



Monitoring Report

CARBON OFFSET UNIT (CoU) PROJECT



Title: 1 MW small scale Solar Power Project by M/S G.R. Enterprises

Version 1.0

Date 13/04/2022

First CoU Issuance Period: 03 years 10 months

Monitoring Period: 30/03/2018 to 31/12/2021



Monitoring Report (MR) CARBON OFFSET UNIT (CoU) PROJECT

Monitoring Report	
Title of the project activity	1 MW small scale Solar Power Project by M/S G.R. Enterprises
UCR Project Registration Number	116
Version	1.0
Completion date of the MR	13/04/2022
Monitoring period number and duration of this monitoring period	Monitoring Period Number: 01 Duration of this monitoring Period: (first and last days included (30/03/2018 to 31/12/2021)
Project participants	Creduce Technologies Private Limited (Representator) M/S G.R. Enterprises (Project Proponent)
Host Party	India
Applied methodologies and standardized baselines	Applied Baseline Methodology: AMS-I.D: "Grid connected renewable electricity generation", Version 18.0
Sectoral scopes	01 Energy industries (Renewable/Non-Renewable Sources)
Estimated amount of GHG emission reductions for this monitoring period in the registered PCN	2018: 1,018 CoUs (1,018 tCO ₂ eq)
	2019: 1,367 CoUs (1,367 tCO ₂ eq)
	2020: 1,426 CoUs (1,426 tCO ₂ eq)
	2021: 1,385 CoUs (1,385 tCO ₂ eq)
Total:	5,196 CoUs (5,196 tCO ₂ eq)

SECTION A. Description of project activity

A.1. Purpose and general description of project activity >>

The proposed project activity with title under UCR “1 MW small scale Solar Power Project by M/S G.R. Enterprises”, is a grid connected renewable power generation activity which incorporates installation and operation of Solar Photovoltaic power generation project in the District Sirmaur, in the state of Himachal Pradesh, in India. The project has aggregated installed capacity of 1000 MW. The project is an operational activity with continuous reduction of GHG, currently being applied under “Universal Carbon Registry” (UCR).

a) Purpose of the project activity and the measures taken for GHG emission reductions >>

The project activity aims to harness Solar radiation of sun which is a renewable source, to generate electricity. The net generated electricity from the project activity is sold to state electricity board i.e., Himachal Pradesh State Electricity Board (HPSEB) under the Power Purchase Agreement (PPA) signed between the Project Proponent (PP) and the utility.

In pre-project scenario the State utility was importing the required electricity from the NEWNE grid to meet its requirement of electrical energy. Currently, NEWNE grid is connected to large numbers of fossil fuel-based power plants. Hence, project activity is displacing the gross electricity generation i.e., 5,773 MWh from the NEWNE grid, which otherwise would have been imported from the NEWNE grid. The project activity doesn't involve any GHG emission sources.

The annual and the total CO₂e emission reduction by the project activity over the defined monitoring period is as per **Annexure I**.

b) Brief description of the installed technology and equipment>>

The project activity involves one Ground Mounted Photovoltaic (PV) Plant having installed capacity of 1000 kW. The average life time of the Photovoltaic Panel is around 20 years as per the equipment supplier specification. Solar radiation is converted directly into electricity by solar cells (photovoltaic cells). In such cells, a small electric voltage is generated when light strikes the junction between a metal and a semiconductor (such as silicon) or the junction between two different semiconductors. Photovoltaic module consists of several photovoltaic cells connected by circuits and sealed in an environmentally protective laminate, which forms the fundamental building blocks of the complete PV generating unit. Several PV panels mounted on a frame are termed as PV Array.

c) Relevant dates for the project activity (e.g., construction, commissioning, continued operation periods, etc.)>>

The duration of the crediting period corresponding to the monitoring period is covered in this monitoring report.

