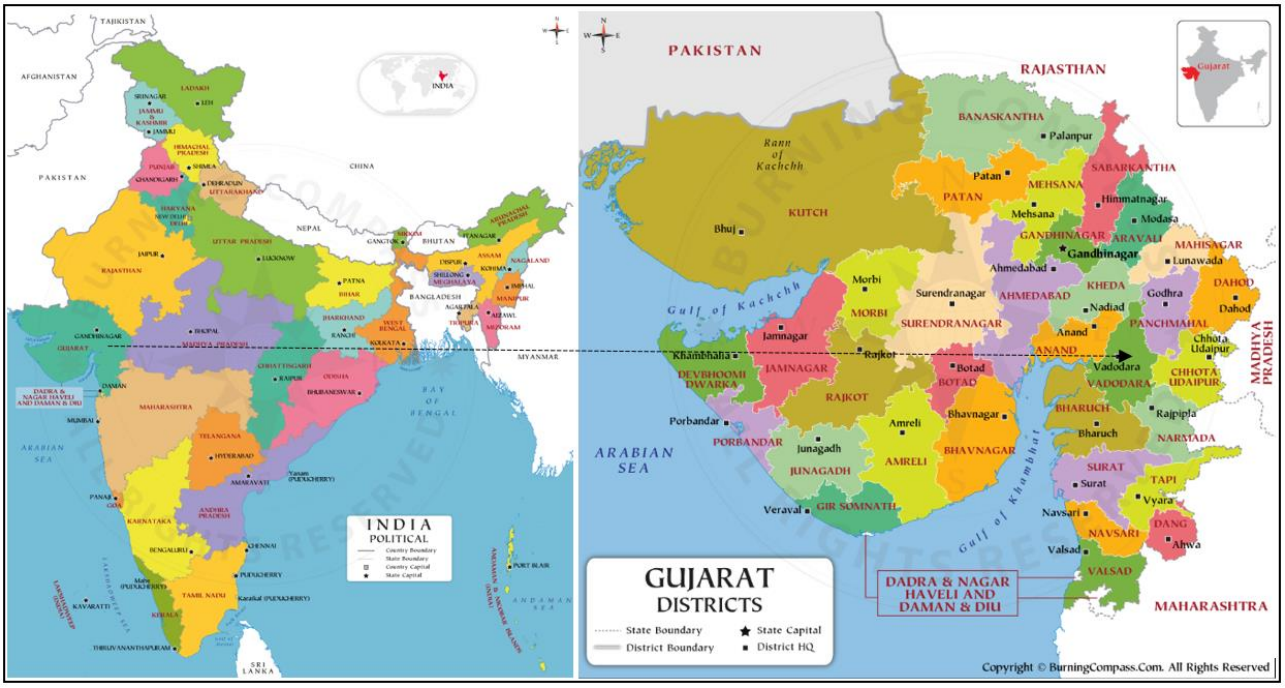

Figure 1: Project Location

(Courtesy: google images, www.burningcompass.com)

A.4. Technologies/measures >>

The Waste Heat Recovery (WHR) based Captive Power Plant is installed at PIPL site with a total capacity of 20.5 MW power generation. The process involved in the project activity includes a boiler and a turbine. The boiler generates steam at high pressure and high temperature. The steam turbine converts the heat energy of steam into mechanical energy. The generator then converts the mechanical energy into electric power.

