



BUNDLED SOLAR POWER PROJECT BY AMP ENERGY - 01



Document Prepared by (EKI Energy Services Limited)

Project Title	Bundled Solar Power Project by AMP Energy - 01
Version	4.0
Date of Issue	28-April-2023
Prepared By	Ms. Neerja Agrawal Deputy Manager, Climate Change, EKI Energy Services Limited
Contact	Enking Embassy, Office no. 201, Plot 48, Scheme 78 Part 2, Vijay Nagar Near Brilliant Convention Centre, Indore -452010, Madhya Pradesh, India Website: www.enkingint.org Email ID: neerja.agrawal@enkingint.org / markets@ampenergyindia.com M: +918989880655

CONTENTS

1	PROJECT DETAILS.....	4
1.1	Summary Description of the Project	4
1.2	Sectoral Scope and Project Type	4
1.3	Project Eligibility	5
1.4	Project Design	6
1.5	Project Proponent	6
1.6	Other Entities Involved in the Project	7
1.7	Ownership.....	8
1.8	Project Start Date	8
1.9	Project Crediting Period	8
1.10	Project Scale and Estimated GHG Emission Reductions or Removals	8
1.11	Description of the Project Activity.....	9
1.12	Project Location	13
1.13	Conditions Prior to Project Initiation	18
1.14	Compliance with Laws, Statutes and Other Regulatory Frameworks.....	18
1.15	Participation under Other GHG Programs	18
1.16	Other Forms of Credit.....	18
1.17	Sustainable Development Contributions	19
1.18	Additional Information Relevant to the Project	23
2	SAFEGUARDS	23
2.1	No Net Harm	23
2.2	Local Stakeholder Consultation	23
2.3	Environmental Impact	25
2.4	Public Comments	25
2.5	AFOLU-Specific Safeguards	25
3	APPLICATION OF METHODOLOGY.....	26
3.1	Title and Reference of Methodology	26
3.2	Applicability of Methodology	26
3.3	Project Boundary	30
3.4	Baseline Scenario	31
3.5	Additionality	32
3.6	Methodology Deviations	44

4	ESTIMATED GHG EMISSION REDUCTIONS AND REMOVALS.....	45
4.1	Baseline Emissions	45
4.2	Project Emissions	50
4.3	Leakage.....	51
4.4	Estimated Net GHG Emission Reductions and Removals.....	51
5	MONITORING	52
5.1	Data and Parameters Available at Validation	52
5.2	Data and Parameters Monitored.....	54
5.3	Monitoring Plan.....	55
6	ACHIEVED GHG EMISSION REDUCTIONS AND REMOVALS	59
6.1	Data and Parameters Monitored.....	59
6.2	Baseline Emissions	59
6.3	Project Emissions	60
6.4	Leakage.....	60
6.5	Net GHG Emission Reductions and Removals.....	60
	APPENDIX 1: PROJECT ACTIVITY DETAILS	65
	APPENDIX 2: METER DETAILS.....	70
	APPENDIX 3: BREAKDOWN DETAILS	74
	APPENDIX 4: EMPLOYEE DETAILS.....	77

1 PROJECT DETAILS

1.1 Summary Description of the Project

The project involves installation of bundled Solar Photovoltaic (SPV) power plant with a cumulative capacity of 9.43 MW primarily to meet the captive demand of the premises owners and the rooftop solar units are connected to the national grid through net metering mechanism. All the solar panel units involved in the project are implemented under DBFOT model, i.e., Design, Build, Finance, Operate and Transfer. The premises owners are the customers of the power generated from the solar panels who purchase the power under long term power purchase agreements signed for 25 years. Before installation of the rooftop solar units, the Kochi Metro Rail Limited 2 (KMRL 2) premises, Subros Ltd. and SECI rooftop premises owners used to meet the electricity demand from the national grid of the India. The project thus replaces fossil fuel dominated grid electricity thereby reducing the equivalent amount of GHG emission. The project company for Kochi Metro premises and Subros Ltd is AMPSolar Power Generation Private Limited and for SECI Rooftop, it is AMP Energy Green (C&I) Private Limited (formerly known as Amp Energy Distributed Generation Private Limited).

There are three project activities included in the bundle to form a single project activity. The earliest commissioning date of the solar PV units involved in the project activity (corresponds to Subros Ltd.) is 05-March-2021. The complete details about the project activity are given in Appendix 1.

The annual estimated emission reductions over 1st crediting period are 13,207 tCO₂e/annum and the total estimated emission reductions over the entire crediting period are 92,451 tCO₂e/annum.

The project is in operational phase in the same way as it has been described in the Joint PD MR since the commissioning.

The actual emission reductions in the current monitoring period (05-March-2021 to 31-December-2022) are 13,398 tCO₂e.

1.2 Sectoral Scope and Project Type

The project activity has the following parameters:

Sectoral Scope:	01 - Energy industries (renewable / non-renewable sources)
Project Type:	I - Renewable Energy Projects
Project Category:	The project activity applies only small-scale solar technology.

Methodology:	AMS-I.F.: Renewable electricity generation for captive use and mini-grid – Version 5.0 ¹
--------------	---

The project is not a grouped project activity and it does not fall under the AFOLU project category.

1.3 Project Eligibility

The project activity involves installation and generation of electricity using renewable energy resources i.e., by using the solar energy (renewable sources) replacing electricity supply from a fossil-fuel dominated electricity, thus leads to reductions of anthropogenic GHG emissions from atmosphere. Hence the project activity is eligible Sectoral scope 1 i.e., energy industries (renewable/ non-renewable sources) under the scope of the VCS Program.

As the electricity produced by all the solar units involved in the project activity is intended to be used by the captive consumers and excess of the electricity to be supplied to the grid, 100% of the electricity generated by the solar PV units is to be accounted for emission reduction.

Net Metering applicability:

For KMRL2, net metering is not applicable as it is treated as a government utility.

For Subros, there is no net metering applicable as per clause 2(K) of the UPERC RSPV Regulations, 2019². 100% of the generated electricity is consumed in-house as there is no net metering.

For SECI Rooftop, as per the net metering agreements, it is mentioned that the eligible consumer will generate power for self-consumption and feed excess power into the grid of DISCOM. However, till date, there is 100% self-consumption of the generated power. This can be demonstrated from the load sanctioned details for the project sites which are given below:

S.I No.	Project Location (SECI Rooftop)	Contract/ Sanctioned demand	Installed Capacity (kW)
1	Pondicherry University	3000 kW	2389.22
2	Mahatma Gandhi Post Graduate Institute of Dental Science (MGPGIDS)	250 kW	199.66
3	Rajiv Gandhi Institute of Veterinary Education & Research (RIVER)	250 kW	200

¹ <https://cdm.unfccc.int/UserManagement/FileStorage/I1P3XEBCJ0625DUALGSNO79R8FWY4V>

² <http://www.manikarananalytics.in/regulation/RSPV-Regulation-2019-dt-04-01-2019.pdf>

S.I No.	Project Location (SECI Rooftop)	Contract/ Sanctioned demand	Installed Capacity (kW)
4	Indira Gandhi Medical College & Research Institute (IGMC&R)	1000 kW	348.4
5	Rajiv Gandhi Government Women & Children Hospital (RGGWCH)	750 kW	109.21
6	Centre For Good Governance	300 kVA	290
7	Accounts General Audit	500 kVA	167.5
8	School of Planning & Architecture	450 kVA	119.93
9	MANIT	1000 kVA	230

From the above-mentioned table, it can be concluded that the project installed capacity is very less as compared to the sanctioned load for the project location. The generated electricity from the rooftop solar units is very less considering the PLF values in the range of 18-19% which is negligible when compared with the electricity demand of the above institutions. Therefore, it is demonstrated that the project activities under consideration do not supply more than 50% of the electricity generated to the grid. Hence, the project is not a grid connected renewable energy project and does not fall in the excluded category as per the paragraph 2.1.3 of VCS Standard 4.4.