UCR Project ID	:	116
Commissioning Date of M/S G.R. Enterprises	:	30/03/2018
Start Date of Crediting Period M/S G.R. Enterprises	:	30/03/2018

d) Total GHG emission reductions achieved or net anthropogenic GHG removals by sinks achieved in this monitoring period>>

The total GHG emission reductions achieved in this monitoring period is as follows:

Summary of the Project Activity and ERs Generated for the Monitoring Period	
Start date of this Monitoring Period	30/03/2018
Carbon credits claimed up to	31/12/2021
Total ERs generated (tCO _{2eq})	5,196 tCO _{2eq}
Leakage	0

e) Baseline Scenario>>As per the approved consolidated methodology AMS-I.D. Version 18.0

If the project activity is the installation of a new grid-connected renewable power plant/unit, the baseline scenario is the following: **“The baseline scenario is that the electricity delivered to the grid by the project activity would have otherwise, been generated by the operation of grid-connected power plants and by the addition of new generation sources into the grid”.**

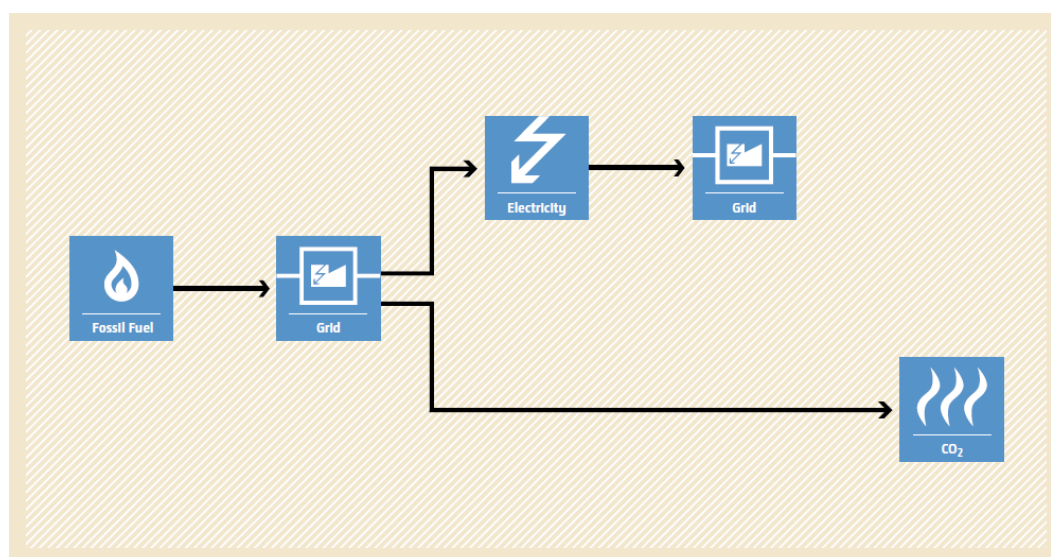


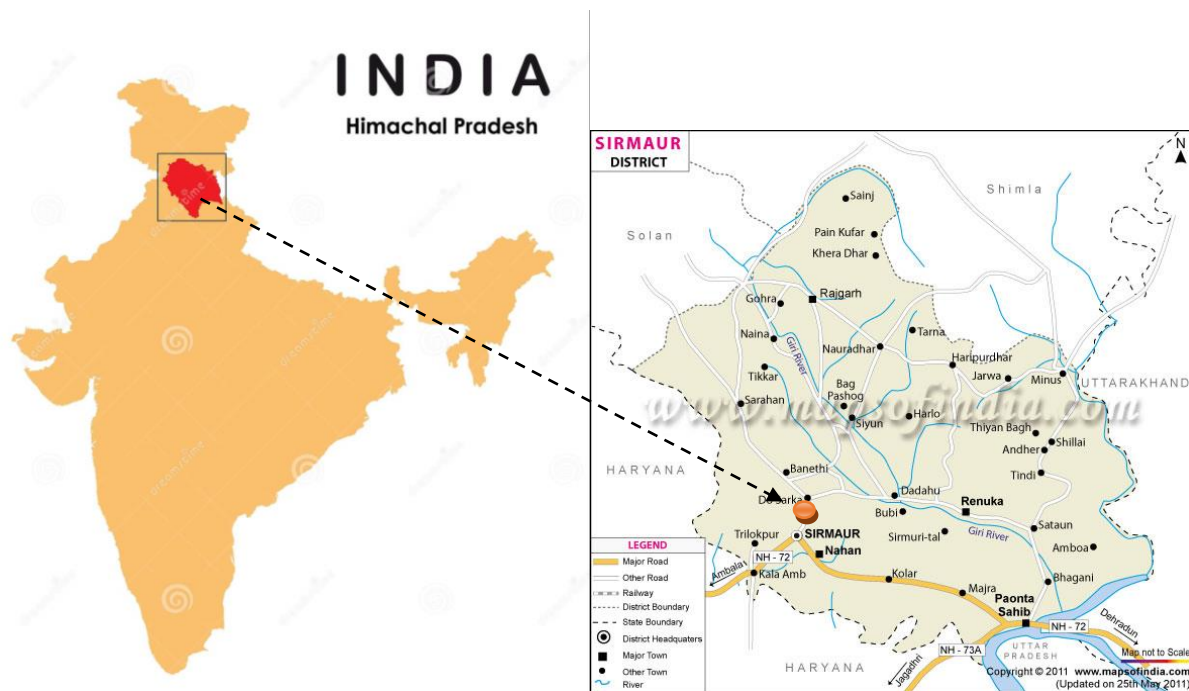
Figure 1 Baseline Scenario

A.2. Location of project activity>>

Country : India
State : Himachal Pradesh
Village : Nahan
District : Sirmaur

The project location is situated at Village-Nahan, District-Sirmaur in the state of Himachal Pradesh. Project activity is well connected with road, railway station and airport. It is approximately 85 Kilometres from Chandigarh city. The geographic co-ordinate of the project location is 30°34'33.0"N and 77°11'20.0"E.

The representative location map is included below:



Project Location

(Courtesy: google images and www.mapofindia.com)

A.3. Parties and project participants >>

Party (Host)	Participants
India	Creduce Technologies Private Limited (Representator) Contact person: Shailendra Singh Rao Mobile: +91 9016850742, 9601378723 Address: 2-O-13,14 Housing Board Colony, Banswara, Himachal Pradesh - 327001, India. M/S G.R. Enterprises (Developer) Address: 288, Industrial Area, Phase II, Chandigarh-160002, India.