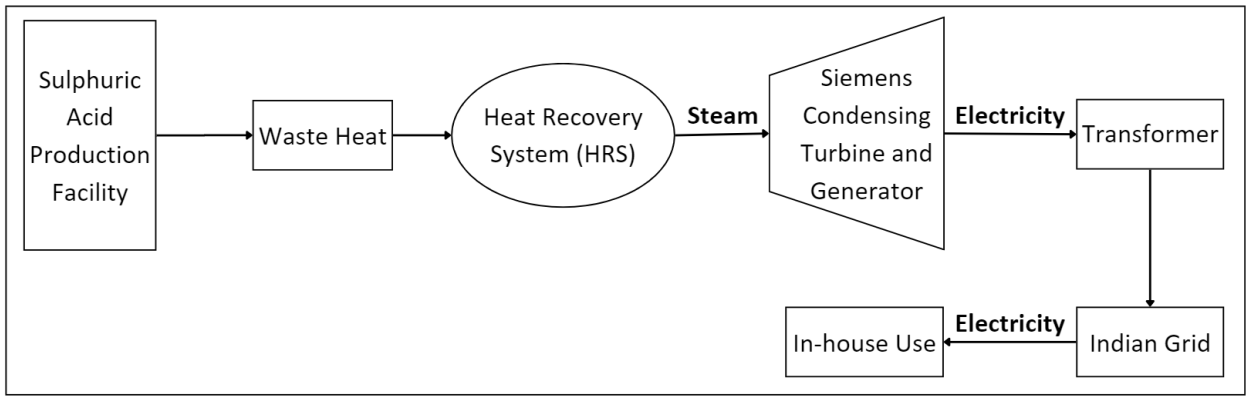

Figure 2: Technique Process

In the project activity, the waste heat from sulphuric acid production processes will be recovered by HRS to generate steam for turbine. The technology is proven to be reliable, which involved HRS systems and auxiliary equipment and the monitoring instrumentation.

Siemens Turbine Units can generate power with high efficiency. The turbine can turn steam's enthalpy to power so efficiently that the exhaust steam at the indicated exhaust pressures and temperatures may contain as much as 10-20% water (condensed steam) depending on partial or full load and exhaust pressure. For high efficiency condensing turbines like this kind, water content in the exhaust steam is typical. For a simple explanation, there is water entrained because the turbine has extracted enough power from the steam that some steam has condensed before being exhausted to the condenser.

In the project activity, monitoring equipment installed at the time of plant installation or plant commissioning.

A) Details of the installation of monitoring equipments at 6.5 MW capacity plant are;

Equipments	**Make**	**Capacity**	**Serial No.**	**Voltage Level/ Voltage ratio (KV)**
Transformer	Prolec GE	2500.0 KVA	IT-53842	11/0.433
HT Breaker	Seimens	800.00 AMP	NB 30205	12.0
Transformer	Prolec GE	2500.0 KVA	IT-53843	11/0.433
HT Breaker	Seimens	800.00 AMP	N8 30203	12.0
HT Motor	Jeumont	1400.0 KW	IA 1053_20_01	11
HT Motor	Jeumont	730.0 KW	IA 1053_10_01	11
No.	**Particular**	**CGP**		
		Engine	**Alternator**	**Energy Meter**
1	Make	Triveni Turbine Ltd	TDPS	Secure
2	Capacity	8500.00 KW	6125.0 KVA	-----
3	Sr. No.	TST-2060-181	T-04143	XC451758
4	Volt	-----	11000	11.0
5	Amp.	-----		
6	RPM	8226	-----	-----

7	C.T. Ratio	-----	-----	500/5-5A
8	P.T. Ratio	-----	-----	11000/110
9	Dial M.F.	-----	-----	1.0
10	Final M.F.	-----	-----	1.00
11	Reading	-----	-----	5
12	Seel No. of Terminal Cover	-----	-----	1471001.02
13	Seel No. of MMB	-----	-----	1066395.96

B) Details of the installation of monitoring equipments at 14 MW capacity plant are;