1.4 Project Design

The project is designed to include multiple locations but is not being developed as a grouped project.

1.5 Project Proponent

Organization name	AMP Solar Power Generation Private Limited
Contact person	Shriprakash Rai
Title	Director
Address	309, 3rd Floor, Rectangle One, Behind Sheraton Hotel, Saket, New Delhi, 110017 India
Telephone	8826022877
Email	markets@ampenergyindia.com

Organization name	AMP Energy Green (C&I) Private Limited
Contact person	Shriprakash Rai
Title	Director
Address	309, 3rd Floor, Rectangle One, Behind Sheraton Hotel, Saket, New Delhi, 110017 India
Telephone	8826022877
Email	markets@ampenergyindia.com

1.6 Other Entities Involved in the Project

Organization name	EKI Energy Services Limited
Role in the project	Project Consultant
Contact person	Ms. Neerja Agrawal
Title	Deputy Manager, Climate Change
Address	Office no. 201, Plot 48, Scheme 78 Part 2 Vijay Nagar, Near Brilliant Convention Centre Indore - 452010 (M.P, India) Website www.enkingint.org
Telephone	+91-8989880655
Email	neerja.agrawal@enkingint.org

Organization name	AMP Energy Markets India Private Limited
Role in the project	Authorized Representative
Contact person	Aditya Malpani
Title	Director
Address	309, 3rd Floor, Rectangle One, Behind Sheraton Hotel, Saket, New Delhi, 110017 India
Telephone	9867300018
Email	markets@ampenergyindia.com

1.7 Ownership

The renewable energy technology installed at site of each of the project activities as part of the proposed project activity are under ownership of respective SPV/Project Proponent. The Power Purchase Agreement (PPA) for the project activity and commissioning certificate for project activity are the supporting documents to demonstrate the project ownership.

This demonstrates the right of use according to clause 3.7.1 (3) of VCS Standard (v4.4) – “a project ownership arising by virtue of a statutory, property or contractual right in the plant, equipment or process that generates GHG emission reductions and/or removals”.

1.8 Project Start Date

Start date of project activity is 05-March-2021, which is the earliest date of commissioning³ of the solar PV units involved in the project activity.

1.9 Project Crediting Period

Crediting Period Start date: 05-March-2021

Crediting Period End date: 04-March-2028

Since this is non- AFOLU project, the crediting period of the project activity shall be seven years, twice renewable for a total of 21 years.

1.10 Project Scale and Estimated GHG Emission Reductions or Removals

Indicate the scale of the project (project or large project) and the estimated annual GHG emission reductions or removals for the project crediting period.

Project Scale	
Project	✓
Large project	

Year	Estimated GHG emission reductions or removals (tCO ₂ e)
Year 1 (05-March-2021 to 04-March-2022)	13,492
Year 2 (05-March-2022 to 04-March-2023)	13,395

³ This corresponds to the project site for Subros Ltd.

Year 3 (05-March-2023 to 04-March-2024)	13,302
Year 4 (05-March-2024 to 04-March-2025)	13,208
Year 5 (05-March-2025 to 04-March-2026)	13,112
Year 6 (05-March-2026 to 04-March-2027)	13,018
Year 7 (05-March-2027 to 04-March-2028)	12,924
Total estimated ERs	92,451
Total number of crediting years	7
Average annual ERs	13,207

1.11 Description of the Project Activity

The project involves installation of bundled Solar Photovoltaic (SPV) power plant with a cumulative capacity of 9.43 MW primarily to meet the captive demand of the premises owners. All the solar panel units involved in the project are implemented under DBFOT model, i.e., Design, Build, Finance, Operate and Transfer. The premises owners are the customers of the power generated from the solar panels who purchase the power under long term power purchase agreements signed for 25 years. The purchased power by the customers is used for captive purpose and consumed/utilized by the customers in the premises.

Before installation of the rooftop solar units, the Kochi Metro premises, Subros Ltd., SECI rooftop premises owners used to meet the electricity demand from the national grid of the India. The project thus replaces fossil fuel dominated grid electricity thereby reducing the equivalent amount of GHG emission.

Net Metering:

Under the concept of Net Metering, the customers are charged only for the net power that they consume from the electricity service provider that has accumulated over a specific period. In other words, if their renewable energy generating systems make more electricity than consumed, they may be credited or paid for the excess electricity contributed to the grid over the same period. Net metering is also a way to increase the energy in the power grid to keep up with increase in demand during peak power use times, and this is of particular interest to states facing power shortages.

The operational life of the installed solar modules is 25 years based upon the manufacturer's specifications and on the standard operational and maintenance practices followed at the project sites. The key technical specifications of the project activity are given below:

Kochi Metro Rail Limited:

S.No	Station name	Module Details			Inverter Details		
		Module Wp	Module make	No of modules	Inverter rating (Kw)	Inverter make	No of Inverters
1	Aluva	335	Vikram	156	50	Sungrow	1
2	Company Paddy	335	Vikram	148	50	Sungrow	1
3	Kalamasheery	335	Vikram	110	33	Sungrow	1
4	Pathadipalam	335	Vikram	118	33	Sungrow	1
5	Edapally oppo	335	Vikram	174	50	Sungrow	1
6	Palarivattom	335	Vikram	224	33	Sungrow	2
7	JLN Stadium	335	Vikram	600	100	Sungrow	2
8	Town Hall	335	Vikram	176	50	Sungrow	1
9	MG Road	335	Vikram	120	20	Sungrow	2
10	Maharaja collage	335	Vikram	168	50	Sungrow	1
11	Ernakulam South	335	Vikram	410	100+33	Sungrow	1+1
12	Kadavanthra	335	Vikram	520	20+50+100	Sungrow	1+1+1
13	Elamkulam	335	Vikram	527	20+50+100	Sungrow	1+1+1
14	Vytilla	335	Vikram	720	20+100	Sungrow	1+2
15	Thykoodam	335	Vikram	552	20+50+100	Sungrow	1+1+1
16	Thykoodam RSS	335	Vikram	72	20	Sungrow	1
17	Petta	335	Vikram	542	20+50+100	Sungrow	1+1+1
18	Pway	335	Vikram	274	100	Sungrow	1
19	Ass-3	335	Vikram	144	50	Sungrow	1
20	Muttom Depot - Multiple sites (shown below)	335+390	Vikram+Waaree	2460+6328	800	TMEIC	4

Muttom Depot	Module Wp	Module make	No of modules	Inverter rating (Kw)	Inverter make	No of Inverters
Track-A	390	Waaree	1428	800	TMEIC	2
Track-B	390	Waaree	840			
Road/green area	390	Waaree	1680			
SBL	390	Waaree	2380	800	TMEIC	1
Ground area	335	Vikram	2460	800	TMEIC	1

Subros Ltd.:

S.No	Roof Name	Module Wp	Module make	No of modules	Inverter rating (Kw)	Inverter make	No of Inverters
1	Subros R&D	330	Waaree	567	60+80	Solis	2

SECI Rooftop:

Sl. No	Location	Building (no. of inverters)	Inverter Details			Module Details			
			Inverter Make	Inverter Capacity	Inverter Model	Module Make	Module Type	Module Capacity	Total No of Modules
1	Pondicherry University	Dept.of comp science	Solis	50.0	5G	Vikram Solar	PolyCrys taline	335 Wp	140
2	Pondicherry University	Dept.of Earth Science	Solis	100.0	5G	Vikram Solar	PolyCrys taline	335 Wp	280
3	Pondicherry University	Dept.of Physics	Solis	100.0	5G	Vikram Solar	PolyCrys taline	335 Wp	280
4	Pondicherry University	Science Block-1	Solis	100.0	5G	Vikram Solar	PolyCrys taline	335 Wp	290
5	Pondicherry University	Ground Mount-1	Solis	50.0	5G	Vikram Solar	PolyCrys taline	335 Wp	160
6	Pondicherry University		Solis	100.0	5G	Vikram Solar	PolyCrys taline	335 Wp	340
7	Pondicherry University	Ananda Rangapill ai Library	Solis	80.0	5G	Vikram Solar	PolyCrys taline	335 Wp	212
8	Pondicherry University	Dept.of B iotechnol ogy	Solis	50.0	5G	Vikram Solar	PolyCrys taline	335 Wp	160
9	Pondicherry University	Lecture Hall Complex	Solis	50.0	5G	Vikram Solar	PolyCrys taline	335 Wp	120
10	Pondicherry University	School of Manage ment	Solis	100.0	5G	Vikram Solar	PolyCrys taline	335 Wp	328
11	Pondicherry University	Ground Mount-2	Solis	80.0	5G	Vikram Solar	PolyCrys taline	335 Wp	240
12	Pondicherry University		Solis	100.0	5G	Vikram Solar	PolyCrys taline	335 Wp	300
13	Pondicherry University	School of Humanity	Solis	50.0	5G	Vikram Solar	PolyCrys taline	335 Wp	152
14	Pondicherry University		Solis	80.0	5G	Vikram Solar	PolyCrys taline	335 Wp	232
15	Pondicherry University	School of Social Science	Solis	60.0	4G	Vikram Solar	PolyCrys taline	335 Wp	176
16	Pondicherry University		Solis	80.0	5G	Vikram Solar	PolyCrys taline	335 Wp	232

17	Pondicherry University	Sri Aurobindo Hostel	Solis	60.0	4G	Vikram Solar	PolyCrys taline	335 Wp	180
18	Pondicherry University	Ground Mount-3	Solis	80.0	5G	Vikram Solar	PolyCrys taline	335 Wp	240
19	Pondicherry University		Solis	100.0	5G	Vikram Solar	PolyCrys taline	335 Wp	280
20	Pondicherry University	Electronic media	Solis	100.0	5G	Vikram Solar	PolyCrys taline	335 Wp	290
21	Pondicherry University	Marie curie Research Hostel	Solis	80.0	5G	Vikram Solar	PolyCrys taline	335 Wp	220
22	Pondicherry University	Narmadha Hostel	Solis	50.0	5G	Vikram Solar	PolyCrys taline	335 Wp	140
23	Pondicherry University	Mega mess	Solis	80.0	5G	Vikram Solar	PolyCrys taline	335 Wp	220
24	Pondicherry University	Ground mount 4	Solis	60.0	4G	Vikram Solar	PolyCrys taline	335 Wp	160
25	Pondicherry University		Solis	60.0	4G	Vikram Solar	PolyCrys taline	335 Wp	200
26	Pondicherry University		Solis	60.0	4G	Vikram Solar	PolyCrys taline	335 Wp	200
27	Pondicherry University	Carport-1	Solis	100.0	5G	Vikram Solar	PolyCrys taline	335 Wp	300
28	Pondicherry University	Carport-2	Solis	80.0	5G	Vikram Solar	PolyCrys taline	335 Wp	240
29	Pondicherry University		Solis	100.0	5G	Vikram Solar	PolyCrys taline	335 Wp	300
30	Pondicherry University	Ground Mount-5	Solis	80.0	5G	Vikram Solar	PolyCrys taline	335 Wp	240
31	Pondicherry University		Solis	100.0	5G	Vikram Solar	PolyCrys taline	335 Wp	280
32	MGPPI	Inverter1	Solis	100.0	5G	Vikram Solar	PolyCrys taline	335 Wp	296
33	MGPPI	Inverter2	Solis	100.0	5G	Vikram Solar	PolyCrys taline	335 Wp	300
34	RIVER	Inverter 1	Solis	50.0	5G	Vikram Solar	PolyCrys taline	335 Wp	150
35	RIVER	Inverter 2	Solis	80.0	5G	Vikram Solar	PolyCrys taline	335 Wp	266
36	RIVER	Inverter 3	Solis	60.0	4G	Vikram Solar	PolyCrys taline	335 Wp	180
37	IGMC	Inverter 1	Solis	100.0	5G	Vikram Solar	PolyCrys taline	335 Wp	300
38	IGMC	Inverter 2	Solis	110.0	5G	Vikram Solar	PolyCrys taline	335 Wp	324
39	IGMC	Inverter 3	Solis	110.0	5G	Vikram Solar	PolyCrys taline	335 Wp	324
40	IGMC	Inverter 4	Solis	30.0	5G	Vikram Solar	PolyCrys taline	335 Wp	92
41	RGGWCH	Inverter 1	Solis	110.0	5G	Vikram Solar	PolyCrys taline	335 Wp	326

42	CGG	Carport-1 Inv -1	Solis	80.0	5G	Vikram Solar	PolyCrys taline	335 Wp	232
43	CGG	Carport-1 Inv -2	Solis	60.0	4G	Vikram Solar	PolyCrys taline	335 Wp	178
44	CGG	Carport-2 Inv -3	Solis	80.0	5G	Vikram Solar	PolyCrys taline	335 Wp	232
45	CGG	Carport-2 Inv -4	Solis	60.0	4G	Vikram Solar	PolyCrys taline	335 Wp	178
46	CGG	ASS Room Inv-5	Solis	15.0	4G	Vikram Solar	PolyCrys taline	335 Wp	45
47	AG Office	Rooftop Inv -1	Solis	110.0	5G	Vikram Solar	PolyCrys taline	335 Wp	320
48	AG Office	Rooftop Inv -2	Solis	60.0	4G	Vikram Solar	PolyCrys taline	335 Wp	180
49	SPA	Rooftop	Solis	60.0	4G	Vikram Solar	PolyCrys taline	335 Wp	180
50	SPA	Rooftop	Solis	60.0	4G	Vikram Solar	PolyCrys taline	335 Wp	178
51	MANIT	Rooftop	Solis	230.0	5G	Vikram Solar	PolyCrys taline	335 Wp	688

1.12 Project Location

The location of the bundled project activity is mentioned in the table below:

S.I No.	Name of the project owner	Installatio n Location	Premises Address	Capacity (kW)	Latitude (N)	Longitude (E)
1	Kochi Metro Rail Limited	Aluva	Periyar Nagar, Aluva, Kerala 683101	52.26	10° 06' 35" N	76° 20' 58" E
		Company Paddy	Thaikkttukara, Choornikkara, Aluva, Kerala, 683106	49.58	10° 05' 14" N	76° 20' 34" E
		Kalamash eery	NH544, South Kalamassery, Kalamassery, Ernakulam, Kerala	36.85	10° 03' 31" N	76° 19' 19" E
		Pathadipa lam	Koonamthai Pathadipalam Residence Association Block A, Koonamthai, Edappally,	39.53	10° 02' 10" N	76° 18' 52" E

S.I No.	Name of the project owner	Installation Location	Premises Address	Capacity (kW)	Latitude (N)	Longitude (E)
			Ernakulam, Kerala 682024			
		Edappally oppo	Edappally, Kochi, Kerala 682024	58.29	10° 01' 30" N	76° 18' 29" E
		Palarivattom	Palarivattom - Edappally Rd, Sonia Nagar, Mamangalam, Palarivattom, Ernakulam, Kerala 682565	75.04	10° 00' 23" N	76° 18' 17" E
		JLN Stadium	JLN Metro Station, 4th Floor, Kaloor, Ernakulam 682017	201	10° 00' 02" N	76° 17' 56" E
		Town Hall	Ernakulam North, Kaloor, Ernakulam, Kerala 682017	58.96	9° 59' 30" N	76° 17' 18" E
		MG Road	Postmaster, Kochi M.G.Road S.O, Ernakulam, Kerala, India (IN), Pin Code:-682016	40.2	9° 59' 00" N	76° 16' 56" E
		Maharaja collage	KPCC Junction, Opp Maharajas Ground, Shenoy's, Ernakulam, Kerala, 682011	56.28	9° 58' 23" N	76° 17' 06" E
		Ernakulam South	S Railway Station Rd, Kalathiparambil, Ernakulam South, Ernakulam, Kerala 682016	137.35	9° 58' 07" N	76° 17' 20" E
		Kadavant hara	Elamkulam, Ernakulam, Kerala 682020	174.2	9° 57' 59" N	76° 17' 52" E