A.4. References to methodologies and standardized baselines >>

SECTORAL SCOPE	-	01 Energy industries (Renewable/Non-Renewable Sources)
TYPE	-	Renewable Energy Projects
CATEGORY	-	AMS-I. D: “Grid connected renewable electricity generation”, Version 18.0

A.5. Crediting period of project activity >>

Start Date of Crediting Period M/S G.R. Enterprises : 30/03/2018

Length of the crediting period corresponding to this monitoring period: 03 years 10 months
i.e., 30/03/2018 to 31/12/2021 (Both the dates are inclusive).

A.6. Contact information of responsible persons/entities >>

Name : Shailendra Singh Rao
Contact No : +91 9016850742, 9601378723
E-Mail : shailendra@creduce.tech

SECTION B. Implementation of project activity

B.1. Description of implemented registered project activity >>

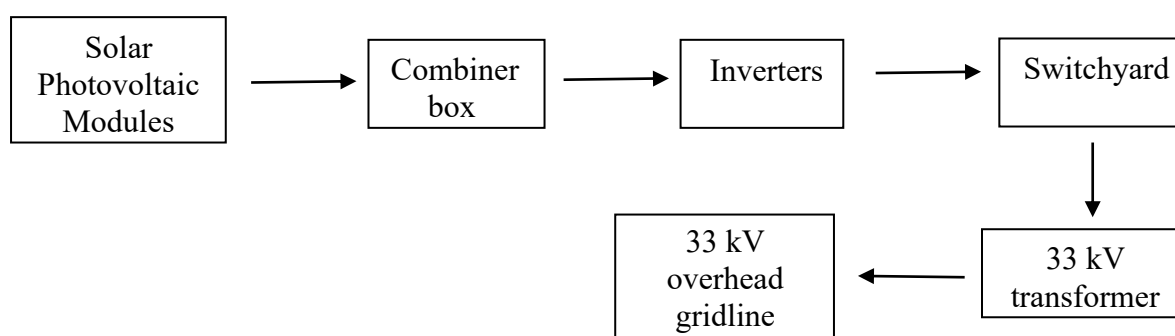
a) Provide information on the implementation status of the project activity during this monitoring period in accordance with UCR PCN>>

The project consists of one Photo Voltaic Plant with capacity of 1 MW. The plant was commissioned on 30/03/2018 by the respective authority of Government of Himachal Pradesh. The project generates clean energy by utilizing the Solar Radiations.

b) For the description of the installed technology, technical process and equipment, include diagrams, where appropriate>>

Photovoltaic module consists of several photovoltaic cells connected by circuits and sealed in an environmentally protective laminate, which forms the fundamental building blocks of the complete PV generating unit. Several PV panels mounted on a frame are termed as PV Array. The project activity has used the reliable and proven technology from supplier to ensure that an environmentally safe and sound technology is only being implemented in the proposed project activity leading to the GHG reduction.