Equipments	**Make**	**Capacity**	**Serial No.**	**Voltage Level/ Voltage ratio (KV)**
Transformer	Indo Tech	3000.0 KVA	IT-55507	11/0.433
HT Breaker	Seimens	1250.00 AMP	NB 40665	11.0
Transformer	Indo Tech	3000.0 KVA	IT-55508	11/0.433
HT Breaker	Seimens	1250.00 AMP	NB 39150	11.0
HT Motor	Jeumont	730.0 KW	IA 1140_M10_01	11
HT Motor	Jeumont	2300.0 KW	IA 1140_M20_01	11
No.	**Particular**	**CGP**		
		Engine	**Alternator**	**Energy Meter**
1	Make	Siemens	TD Power Systems	Secure
2	Capacity	1400.00 KW	17500.0 KVA	-----
3	Sr. No.	3,21,19,686	T-05210	X1576928
4	Volt	-----	11000V	11.0
5	Amp.	-----		
6	RPM	9400	-----	-----
7	C.T. Ratio	-----	-----	1200/5
8	P.T. Ratio	-----	-----	11000/110
9	Dial M.F.	-----	-----	1.0
10	Final M.F.	-----	-----	1000.00
11	Reading	-----	-----	45
12	Seel No. of Terminal Cover	-----	-----	7643292
13	Seel No. of MMB	-----	-----	7643295

A.5. Parties and project participants >>

Party (Host)	Participants
Government of India	Advait Greenergy Private Limited (Represntator) M/s. Panoli Intermediates (India) Pvt Ltd. (Developer)

A.6. Baseline Emissions>>

Project activity is the installation of waste heat recovery system for power generation of total capacity of 20.5 MW. 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 an 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 generated from the connected/ new power plants in the Indian grid, which are/ will be predominantly based on fossil fuels[1], hence baseline scenario of the project activity is the electricity obtained from the Indian grid. Since the project activity involves power generation from recovered waste heat, hence it does not emit any emissions in the atmosphere.

Schematic diagram showing the baseline and project scenario:

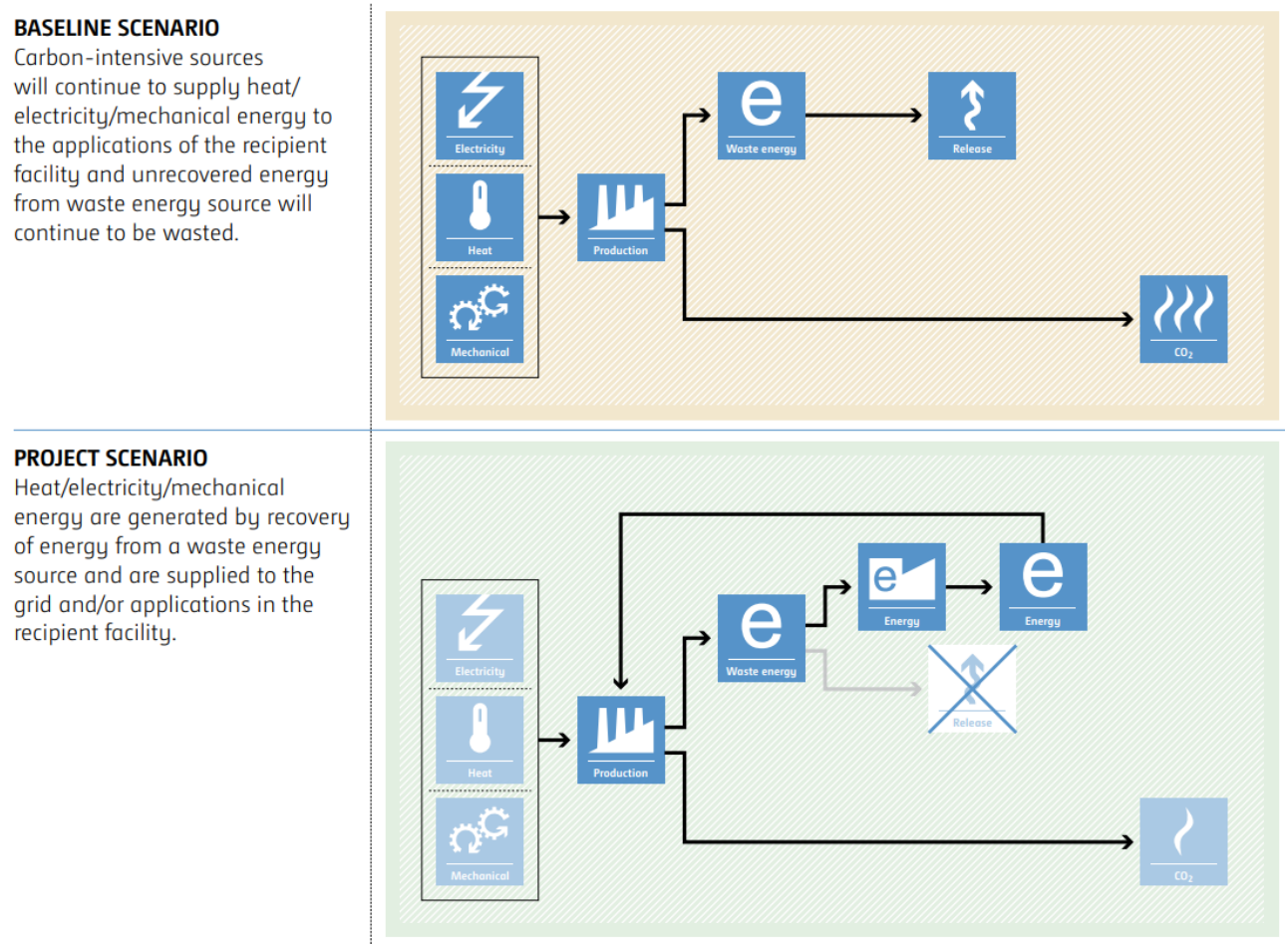

Figure 3: Baseline and Project Scenario

[1] http://www.cea.nic.in/installed_capacity.html

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;

$BE_{EL,j,y}$ = Baseline emissions corresponding to the electricity supplied in year y by the project activity to the recipient facility j as per case (1a) and case (1b) described below during the year y (tCO_2)

$EG_{i,j,y}$ = 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 ($t\ CO_2/MWh$)

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/Non-renewable sources)
04, Manufacturing Industries

TYPE : III – Energy Efficiency

CATEGORY : ACM0012, CDM approved Large-scale Consolidated Methodology **Waste energy recovery, Version 6.0**[2]

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

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. The project status is corresponding to the methodology ACM0012, version 6.0 and applicability of methodology is discussed below:

Applicability Condition	Justification
1) The useful energy generated from the utilization of waste energy carried in the WECM stream(s) for a project activity may be one or a combination of the below: a) Generation of electricity; b) Cogeneration; c) Direct use as process heat source in as unit process/chemical reactor; d) Generation of heat in element process; e) Generation of mechanical energy; or f) Supply of heat of reaction with or without process heating.	The useful energy generated from the utilization of waste energy carried in the WECM stream will be used for generation of electricity in project scenario.
2) In the absence of the project activity, the following situations for the WECM stream(s) would occur: a) WECM would not be recovered and therefore would remain unutilized (e.g. flared or released to the atmosphere) at the existing or Greenfield WEG facility; or b) WECM would be partially recovered and/or recovered in less efficient equipment of recipient facility, and the unrecovered portion of WECM stream would remained unutilised at the existing or Greenfield WEG facility. In this case, the type of useful energy produced from this WECM by the project activity shall be the same type of useful energy that is produced in the absence of project activity implementation using partially recovered	In absence of the project activity, the WECM carrying the waste heat would have been vented to atmosphere after passing through ESP and cooling tower (a) released to atmosphere.