S.I No.	Name of the project owner	Installation Location	Premises Address	Capacity (kW)	Latitude (N)	Longitude (E)
		Elamkulam	Arya bhang Pinnacle , S.A.Road, Elamkulam, Kadavanthra, Kochi, Kerala 682020	176.545	9° 58' 02" N	76° 18' 29" E
		Vytilla	Vytilla, Ernakulam, Kerala 682019	241.2	9° 58' 02" N	76° 19' 13" E
		Thykooodam	SH15, Thykooodam, Vytilla, Ernakulam, Kerala 682019	160.8	9° 57' 36" N	76° 19' 24" E
		Thykooodam RSS	SH15, Thykooodam, Vytilla, Ernakulam, Kerala 682019	24.12	9° 57' 34" N	76° 19' 22" E
		Petta	SH15, Upasana Nagar, Maradu, Ernakulam, Kerala 682304	181.57	9° 57' 09" N	76° 19' 47" E
		P-way & ASS3	P-way (87.1 kw): Choornikkara, muttom, Aluva, Kerala 683106 ASS 3 (48.24 kw): Alstom Transport India Limited KS1- Warehouse & Office, Near Kochi Metro Muttom Depot, Thaikkatukara PO, Aluva, Ernakulam- 683106, Kerala 683106	135.34	P-way: 10° 04' 36" N ASS3: 10° 04' 39" N	P-way: 76° 20' 26" E ASS3: 76° 20' 29" E

S.I No.	Name of the project owner	Installation Location	Premises Address	Capacity (kW)	Latitude (N)	Longitude (E)
		Muttom Depot – ground mount	Alstom Transport India Limited KS1-Warehouse & Office, Near Kochi Metro Muttom Depot, Thaikkatukara PO, Aluva, Ernakulam-683106, Kerala 683106	824.10	10° 4' 37" N	76° 20' 21" E
		Muttom Depot – SBL Shed	Choornikkara, muttom, Aluva, Kerala 683106	928.20	10° 4' 47" N	76° 20' 37" E
		Muttom Depot – Track A shed		556.92	10° 4' 35" N	76° 20' 23" E
		Muttom Depot – Track B Shed		316.68	10° 4' 42" N	76° 20' 31" E
		Road Area		655.2	10° 4' 42" N	76° 20' 27" E
		Track B - Muttom Depot		10.92	10° 4' 42" N	76° 20' 31" E
2	Subros Limited	Subros Limited (Research and development centre)	C-51, Distt: Phase 2, Noida, Uttar Pradesh – 201305	187.11	28° 32' 23" N	77° 24' 52" E
3	SECI Rooftop	Pondicherry University	R Venkataraman Nagar, Kalapet, Puducherry-605014	2389.22	12° 02' 00" N	79° 51' 29" E
		Mahatma Gandhi Post Graduate Institute of Dental Science (MGPGIDS)	Mahatma Gandhi Postgraduate Institute of Dental Sciences (MGPGI) Indra Nagar Gorimedu Pondicherry-605006	199.66	11° 57' 26" N	79° 47' 36" E

S.I No.	Name of the project owner	Installation Location	Premises Address	Capacity (kW)	Latitude (N)	Longitude (E)
		Rajiv Gandhi Institute of Veterinary Education & Research (RIVER)	Rajiv Gandhi Institute of Veterinary Education and Research (RIVER) Vazhudhavur Road, Kurumbapet, Puducherry – 605009	200	11° 56' 17" N	79° 45' 47" E
		Indira Gandhi Medical College & Research Institute (IGMC&R)	Indira Gandhi Medical College & Research Institute (IGMC) Vazhudhavur Road, Kathirkanam, Puducherry – 605009	348.4	11° 56' 24" N	79° 47' 51" E
		Rajiv Gandhi Government Women & Children Hospital (RGGWCH)	Rajiv Gandhi Government Women and Children Hospital (RGGWCH) Ellaipillaichavadi, Puducherry - 605009	109.21	11° 56' 14" N	79° 48' 25" E
		Centre For Good Governance	Survey No.91, Near Outer Ring Road, Chowrasta, Gachibowli, Hyderabad, Telangana – 500032	290	17° 26' 11" N	79° 21' 41" E
		Accounts General Audit	Ambedkar Colony, Khairtabad, Hyderabad, Telangana - 500004	167.50	17° 24' 22" N	78° 28' E
		School of Planning & Architecture	Survey No. 4/4, ITI Road, Vijaywada, Andhra Pradesh - 520008	119.93	16° 30' 21" N	80° 39' 25" E
		MANIT	Link Road No.3, Near Mata Mandir, Bhopal, Madhya Pradesh - 462003	230	23° 12' 48" N	77° 24' 26" E

1.13 Conditions Prior to Project Initiation

The project is a Greenfield solar power project and does not involve generation of GHG emissions for the purpose of their subsequent reduction, removal or destruction. Prior to the initiation of the project activity, the equivalent amount of electricity has been drawn from grid connected or new power plants, in Indian Grid. The grid is predominantly coal based and therefore is a major source of carbon dioxide emissions in India. The main emission in the pre project scenario is the power plants connected to the Indian Grid, and main GHG involved is CO₂. The baseline identified in section 3.4 is same as the pre-project scenario.

1.14 Compliance with Laws, Statutes and Other Regulatory Frameworks

The Project has received necessary approvals for development and commissioning for each PV Plant from the state Nodal agencies and is in compliance to the local laws and regulations.

The relevant national laws and regulations pertaining to generation of energy in India are:

- Electricity Act 2003
- National Electricity Policy 2005
- Tariff Policy 2006

The Project activity conforms to all the applicable laws and regulations in India:

- Power generation using solar energy is not a legal requirement or a mandatory option.
- There are state and sectoral policies, framed primarily to encourage solar power projects. These policies have also been drafted realizing the extent of risks involved in the projects and to attract private investments.
- The Indian Electricity Act, 2003 (May 2007 Amendment) does not influence the choice of fuel used for power generation.
- There is no legal requirement on the choice of a particular technology for power generation.

1.15 Participation under Other GHG Programs

1.15.1 Projects Registered (or seeking registration) under Other GHG Program(s)

The proposed project activity has not been registered and is not seeking registration at moment under any other GHG programs.

1.15.2 Projects Rejected by Other GHG Programs

The proposed project activity is not participating in other Environmental credits, other GHG programs and has not been rejected by other GHG programs.

1.16 Other Forms of Credit

1.16.1 Emissions Trading Programs and Other Binding Limits

The project activity under consideration is not participating in any other Emission trading programme and other binding limits.

The all-project activity is not participating at moment in any other emission trading programme and other binding limits. The GHG emission reductions generated during the current monitoring period have not been used for compliance of other mechanism.

1.16.2 Other Forms of Environmental Credit

The proposed project activity neither has nor intends to generate any other form of GHG related environmental credit for GHG emission reductions or removals claimed under the VCS Program.