The technical arrangement of the project activity is as provided below:



Technical details of the machines installed are explained below:

1. SPV Power Plant

- | | |
|--------------------|---------------------------------|
| i. Capacity | 1000 kWp |
| ii. No. of modules | 3031 |
| iii. Connections | in series 20
in parallel 152 |
| iv. DC BUS | Multiple No. |

2. Technical details of a SPV Module

a) PV Module type	Poly crystalline
b) Electrical Parameter	
i. Maximum Power Rating	330 Wp
ii. Rated Current	8.7 A
iii. Rated Voltage	37.5 V
iv. Short Circuit Current	9.2 A
v. Open Circuit Voltage	45.1 V

3. Mounting Arrangement

i. Mounting	Fixed Type
ii. Tilt angle(slope)	30°
iii. Position	Ground Mounted

4. Inverter/ Power Conditioning Unit (PCU)

i. Number of units	Single Unit
ii. Rated Capacity	1000 KW
iii. Input Voltage	1000 VDC
iv. Output Voltage	380 V
v. Frequency	50 Hz
vi. Efficiency	98%

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

Indian economy is highly dependent on “Coal” as fuel to generate energy and for production processes. Thermal power plants are the major consumers of coal in India and yet the basic electricity needs of a large section of population are not being met. This results in excessive demands for electricity and places immense stress on the environment.

Changing coal consumption patterns will require a multi-pronged strategy focusing on demand, reducing wastage of energy and the optimum use of renewable energy (RE) sources. This project is a greenfield activity where grid power is the baseline. 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.

The Government of India has stipulated following indicators for sustainable development in the interim approval guide lines for such projects which are contributing to GHG mitigations. The Ministry of Environment, Forests & Climate Change, 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: The project would help in generating direct and indirect employment benefits accruing out of ancillary units for installing and maintenance during operation of the project activity. It will lead to development of infrastructure around the project area in terms of improved road network etc. and will also directly contribute to the development of renewable infrastructure in the region.

Environmental well-being: The project utilizes Solar energy for generating electricity which is a clean source of energy. The project activity will not generate any air pollution, wind pollution or solid waste to the environment which otherwise would have been generated through fossil fuels. Also, it will contribute to reduction GHG emissions. Thus, the project causes no negative impact on the surrounding environment contributing to environmental well-being.

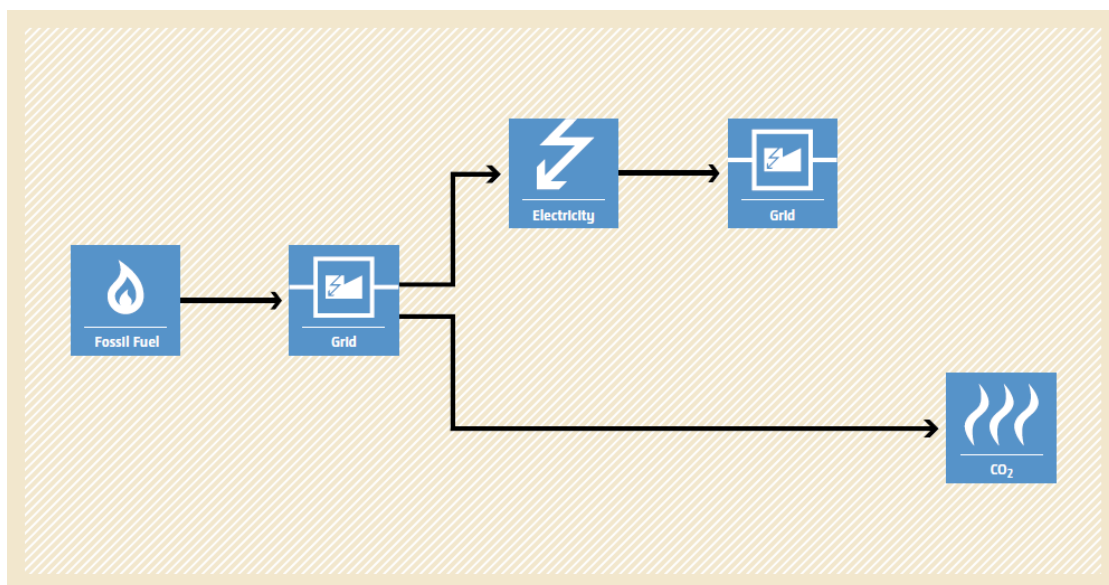
Economic well-being: Being a renewable resource, using Solar energy to generate electricity contributes to conservation precious natural resources. The project contributes to the economic sustainability through promotion of decentralization of economic power, leading to diversification of the national energy supply, which is dominated by conventional fuel based generating units. Locally, improvement in infrastructure 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 project activity leads to the promotion of 1 MW PV power generation project into the region and will promote practice for small scale industries to reduce the dependence on carbon intensive grid supply to meet the captive requirement of electrical energy and also increasing energy availability and improving quality of power under the service area. Hence, the project leads to technological well-being.