[2] https://cdm.unfccc.int/UserManagement/FileStorage/3KHXY4AC52ILPV6URQB0E1TONWM789

WECM and/or less efficient use of WECM (e.g. if the WECM is partially used to produce electricity in the absence of project activity then the methodology is only applicable if the WECM is recovered in the project to produce electricity).	
3) This methodology applies to the following two categories of project activities: a) Category 1: Project activities that involve recovery of WECM as per situation in paragraph 4(a) above; and b) Category 2: Project activities that involve enhanced/improved energy recovery of the WECM as compared to the baseline scenario as per situation in paragraph 4(b) above.	The project applies to condition (a) i.e. Category 1.
4) Project activities under category 2 would include improving the WECM recovery that may: (i) capture and utilise a larger quantity of WECM stream as compared to the historical situation in an existing WEG facility, or capture and utilise a larger quantity of WECM stream as compared to a "reference waste energy generating facility" for a Greenfield facility; and/or (ii) apply better energy efficient equipment to replace/modify/expand waste energy recovery equipment in an existing recipient facility, or implement a better energy efficient equipment than the "reference energy generation facility" for a Greenfield facility.	This criterion is not applicable to project activity, as project activity falls in category-1.
5) The methodology is applicable under the following conditions: a) Regulations do not require the WEG facility to recover and/or utilize the waste energy prior to the implementation of the project activity; b) For project activities which recover waste pressure, the methodology is applicable where waste pressure is used to generate electricity only and the electricity generated from waste pressure is measurable; c) If the production capacity of the WEG facility is expanded as a result of the project activity, the added production capacity shall be treated as a Greenfield facility; d) WECM that is released under abnormal operation (for example, emergencies, shut down) of the WEG facility shall not be included in the emission reduction calculations.	a) There are no regulations in India requires to recover and utilize the waste energy prior to implementation of the project activity. b) The project activity does not involve the use of waste pressure. c) The project activity was implemented at new facility. There is no expansion in production capacity of the project facility due to project activity. d) Waste energy released under abnormal operation will not be accounted for emission reduction calculation.
6) For project activities which supply useful energy from recovery and use of waste energy to existing recipient facilities, the methodology is applicable to those project activities that generate electricity and/or mechanical energy to supply up to and beyond the maximum capacity of the pre-project equipment of existing recipient facilities. The methodology, however, is not applicable to	The project activity involves electricity generation only by utilization of waste heat and does not supply thermal energy.

project activities that supply additional thermal energy beyond the maximum pre-project capacity of existing recipient facility(ies).	
7) The methodology is not applicable to cases where a WECM stream is partially recovered in the absence of the CDM project activity to supply the heat of reaction, and the recovery of this WECM stream is increased under the project activity to replace fossil fuels used for the purpose of supplying heat of reaction.	There was no partial recovery of WECM stream in the absence of the project activity to supply the heat of reaction and thus there will not be any increase in recovery of WECM stream under the project activity to replace fossil fuels used to supply heat of reaction.
8) This methodology is also not applicable to project activities where the waste gas/heat recovery project is implemented in a single-cycle power plant (e.g. gas turbine or diesel generator) to generate power. However, projects recovering waste energy from single cycle and/or combined cycle power plants or any power only generation plant for the purpose of generation of heat only can apply this methodology.	The project activity does not recover waste energy from single cycle or combined cycle power plants for the purpose of generation of heat.
9) No emission reduction credits can be claimed at and beyond the end of the lifetime of the waste energy generation equipment.	The emission reduction from the project will be claimed for a period of full crediting period, i.e., the average lifetime of the project activity.
10) In case the equipment at recipient facility(ies) that will be displaced by the project activity reaches end of its lifetime during the crediting period, separate guidance is provided in the section on the identification of baseline scenario below.	The emission reduction from the project will be claimed for a period of full crediting period, i.e., the average lifetime of the project activity.
11) The extent of use of waste energy from the WEG facilities in the absence of the CDM project activity will be determined in accordance with the procedures to this methodology provided in: a) Appendix 1 for Greenfield project facilities; and b) Appendix 2 for existing project facilities.	The extent of use of waste energy from the waste energy generation facilities in the absence of the project activity will be determined in accordance with the procedures provided in Appendix 1 (for Greenfield project facilities) to the methodology ACM0012.
12) If multiple WECM are available in the WEG facility and can be used interchangeably for various applications as part of the energy sources in the WEG facility, the implementation of the CDM project activity shall not result in the reduction of the recovery of any WECM, which would be totally or partially recovered in the absence of the project activity. This shall be demonstrated by use of the guidance provided in appendix 3 of this methodology.	The project activity is utilizing waste gas streams for power generation in the installed facility and it will not impact any other process.