1.17 Sustainable Development Contributions

1.17.1 Sustainable Development Contributions Activity Description

The project involves installation of bundled Solar Photovoltaic (SPV) power plant with a cumulative capacity of 9.43 MW primarily to meet the captive demand of the premises owners. The premises owners are the customers of the power generated from the solar panels who purchase the power under long term power purchase agreements signed for 25 years. Before installation of the rooftop solar units, the Kochi Metro premises, Subros Ltd., SECI rooftop premises owners used to meet the electricity demand from the national grid of the India. The project thus replaces fossil fuel dominated grid electricity thereby reducing the equivalent amount of GHG emission and contributing to sustainable development. The project activity has also provided employment to local people, thus contributing towards SDG 8. The sustainable development contributions made by the project activity are mentioned in Table 1 of the section 1.17.2

Contribution to sustainable development:

Apart from generation of renewable electricity, the project activity contributes to the sustainable development of the region - socially, environmentally and economically., Ministry of Environment, Forest and Climate Change has stipulated economic, social, environment and technological well-being as the four indicators of sustainable development. The project contributes to sustainable development using the following ways.

- **Social well-being:** The project helped in generating employment opportunities during the construction and operation phases. The project activity leads to development in infrastructure in the region like development of roads and also promotes business with improved power generation.
- **Economic well-being:** The project is a clean technology investment in the region, which would not have been taken place in the absence of the VCS benefits. The project activity also helps to reduce the demand supply gap in the state. The project activity creates local employment generation which helps economic well-being of local people.

- **Technological well-being:** The successful operation of project activity leads to promotion of solar based power generation and encourages other entrepreneurs to participate in similar projects.
- **Environmental well-being:** Solar being a renewable source of energy, it reduces the dependence on fossil fuels and conserves natural resources which are on the verge of depletion. Due to its zero emission, the project activity also helps in avoiding significant amount of GHG emissions.

1.17.2 Sustainable Development Contributions Activity Monitoring

The project activity is solar renewable energy project to use electricity generated for captive purpose, thus reduces GHG emissions by displacing the fossil fuel dominated grid-based electricity with renewable electricity. It also provides employment opportunities for local persons. and resulted in increasing business opportunities for local contractors and suppliers during various phases.

Project contributes towards following SDGs achievement during the current monitoring period:

SDG - 7: Ensure access to affordable, reliable, sustainable and modern energy for all.

SDG - 8: Promote sustained, inclusive and sustainable economic growth, full and productive employment, Equal pay and decent work for all and protect labour rights and promote safe working environment.

SDG - 13: Climate Action: Take urgent action to combat climate change and its impacts.

Table 1: Sustainable Development Contributions

Row number	SDG Target	SDG Indicator	Net Impact on SDG Indicator	Current Project Contributions	Contributions Over Project Lifetime
1)	13.0	Tonnes of greenhouse gas emissions avoided or removed	Implemented activities to increase	Activity: CO₂e Reduction The project has reduced 13,398 tCO₂e during the ongoing monitoring period, 05-March-2021 to 31-December-2022.	As of now, the project has reduced 13,398 tCO ₂ e up to 31-December-2022 since the start date of the crediting period.
2)	7.2	7.2.1: Renewable energy share in the total final energy consumption	Implemented activities to increase	Activity: Renewable electricity generation The project has generated 14,391 MWh of renewable energy during the ongoing monitoring period, 05-March-2021 to 31-December-2022.	As of now, the project has generated 14,391 MWh of renewable energy up to 31-December-2022 since the start date of the crediting period.

3)	8.5	8.5.2 Unemployment rate, by sex, age and persons with disabilities	Implemented activities to decrease	Activity: Employment The project activity bundle has employed a total of 70 workers. Thus, the project is contributing towards SDG 8.5.2 by increasing the employment opportunities to the local people. The employee details are added in Appendix 4.	The project activity bundle has employed a total of 70 workers. Thus, the project is contributing towards SDG 8.5.2 by increasing the employment opportunities to the local people. The employee details are added in Appendix 4.
----	-----	--	---------------------------------------	--	--

1.18 Additional Information Relevant to the Project

Leakage Management

Since the project activity is a renewable energy (rooftop and ground mounted) project based on solar technology, no leakage emissions are considered.

Thus, leakage management plan and implementation of leakage and risk mitigation measures are not applicable for this project activity.

Commercially Sensitive Information

Not applicable. No any commercially sensitive information has been excluded from the public version of the project description. There is no commercially sensitive information.

Further Information

Not Applicable

2 SAFEGUARDS

2.1 No Net Harm

The project activity promotes environmental and socio-economic well-being as it results in zero GHG emissions due to installation and operation of clean, renewable energy technology for electricity generation.

The report on “Developmental Impacts and Sustainable Governance Aspects of Renewable Energy Projects” prepared by MNRE dated September 2013. This report clearly mentioned that solar project activity operations do not result in direct air pollution, noise pollution. Please refer below web link for the same⁴.

Thus, there are no any significant impacts due to implementation of project activity on air, water, soil quality and ambience are envisaged due to the project activity.

2.2 Local Stakeholder Consultation

⁴ https://www.odishainnovationcell.nic.in/Content/SIC/Articles/RE_Development_Impacts_in_India.pdf

The local stakeholder consultation for the bundled project activities have been carried out. The stakeholders were identified and informed about the proposed project activity by circulating pamphlets briefing the scope, nature and description of the project.

The local stakeholder consultations were carried out at the project sites:

Meeting No.	Local Stakeholder Meeting Date	Venue
1	26-April-2021	Kochi Metro Depots
2	26-February-2021	C-51, Distt: Phase 2, Noida, Uttar Pradesh – 201305
3	15-March-2021	Pondicherry University
4	16-March-2021	SPA – Vijayawada Campus, Andhra Pradesh
5	18-March-2021	MANIT, Bhopal, Madhya Pradesh
6	10-March-2021	AG office & CGG, Hyderabad, Telangana

AMP representative opened the meeting by welcoming everyone to the Stakeholder Consultation and explained the benefits of the Rooftop Solar System as presented below:

- Utilization of available vacant roof space
- Low gestation period
- Lower transmission and distribution losses
- Improvement in the tail-end grid voltages and reduction of system congestion
- Long term energy and ecological security by reduction in carbon emission
- Abatement of carbon over its life cycle

Alongside, AMP representative also provided an overview of the said rooftop project and the benefits during the consultation. It was observed that few of attendee already had good understanding of such type of project and how it is beneficial for the company and the environmental. After the detailed discussions, the session was open for questions from stakeholders.

The stakeholders were totally in support for setting up of these kinds of projects in their premises. There were no negative comments received from any of the stakeholders about the projects. All of them were content on implementation of such clean and green projects which are beneficial for the environment.

The Minutes of meeting along with the attendance sheet is submitted to the VVB. Regular stakeholder engagement is one the key focus at the project site. The project proponents have a Grievance Redressal Committee (GRC) along with a proper Grievance Redressal Mechanism in place. As a part of continuous feedback from stakeholders, grievances registers are placed at the sites and is being continuously monitored. In the grievance register, the stakeholder can mention

the comments or feedback related to the project activity. If any comments are received, the concerned person from the project proponent's side addresses them accordingly.

2.3 Environmental Impact

The guidelines on Environmental Impact Assessment have been published by Ministry of Environment, Forests and Climate Change (MoEFCC), Government of India (GOI) under Environmental Impact Assessment notification 14-September-2006⁵. Further amendments to the notification have been done on 14-July-2018⁶. As per the notification:

The following projects or activities shall require prior environmental clearance from the concerned regulatory authority, which shall hereinafter referred to be as the Central Government in the Ministry of Environment, Forest and Climate Change matters falling under Category 'A' in the Schedule and at State level, the State Environment Impact Assessment Authority (SEIAA) for matters falling under Category 'B' in the said Schedule, before any construction work, or preparation of land by the project management except for securing the land, is started on the project or activity:

- (i) All new projects or activities listed in the Schedule to this notification;
- (ii) Expansion and modernization of existing projects or activities listed in the Schedule to this notification with addition of capacity beyond the limits specified for the concerned sector, that is, projects or activities which cross the threshold limits given in the Schedule, after expansion or modernization;
- (iii) Any change in product - mix in an existing manufacturing unit included in Schedule beyond the specified range.