B.3. Baseline Emissions>>

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 (NEWNE Grid)), which is carbon intensive due to predominantly sourced from fossil fuel-based power plants.

Baseline Scenario:



Thus, this project activity was a voluntary investment which replaced equivalent amount of electricity from the Indian grid. The project proponent was not bound to incur this investment as it was not mandatory by national and sectoral policies. Thus, the continued operation of the project activity would continue to replace fossil fuel-based power plants and fight against the impacts of climate change. The Project Proponent hopes that carbon revenues from 2018-2021 accumulated as a result

of carbon credits generated will help repay the loans and help in the continued maintenance of this project activity.

B.4. Debundling>>

This project activity is not a de-bundled component of a larger project activity.

SECTION-C: Application of methodologies and standardized baselines

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

Sectoral Scope: 01 Energy industries (Renewable/Non-Renewable Sources)

TYPE I – Renewable Energy Projects

Applied Baseline Methodology: AMS-I.D.: “Grid connected renewable electricity generation”, Version 18.0

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

This project activity involves generation of grid connected electricity from the construction and operation of a new solar power-based power project. The project activity has installed capacity of 1 MW which will qualify for a small-scale project activity under Type-I of the Small-Scale methodology. The project status is corresponding to the methodology AMS-I.D., version 18 and applicability of methodology is discussed below:

Applicability Criterion	Project Case
1. This methodology comprises renewable energy generation units, such as photovoltaic, hydro, tidal/wave, wind, geothermal and renewable biomass: (a) Supplying electricity to a national or a regional grid; or (b) Supplying electricity to an identified consumer facility via national/regional grid through a contractual arrangement such as wheeling.	The project activity involves setting up of a grid connected renewable energy (solar) generation plant and sell it to the national grid. Thus, the project activity meets point (a) of the criteria 1.
2. This methodology is applicable to project activities that: (a) Install a Greenfield plant; (b) Involve a capacity addition in (an) existing plant(s); (c) Involve a retrofit of (an) existing plant(s); (d) Involve a rehabilitation of (an) existing plant(s)/unit(s); or (e) Involve a replacement of (an) existing plant(s).	The option (a) of applicability criteria 2 is applicable as project is a Greenfield plant /unit. Hence the project activity meets the given applicability criterion.