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 geographical extent project boundary shall include the relevant WECM stream(s), equipment and energy distribution system in the following facilities:

1. The WEG facility;
2. The recipient facility (ies), which may be the same as the WEG facility.

The spatial extent of the grid is as defined in the "Tool to calculate the emission factor for an electricity System". The relevant equipment and energy distribution system cover:

- In a project facility, the WECM stream(s), waste energy recovery and useful energy generation equipment, and distribution system(s) for useful project energy;
- In a recipient facility, the equipment which receive useful energy supplied by the project, and distribution system(s) for useful project energy.

As per applicable methodology ACM0012, Waste energy recovery, Version 6.0, the project boundary is defined as: Table below illustrates which emissions sources are included and which are excluded from the project boundary for determination of baseline scenario and project emissions.

Source		Gas	Included	Justification/Explanation
Baseline	Electricity consumption, grid or captive source	CO_2	Included	Main emission source
		CH_4	Excluded	Excluded for simplification. This is conservative
		N_2O	Excluded	Excluded for simplification. This is conservative
	Fossil fuel consumption in element process for thermal energy	CO_2	Excluded	Project activity does not involve production of thermal energy
		CH_4	Excluded	
		N_2O	Excluded	
	Fossil fuel consumption in cogeneration plant	CO_2	Excluded	Project activity does not involve cogeneration
		CH_4	Excluded	
		N_2O	Excluded	
	Fossil fuel consumption for generation of steam used in the flaring process, if any	CO_2	Excluded	Flaring is not being done in the baseline
		CH_4	Excluded	
		N_2O	Excluded	
Project activity	Fossil fuel consumption for supply of process heat and/or reaction heat	CO_2	Excluded	Project activity does not involve production of process heat
		CH_4	Excluded	
		N_2O	Excluded	
	Supplemental fossil fuel consumption at the project plant	CO_2	Excluded	No supplemental fossil fuel is being used
		CH_4	Excluded	
		N_2O	Excluded	

Source		Gas	Included	Justification/Explanation
	Supplemental electricity consumption	CO_2	Excluded	No supplemental electricity is being consumed in the project activity
		CH_4	Excluded	
		N_2O	Excluded	
	Electricity import to replace captive electricity, which was generated using waste energy in absence of project activity[3]	CO_2	Excluded	In the absence of project activity, waste energy was not being used for electricity generation
		CH_4	Excluded	
		N_2O	Excluded	
	Energy consumption for gas cleaning	CO_2	Excluded	No gas cleaning is being done in the project activity
		CH_4	Excluded	
		N_2O	Excluded	