As the solar power generation projects are not listed in any of the categories of the schedule. So, the project is considered environmentally safe and as per Host party- India no EIA is required.

2.4 Public Comments

The project was listed for public comment period from 17-January-2023 to 16-February-2023. No comments were received during this period.

2.5 AFOLU-Specific Safeguards

This section is not required as this project activity is a non - AFOLU project activity.

⁵ EIA Notification 2006: <http://www.environmentwb.gov.in/pdf/EIA%20Notification,%202006.pdf>

⁶ EIA Notification 2018: <http://www.egcipl.com/Doc/Gazette%20Notification.pdf>

3 APPLICATION OF METHODOLOGY

3.1 Title and Reference of Methodology

The project activity is small scale project activity with power generation capacity less than or equal to 15 MW as per CDM terminology. Accordingly, below mentioned methodology is used for each of the project activity.

The methodology for the project activity is the approved methodology for small- scale CDM project activities. The details of the methodology are as follows:

Methodology: AMS.I.F.

Project Type : Type-I: Renewable Energy Projects
 Title : Renewable Electricity Generation for captive use and Mini-grid
 Version No. : Version 05.0; EB 115
 Reference : CDM Methodologies⁷

Tools involved in the project are listed below:

1. Tool 07: Tool to calculate the emission factor for an electricity system - Version 7.0⁸
2. Tool 21: Demonstration of additionality of small-scale project activities – Version 13.1⁹
3. Tool 27: “Investment Analysis” Version 9.0¹⁰, Version 10.0¹¹ & version 12.0¹²

3.2 Applicability of Methodology

The small-scale grid connected project activity meet the applicability conditions of the approved methodology AMS I.F., Version 05.0, Sectoral Scope 1, as described below:

Applicability Condition of AMS I F Version 5.0	Project activity vis-à-vis applicability Conditions
This methodology is applicable for project activities that: a) Install a new power plant at a site where there was no renewable energy power plant	The project activity is installation of greenfield power plants. Hence the condition (a) is justified by the project activity.

⁷ <https://cdm.unfccc.int/UserManagement/FileStorage/I1P3XEBCJ0625DUALGSNO79R8FWY4V>

⁸ <https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v7.0.pdf>

⁹ <https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-21-v13.1.pdf>

¹⁰ <https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-27-v9.0.pdf>

¹¹ <https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-27-v10.0.pdf>

¹² <https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-27-v12.pdf>

operating prior to the implementation of the project activity (Greenfield plant); b) Involve a capacity addition, c) Involve a retrofit of (an) existing plant(s); or d) Involve a replacement of (an) existing plant(s).	
Illustration of respective situations under which each of the methodology (“AMS-I.D.: Grid connected renewable electricity generation”, “AMS-I.F.: Renewable electricity generation for captive use and mini-grid” and “AMS-I.A.: Electricity generation by the user”) applies is included in Table below.	The project activity applies methodology AMS I.F and the detailed scenario has been explained after end of this table.
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 distinct from the existing units.	Project activity is not a capacity addition. All are greenfield installation.
In the case of retrofit or replacement, to qualify as a small-scale project, the total output of the retrofitted or replacement unit shall not exceed the limit of 15 MW.	This project activity is not a retrofit or replacement of existing project activity
If the unit added 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 unit added co-fires fossil fuel, the capacity of the entire unit shall not exceed the limit of 15 MW.	The project activity does not have a non-renewable component.
Combined heat and power (co-generation) systems are not eligible under this category.	The project activity does not involve with co-generation.
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 an existing reservoir with no change in the volume of reservoir; b. The project activity is implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity, as per definitions given in project emissions section is greater than 4 W/m²	Project activity does not include hydro power generation.

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/m ² .	
If electricity and/or steam/heat produced by the project activity is delivered to a third party, i.e., another facility or facilities within the project boundary, a contract between the supplier and consumer(s) of the energy will have to be entered that ensures that there is no double counting of emission reductions.	The project activity has a contractual agreement between supplier and consumers in order to specifically avoid double counting.
In the case the project activities utilize biomass, the "TOOL16: Project and leakage emissions from biomass" shall be applied to determine the relevant project emissions from the cultivation of biomass and the utilization of biomass or biomass residues.	The project activity does not involve with biomass usage.

Applicability of AMS-I.D, AMS-I.F and AMS-I.A based on project types

	Project type	AMS-I.A	AMS-I.D	AMS-I.F
1	Project supplies electricity to a national/regional grid		√	
2	Project displaces grid electricity consumption (e.g., grid import) and/or captive fossil fuel electricity generation at the user end (excess electricity may be supplied to a grid)			√
3	Project supplies electricity to an identified consumer facility via national/regional grid (through a contractual arrangement such as wheeling)		√	
4	Project supplies electricity to a mini grid ⁷ system where in the baseline all generators use exclusively fuel oil and/or diesel fuel			√
5	Project supplies electricity to household users (included in the project boundary) located in off grid areas	√		

As the rooftop and ground mounted solar units involved in the project generate electricity to deliver to captive consumers, excess electricity is to be supplied to the grid and wheeling is not used in the grid-connected instances, this resembles the scenario listed at S.I no. 2 of the above table and hence the methodology, AMS I.F. is applied appropriately.

The solar units involved in the project are installed for the purpose of meeting captive electricity demand of the premises owners. The rooftop solar units are connected to the national grid through net metering mechanism, Actual electricity consumption is very high when compared with the units

generated from the solar units. Being implemented with the primary purpose of meeting captive electricity demand, the project is eligible in line with para 2.1.3 of the VCS Standard Version 4.4

Tool 07: Tool to calculate the emission factor for an electricity system¹³ - Version 07.0 (EB 100, Annex 04)

Applicability Criterion	Project Case
This tool may be applied to estimate the OM, BM and/or CM when calculating baseline emissions for a project activity that substitutes grid electricity that is where a project activity supplies electricity to a grid or a project activity that results in savings of electricity that would have been provided by the grid (e.g., demand-side energy efficiency projects).	The project is a grid connected rooftop Greenfield solar power project, under the net metering mechanism and thus the tool is applicable.
Under this tool, the emission factor for the project electricity system can be calculated either for grid power plants only or, as an option, can include off-grid power plants. In the latter case, two sub-options under the step 2 of the tool are available to the project participants, i.e., option II a and option IIb. If option II a is chosen, the conditions specified in "Appendix 2: Procedures related to off-grid power generation" should be met. Namely, the total capacity of off-grid power plants (in MW) should be at least 10 per cent of the total capacity of grid power plants in the electricity system; or the total electricity generation by off-grid power plants (in MWh) should be at least 10 per cent of the total electricity generation by grid power plants in the electricity system; and that factors which negatively affect the reliability and stability of the grid are primarily due to constraints in generation and not to other aspects such as transmission capacity.	Steps involved in calculation of Emission Factor is included in section 4.1 of the Joint PD and MR as per the requirement of the tool.
In case of CDM projects the tool is not applicable if the project electricity system is located partially or totally in an Annex I country.	Project activity is located in non-Annex I country and hence the tool is applicable
Under this tool, the value applied to the CO ₂ emission factor of biofuels is zero.	The project activity is a solar project and there is no involvement of biofuels.

¹³<https://cdm.unfccc.int/methodologies/PAMethodologies/tools/am-tool-07-v7.0.pdf>

The project activity qualifies as Type I during every year of the crediting period in accordance with applicable provisions for project activity eligibility as discussed above. Also, the cumulative capacity of the project activity is 9.43 MW consisting of small-scale project activity and respective methodology is applicable for the project activity.