3. Hydro power plants with reservoirs that satisfy at least one of the following conditions are eligible to apply this methodology: (a) The project activity is implemented in existing reservoir, with no change in the volume of the reservoir; or (b) The project activity is implemented in existing reservoir, where the volume of the reservoir(s) is increased and the power density as per definitions given in the project emissions section, is greater than 4 W/m². (c) The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the project emissions section, is greater than 4 W/m²	The project activity involves installation of Solar PV (SPV). Hence, this criterion is not applicable.
4. If the new unit has both renewable and non-renewable components (e.g., a wind/diesel unit), the eligibility limit of 15 MW for a small-scale CDM project activity applies only to the renewable component. If the new unit co-fires fossil fuel, the capacity of the entire unit shall not exceed the limit of 15 MW.	The proposed project is 1 MW solar power project, i.e., only component is renewable power project below 15 MW, thus the criterion is not applicable to this project activity.
5. Combined heat and power (co-generation) systems are not eligible under this category	This is not relevant to the project activity as the project involves only solar power generating units.
6. In the case of project activities that involve the capacity addition of renewable energy generation units at an existing renewable power generation facility, the added capacity of the units added by the project should be lower than 15 MW and should be physically distinct¹ from the existing units.	There is no other existing renewable energy power generation facility at the project site. Therefore, this criterion is not applicable.
7. In the case of retrofit, rehabilitation or replacement, to qualify as a small-scale project, the total output of the retrofitted, rehabilitated or replacement power plant/unit shall not exceed the limit of 15 MW.	The project activity is a new installation, it does not involve any retrofit measures nor any replacement and hence is not applicable for the project activity.
8. In the case of landfill gas, waste gas, wastewater treatment and agro-industries projects, recovered methane emissions are eligible under a relevant Type III category. If the recovered methane is used for electricity generation for supply to a grid, then the baseline for the electricity component shall be in accordance with procedure prescribed under this methodology. If the recovered methane is used for heat generation or cogeneration other applicable Type-I methodologies such as “AMS-I.C.: Thermal energy production with or without electricity” shall be explored.	This is not relevant to the project activity as the project involves only solar power generating units.

9. In case biomass is sourced from dedicated plantations, the applicability criteria in the tool “Project emissions from cultivation of biomass” shall apply.	No biomass is involved, the project is only a solar power project and thus the criterion is not applicable to this project activity.
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C.3 Applicability of double counting emission reductions >>

The project was not applied under any other GHG mechanism. Hence project will not cause double accounting of carbon credits (i.e., COUs).

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

As per applicable methodology AMS-I.D. Version 18.0, “The spatial extent of the project boundary includes the project power plant and all power plants connected physically to the electricity system.”

Thus, the project boundary includes the Solar Photovoltaic Plant and the Indian grid system.

Source		Gas	Included?	Justification/Explanation
Baseline	Grid connected electricity generation	CO ₂	Yes	CO₂ emissions from electricity generation in fossil fuel fired power plants
		CH ₄	No	Minor emission source
		N ₂ O	No	Minor emission source
		Other	No	No other GHG emissions were emitted from the project
Project	Greenfield Solar Power Project Activity	CO ₂	No	No CO ₂ emissions are emitted from the project
		CH ₄	No	Project activity does not emit CH ₄
		N ₂ O	No	Project activity does not emit N ₂ O
		Other	No	No other emissions are emitted from the project

C.5. Establishment and description of baseline scenario (UCR Protocol) >>

As per para 19 of the approved consolidated methodology AMS-I.D. Version 18.0, if the project activity is the installation of a new grid-connected renewable power plant/unit, the baseline scenario is the following:

“The baseline scenario is that the electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources into the grid”.

The project activity involves setting up of a new Solar Photovoltaic Plant to harness the green power from Solar energy and sell it to the grid. In the absence of the project activity, the equivalent amount of power would have been generated by the operation of grid-connected fossil fuel-based power plants and by the addition of new fossil fuel-based generation sources into the grid. The power

produced at grid from the other conventional sources which are predominantly fossil fuel based. Hence, the baseline for the project activity is the equivalent amount of power produced at the Indian grid.

A "grid emission factor" refers to a CO₂ emission factor (tCO₂/MWh) which will be associated with each unit of electricity provided by an electricity system. The UCR recommends an emission factor of 0.9 tCO₂/MWh for the 2014-2020 years as a fairly conservative estimate for Indian projects not previously verified under any GHG program. Also, for the vintage 2021, 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.