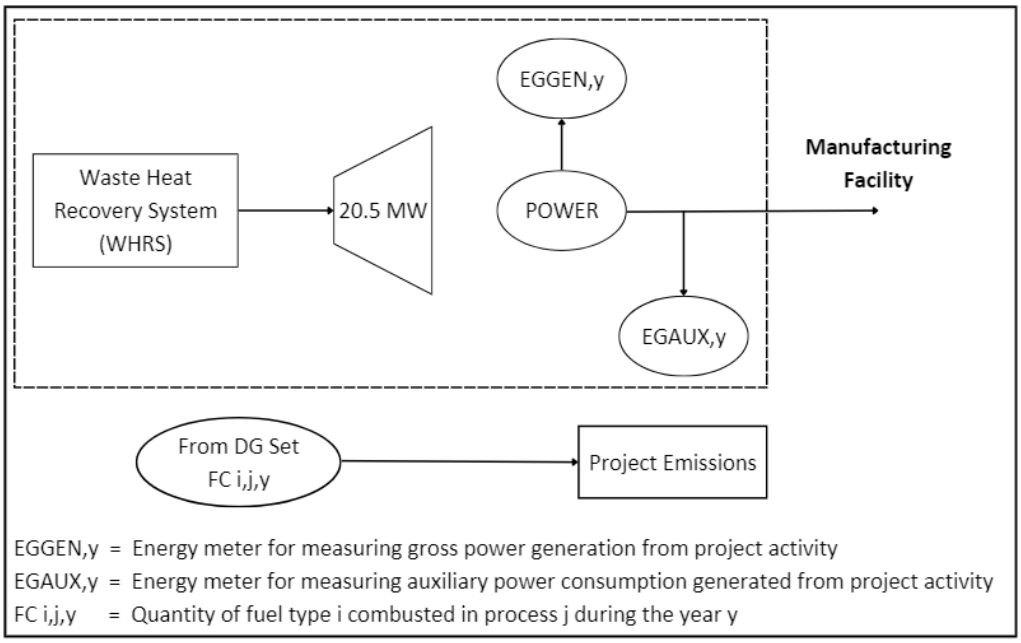

Figure 4: Project Boundary

Net GHG Emission Reductions and Removals

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 ($t\ CO_2/y$)
PE_y = Project Emissions in year y ($t\ CO_2/y$)
LE_y = Leakage Emissions in year y ($t\ CO_2/y$)

[3] Applicable in the scenario where the facility captures and utilizes a portion of waste gas produced at the site for captive power generation in the absence of the project activity.

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. The case established for the power required by the project activity, since it requires 2~2.5 MWh for its captive 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 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;

$BE_{EL,j,y}$ = Baseline emissions corresponding to the electricity supplied in year y by the project activity to the recipient facility j as per case (1a) and case (1b) described below during the year y (tCO_2)

$EG_{i,j,y}$ = 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)

(b) If the electricity displaced by the project activity in the recipient facility is supplied by a connected Indian 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 Generation Capacity	MW	20.5
Auxiliary Power Consumption	%	10%

Estimated Annual Baseline Emission Reductions:

$$BE_{EL,j,y} = EG_{BL,y} \times EF_{CO2,\,grid,y}$$

Where;

$BE_{EL,j,y}$ = Baseline emissions corresponding to the electricity supplied in year y by the project activity to the recipient facility j as per case (1a) and case (1b) described below during the year y (tCO_2)

$EG_{BL,y}$ = Net power generation from turbine in year y (MWh/yr)

$EF_{CO2,grid,y}$ = CO_2 emission factor of the grid in year y (t CO_2/MWh) as determined by the UCR Standard

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 2013-2020 years as a fairly conservative estimate for Indian projects not

previously verified under any GHG program. Also, for the vintage 2021 onwards, 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.

According to the applied methodology, $EG_{BL,y}$ is calculated based on daily gross power generation and auxiliary power consumption in the power generation plant (recipient plant)

$$\boldsymbol{EG_{BL,y} = EG_{GEN,y} - EG_{AUX,y}}$$

Where;

$\boldsymbol{EG_{BL,y}}$	=	Net power generation from turbine in year y (MWh/yr)
$\boldsymbol{EG_{GEN,y}}$	=	Gross power generation from turbine in year y (MWh/yr)
$\boldsymbol{EG_{AUX,y}}$	=	Auxiliary power consumption in power generation plant in year y (MWh/yr)

No leakage is applicable under this methodology, hence, $LE_y = 0$.

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:

Estimated annual Emission Reductions (ER_y) = 80,811 CoUs/yr (80,811 tCO_2e/yr)

B.6. Prior History>>

The project activity has never been applied under any other GHG mechanism prior to this registration with UCR. Also, the capacities 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 >>

The project activity is a bundle of two capacities (6.5 MW & 20 MW). The crediting period under UCR has been considered from the earliest commissioning date of the project, i.e., 24/05/2018.