In addition to the above applicability criteria, the project also meets the criteria of the following methodological tools:

- Compliance to applicability conditions of Methodological Tool: Tool 21: Demonstration of additionality of small-scale project activities - Version 13.1 is demonstrated in section 3.5
- Compliance to applicability conditions of Methodological Tool: Tool 27: Investment analysis – Version 9.0, 10.0 and 12.0 are demonstrated in section 3.5

3.3 Project Boundary

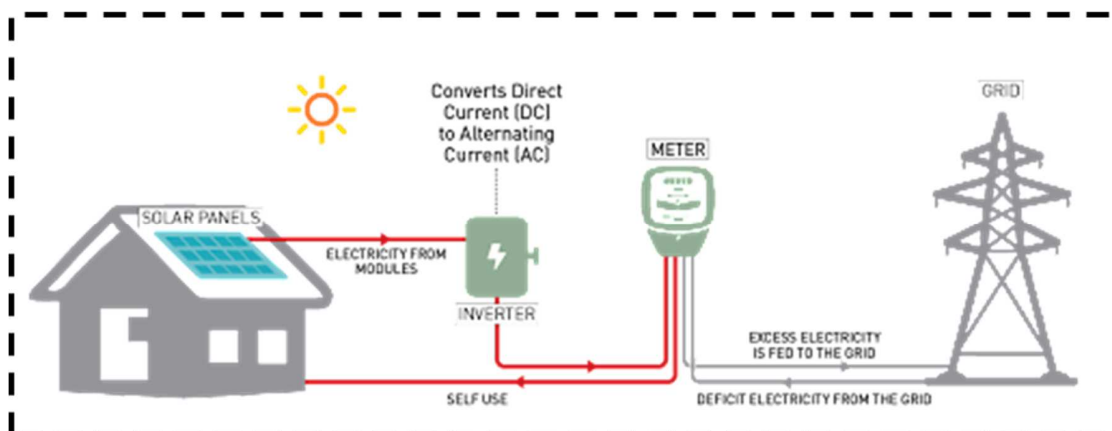
As per AMS I.F, Version 5.0 “The spatial extent of the project boundary includes industrial, commercial facilities consuming energy generated by the system. In the case of electricity generated and supplied to distributed users (e.g., residential users) via mini/isolated grid(s) the project boundary may be confined to physical, geographical site of renewable generating units. The boundary also extends to the project power plant and all power plants connected physically to the electricity system that the CDM project power plant is connected to.”

The project boundary includes the solar rooftop project installed at the user’s roof. Users might also be connected to the Indian grid. Therefore, the entire Indian grid and all connected power plants have been considered in the project boundary for the proposed VCS project activity.

The table below provides an overview of the emissions sources included or excluded from the project boundary for determination of baseline and project emissions.

Source		Gas	Included?	Justification/Explanation
Baseline	Grid connected electricity generation	CO ₂	Yes	Main emission source
		CH ₄	NO	Minor emission source
		N ₂ O	NO	Minor emission source
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

The grid comes under the project boundary as the solar rooftop units are connected to the grid through net metering mechanism. The pictorial depiction of the project boundary is given below.



3.4 Baseline Scenario

As per the applicable methodology, a Greenfield power plant is defined as “a new renewable energy power plant that is constructed and operated at a site where no renewable energy power plant was operated prior to the implementation of the project activity.”

As per AMS I.F Version 05.0; “For project activities that displace electricity consumed from the electric grid and from a fossil fuel fired on-site captive power plant , the baseline emission factor shall reflect the emissions intensity of the grid and the captive power plant in the baseline scenario i.e., the weighted average emission factor for the displaced electricity is calculated using values based on the historical (prior three year ratio) of electricity from captive plants and the grid. For new facilities, the most conservative (lowest) of the emission factor for the two power sources should be used.

Hence, the baseline for the project activity is the equivalent amount of power from the Indian grid. The combined margin ($EF_{CO_2, y}$) is the result of a weighted average of two emission factor pertaining to the electricity system: the operating margin (OM) (having weightage 75%) and build margin (BM) (having weightage 25%). Calculations for this combined margin must be based on data from an official source of CEA database (where available) and made publicly available.

The combined margin of the Indian National Grid used for the project activity is as follows:

Parameter	Value	Nomenclature	Source
-----------	-------	--------------	--------

EF _{grid,CM,y}	0.9310tCO ₂ /MWh	Combined margin CO ₂ emission factor for the project electricity system in year y	Calculated as the weighted average of the operating margin (0.75) & build margin (0.25) values, sourced from Baseline CO ₂ Emission Database, Version 18.0 December - 2022 published by Central Electricity Authority (CEA), Government of India
EF _{grid,OM,y}	0.9518tCO ₂ /MWh	Operating margin CO ₂ emission factor for the project electricity system in year y	Calculated as the last 3-year (2019-20, 2020-21, 2021-22) generation-weighted average, sourced from Baseline CO ₂ Emission Database, Version 18.0 December - 2022 published by Central Electricity Authority (CEA), Government of India
EF _{grid,BM,y}	0.8687tCO ₂ /MWh	Build margin CO ₂ emission factor for the project electricity system in year y	Baseline CO ₂ Emission Database, Version 18.0 December - 2022 published by Central Electricity Authority (CEA), Government of India

3.5 Additionality

In accordance with applied Tool 21, “Demonstration of additionality of small-scale project activities” Version 13.1, the project proponent shall provide an explanation to show that the project activity would not have occurred anyway due to at least one of the following barriers:

- Investment barrier
- Technological barrier
- Barrier due to prevailing practice
- Other barriers

The project proponents have identified “investment barrier” as the most relevant barrier faced by the project activity. The investment barrier faced by the project activity consists of barrier due to high capital cost and consequent impact on return.

Investment Barrier:

The purpose of investment analysis is to determine whether the project activity is economically or financially less attractive than other alternatives without additional funding that may be derived from the sale of carbon credits. The investment analysis was conducted in accordance with guidelines on investment analysis.

The project proponent has considered Equity IRR as the suitable financial indicator for investment

analysis.

Suitability of Benchmark:

As per Tool 27: Investment analysis, Version 12.0, EB 116, Annex 2 “In cases where a benchmark approach is used the applied benchmark shall be appropriate to the type of IRR calculated. Local commercial lending rates or WACC are appropriate benchmarks for a project IRR. Required/expected returns on equity are appropriate benchmarks for an equity IRR. Benchmarks supplied by relevant national authorities are also appropriate if the DOE can validate that the benchmarks used are applicable to the project activity and the type of IRR calculation presented.”

Accordingly, the project proponent has selected required/ expected returns on equity as the appropriate benchmark for the project.

The investment analysis has been carried out in Nominal terms. Accordingly, Default value has been adjusted by adding suitable forecasted inflation rate taken from RBI (Central Bank, India). Project proponent has calculated Benchmark based on WPI mean inflation rate. As per paragraph 16 of the Tool 27: Investment analysis, Version 12.0, EB 116, Annex 2, the inflation forecast of the central bank of the host country should be for the duration of the crediting period. However, since RBI provides forecast inflation only for 5 & 10 years, the project investor has calculated benchmark using 10 years durations and the same is considered as Benchmark for the project activity.

Methodology deployed for arriving at a suitable value of Benchmark using Default Value has been described below:

For Kochi Metro Rail Limited (5.19 MW):

- As the project activity generates power utilizing solar energy, Group 1 as per paragraph 5 of Appendix of EB 112, Annex 2 has been identified as a suitable category.
- The investment analysis has been carried out in Nominal terms. Accordingly, default value as given in paragraph 6, Appendix, Annex 2, EB 112 has been adjusted by adding suitable forecasted inflation rate taken from RBI (Central Bank, India).
- Project proponent has calculated Benchmark based on WPI mean inflation rate. As per paragraph 16 of Appendix of EB 112, Annex 2, the inflation forecast should be for the duration of the crediting period. The project investor has calculated benchmark using 10 years inflation as Benchmark for the project activity.