Net GHG Emission Reductions and Removals

$$ER_y = BE_y - PE_y - LE_y$$

Where:

- ER_y = Emission reductions in year y (tCO₂/y)
- BE_y = Baseline Emissions in year y (t CO₂/y)
- PE_y = Project emissions in year y (tCO₂/y)
- LE_y = Leakage emissions in year y (tCO₂/y)

Baseline Emissions

Baseline emissions include only CO₂ 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:

$$BE_y = EG_{PJ,y} \times EF_{grid,y}$$

Where:

- BE_y = Baseline emissions in year y (t CO₂)
- $EG_{PJ,y}$ = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of this project activity in year y (MWh).
- $EF_{grid,y}$ = UCR recommended emission factor of 0.9 tCO₂/MWh has been considered, this is conservative as compared to the combined margin grid emission factor which can be derived from Database of Central Electricity Authority (CEA), India. (Reference: General Project Eligibility Criteria and Guidance, UCR Standard, page 4)

Hence,

$$BE_y = 5,773 \times 0.9 = 5,196 \text{ tCO}_2\text{eq}$$

Project Emissions

As per paragraph 39 of AMS-I.D. (Version 18.0), for most renewable energy project activities emission is zero.

Hence, P_{Ey} = 0

Leakage Emissions

As per paragraph 42 of AMS-I.D. version-18, all projects other than Biomass projects have zero leakage.

Hence, L_{Ey} = 0

Total Emission reduction by the project for the current monitoring period is calculated as below:

Hence, E_{Ry} = 5,196 – 0 – 0 = 5,196 CoUs

C.6. Prior History>>

The project was not applied under any other GHG mechanism. Hence project will not cause double accounting of carbon credits (i.e., COUs).

C.7. Monitoring period number and duration>>

First Monitoring Period : 03 years 10 months
30/03/2018 to 31/12/2021 (inclusive of both dates)

C.8. Changes to start date of crediting period >>

Crediting period start date is 30/03/2018.

C.9. 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.

C.10. Monitoring plan>>

The project activity essentially involves generation of electricity from Solar Radiations, the employed SPV can only convert Solar energy into electrical energy and cannot use any other input fuel for electricity generation, thus no special ways and means are required to monitor leakage from the project activity. The recording of the electricity fed to the state utility grid is carried out jointly at the incoming feeder of the state power utility.

Parameter	EG _{PJ,y}
Data unit	MWh
Description	Quantity of net electricity generation that is produced for captive consumption.
Source of data Value(s) applied	JMR

Procedures	The Net electricity generation by the Solar Photovoltaic Plant is recorded by the project proponent in the record logs. At the end of every month, Energy bill is generated based on the total monthly electricity exported to the grid.
Monitoring frequency	Monthly
Purpose of data	To estimate Baseline Emission

Data / Parameter	UCR recommended emission factor
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 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	https://a23e347601d72166dcd6-16da518ed3035d35cf0439f1cdf449c9.ssl.cf2.rackcdn.com//Documents/UCRStandardNov2021updatedVer2_301121081557551620.pdf
Value applied	0.9
Measurement methods and procedures	-
Monitoring frequency	Ex-ante fixed parameter
Purpose of Data	For the calculation of Emission Factor of the grid
Additional Comment	The combined margin emission factor as per CEA database (current Version 16, Year 2021) results into higher emission factor. Hence for 2021 vintage UCR default emission factor remains conservative.

ANNEXURE 1 (Emission Reduction Calculation)

1 MW small scale Solar Power Project by M/S G.R. Enterprises

Month - Wise Energy Delivered to Grid (in kWh)												
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2018	-	-	2,670	1,32,770	1,42,870	1,32,190	1,10,300	91,060	1,16,440	1,58,940	1,20,920	1,22,810
2019	1,07,080	1,03,900	1,56,360	1,57,500	1,73,980	1,56,040	1,09,310	1,16,070	1,10,030	1,30,410	1,08,180	90,080
2020	1,00,070	1,32,400	1,45,730	1,56,790	1,59,350	1,50,510	1,35,160	95,470	1,27,340	1,53,280	1,09,810	1,17,790
2021	1,01,930	1,21,100	1,55,060	1,52,950	1,51,450	1,53,110	1,13,800	1,14,660	1,04,570	1,36,450	1,31,790	1,02,540
Year-Wise Emission reduction calculation for the project activity												
Year	Total No. of Electricity delivered in MWh				Recommended emission factor tCO2/MWh				Total CoUs generated			
2018	1,131				0.9				1,018			
2019	1,519				0.9				1,367			
2020	1,584				0.9				1,426			
2021	1,539				0.9				1,385			
Total CoUs to be issued for the first monitoring period (Year: 2018 to 2021)												5,196