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

Not applicable.

B.9. Monitoring period number and duration>>

First Issuance Period: 06 years – 24/05/2018 to 30/06/2024

B.10. Monitoring plan>>

Various departments at PIPL are headed by respective HOD (Head of Department) supported by shift-in-charges & support staff. Departments are mainly divided into projects, mechanical, electrical & instrumentation, production and administration. Mechanical & electrical department are responsible for the overall upkeep of plant, plant machinery and instruments.

To ensure that the data is reliable and transparent, the PP has established Quality Assurance and Quality Control (QA&QC) measures to effectively control and manage data reading and recording as well as archiving data and all relevant documents. The data is monitored on a daily basis and is submitted to PPs on a daily basis.

Key Data Monitored: Net power supplied to manufacturing facility due to waste heat recovery

1. Monitoring Plan Objective and Organization

PP is the project implementer and monitors the electricity generated from the turbines within the project activity. The data is already archived electronically and is stored since 2018.

Director is responsible for the overall functioning of the plant. PIPL has adopted the following procedures to assure the completeness and correctness of the data needed to be monitored for the UCR project activity.

On a monthly basis, the monitoring reports are checked and discussed by the senior project activity team members. In case of any irregularity observed by any of the team members, it is informed to the concerned person for necessary actions. Further these reports are then forwarded to the management monthly.

- Unit Head: Overall responsibility of compliance with the project activity monitoring plan.
- Power plant In-charge: Responsibility for completeness of data, reliability of data (calibration of meters), and monthly report generation.
- Shift In-charge: Responsibility of data monitoring & recording daily.
- Data collection and record keeping: Plant data collected on operation under the supervision of the respective Shift-in-charge and records are kept in daily logs.

Reliability of data collected

The reliability of the meters is checked by testing the meters on yearly basis. Documents pertaining to testing of meters are maintained. PPs have implemented QA&QC measures to calibrate and ensure the accuracy of metering and safety aspects of the project operation. The metering devices are calibrated and inspected properly and periodically, according to state electricity board's specifications and requirements to ensure accuracy in the readings.

Emergency preparedness

The project activity does not lead to any unintentional emissions. So, there is no need for any emergency preparedness in project activity.

Data and Parameters available at validation (ex-ante values):

Data/Parameter	$EF_{CO2, GRID}$
Data unit	tCO_2 /MWh
Description	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 2014- 2020 years as a fairly conservative estimate for Indian projects not previously verified under any GHG program. Hence, the same emission factor has been considered to calculate the emission reduction under conservative approach.
Source of data	UCRCoUStandardAug2022updatedVer6_090822220127104470.pdf (rackcdn.com)
Value(s) applied	0.9
Measurement methods and procedures	Fixed

Monitoring frequency	Ex-ante fixed parameter
Purpose of data	Calculation of baseline emissions

Data and Parameters to be monitored (ex-post monitoring values):

Data / Parameter:	EG_y
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.
Value applied	80,811 (Estimated)
QA/QC procedures:	As per Section B.10
Purpose of data:	Calculation of baseline emissions
Any comment:	Data will be archived electronically for a period of 36 months beyond the end of crediting period.

Data / Parameter:	$EG_{GEN,y}$
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
Value applied	89,790 (Estimated)
QA/QC procedures:	As per Section B.10
Purpose of data:	Calculation of baseline emissions
Any comment:	Data will be archived electronically for a period of 36 months beyond the end of crediting period.

Data / Parameter:	$EG_{AUX,y}$
Data unit:	MWh
Description:	Auxiliary power consumption in project activity
Source of data:	Measured
Measurement procedures (if any):	Plant operation data on power generation in project activity
Monitoring frequency:	Frequency of measurement – Continuous
Value applied	8,979 (Estimated)
QA/QC procedures:	As per Section B.10
Purpose of data:	Calculation of baseline emissions
Any comment:	Data will be archived electronically for a period of 36 months beyond the end of crediting period.