The benchmark has been computed in the following manner:

$$\text{Nominal Benchmark}^{14} = \{(1 + \text{Real Benchmark}) * (1 + \text{Inflation rate})\} - 1$$

where,

Real Benchmark = Default Value, i.e., 9.79% (as per Tool 27: Investment Analysis, version 09.0¹⁵, available at the time of investment decision)

¹⁴ As per Fisher Equation, https://en.wikipedia.org/wiki/Fisher_equation

¹⁵ <https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-27-v9.0.pdf>

Inflation rate = Projected Inflation Rate for India, i.e., 4.00¹⁶

The investment decision for the project was taken on 04-September-2019. The latest Results of the Survey of Professional Forecasters on Macroeconomic Indicators – Round 51 published by Reserve Bank of India on 05-April-2018 has been referred for the projected inflation rate of India.

The nominal benchmark has been calculated as $= \{(1+9.79) * (1+4.00)\} - 1 = 14.18\%$

The Post tax Equity IRR is evaluated for the entire lifetime of the project activity, i.e., 25 years.

It is calculated based on the cash outflows from and cash inflows into the project activity. The IRR and Benchmark analysis are calculated in excel spreadsheet and same is submitted to the DoE during verification of project activity. Based on result of IRR excel spreadsheets, equity IRR is less than Benchmark. This substantiates that the investment is not financially attractive (Equity IRR for the project activity is less than the Benchmark). Thus, it can be easily concluded that project activity is additional & is not business as usual scenario. Input values used in all investment analysis shall be valid and applicable at the time of the investment decision taken by the project proponent which can be clearly verified; thus, it complies with guidance 10 of EB 112, Annex 2.

The financial spread sheets for the key assumption (source of parameters) supporting the financial projections are tabulated below:

Parameters	Values	Source
Details of the project		
Project Location	Kerala	DPR/ Commissioning certificate
Total Capacity (MW)	5.192	Commissioning certificates
Date of Commissioning	06-May-2021	DPR
Life of the plant (Yrs.)	25	DPR
Generation of electricity		
PLF (%)	17.37%	DPR
Annual generation (kWh)	7,902,224	Calculated Value
Annual Degradation per year from 2nd year onwards	0.70%	DPR
Tariff rate at the decision making (INR/kWh)	4.55	PPA
Operation and maintenance cost and Insurance		
O & M Expenses (INR Mn.)	1.66	DPR
O & M free for (Yr.)	-	DPR
Escalation in the operational expenses (%)	2.00%	DPR
Management Fee (₹ Mn)	1.23	DPR
Escalation (%)	0.00%	DPR
Admin Fee (₹ Mn)	0.50	DPR
Escalation (%)	5.00%	DPR

¹⁶ <https://www.rbi.org.in/Scripts/PublicationsView.aspx?id=18113>

Salary (₹ Mn)	0.30	DPR
Escalation (%)	5.00%	DPR
Lender's maintenance (₹ Mn)	0.20	DPR
Escalation (%)	0.00%	DPR
Insurance (₹ Mn)	0.39	DPR
Escalation (%)	0.00%	DPR
DSM - Penalty (~1% of revenue) (₹ Mn)	0.00	DPR
Financial parameters		
TOTAL COST (INR Mn.)	310.00	DPR
Loan Amount (INR Mn.)	217.00	DPR
Equity Investment (INR Mn.)	93.00	Calculated Amount
Term loan		
Loan Amount (INR Mn.)	217.00	70:30 ratio as per DPR
Interest rate (%)	10.15%	DPR
Loan Tenure (Qtr.)	64.00	DPR
Moratorium Period (Qtr.)	4.00	
Repayment Period (Qtr.)	60.00	Calculated Value
Repayment instalments value (INR Mn.)	3.62	Calculated Value
1st instalment from (Qtr. end)	30-June-2022	Considered from the next Quarter End
Book Depreciation (SLM Method)		
Gross Depreciable Value (INR Mn.)	310.00	Calculated
Salvage Value (%)	5.00%	DPR
Salvage value (INR Mn.)	15.50	Calculated
Net Depreciable Value (INR Mn.)	294.50	Calculated
Residual Value (INR Mn.)	15.50	Calculated
IT Depreciation		
IT Depreciation (%)	40.00%	As per IT Act
Income Tax		
Financial Year	FY 2018-19	
Income tax rate (%)	25.00%	As Per Income Tax Rule
Corporate Tax / MAT (%)	0.00%	As Per IT rule
GST (%)	18.00%	As Per Income Tax Rule
Surcharge (%)	7.00%	As Per Income Tax Rule
Health & Education cess (%)	4.00%	As Per Income Tax Rule
Final Tax rates		
Income tax rate (%)	27.82%	Calculated Value
MAT (%)	0.00%	Calculated Value

GST (%)	18.00%	Calculated Value
---------	--------	------------------

Considering the input values, Equity IRRs is given below:

Equity IRR	9.39%
Benchmark	14.18%

Therefore, the project activity cannot be considered as financially attractive as the equity IRR for the project activity is less than the Benchmark.

Sub-step 2d: Sensitivity Analysis

The sensitivity analysis done to identify the percentage variation at which the financial indicators will equal/breach the benchmark and the probability of its occurrence.

Addressing section 7 of EB 112, Annex 2, following factors has been subjected to sensitivity analysis:

1. PLF
2. O&M Cost
3. Project Cost
4. Tariff Rate

The rationale of sensitivity is, "The ultimate objective of the sensitivity analysis is to determine the likelihood of the occurrence of a scenario other than the scenario presented, in order to provide a cross-check on the suitability of the assumptions used in the development of the investment analysis."

Variation %	-10%	Base	10%	Breaching value
PLF	6.06%	9.39%	13.05%	12.95%
O&M	9.88%	9.39%	8.89%	-97.00%
Project Cost	13.77%	9.39%	6.38%	-10.75%
Tariff Rate	6.06%	9.39%	13.05%	12.95%

PLF:

PLF considered for financial estimation is as per Third Party report in line with "Guidelines for the reporting and validation of Plant load factors" stated in EB 48 Annex11 option 3(b). Hence, variation in PLF of more than 10% is unlikely to happen as the PLF has been reported as per the Third-Party Report based on long term data.

Project Cost:

The project is already commissioned. The actual project cost can be verified by the CA certificates. Hence, there is no chance of any increase/ decrease in the project cost.

Tariff:

As the project is operational and the power purchase agreement (PPA) for the project is already signed, the actual tariff applicable for the project could be verified. Hence, there is no probability to get variation for the same.

O&M:

The sensitivity analysis reveals that O&M will breach the benchmark at negative values and is hypothetical case. Since the O&M cost is generally subject to escalation and also subject to inflationary pressure, any reduction in the O&M costs is highly unlikely. Hence, the reduction in the O&M cost is highly unlikely.

This substantiates that the investment is not financially attractive (Equity IRR for the project activity is less than the Benchmark Equity IRR) for any of the investor. Thus, it can be easily concluded that project activity is additional and is not business as usual scenario.

For Subros Limited (0.187 MW):

- As the proposed project activity generates power utilizing solar energy, Group 1 as per paragraph 5 of Appendix of EB 112, Annex 2 has been identified as a suitable category.
- The investment analysis has been carried out in Nominal terms. Accordingly, default value as given in paragraph 6, Appendix, Annex 2, EB 112 has been adjusted by adding suitable forecasted inflation rate taken from RBI (Central Bank, India).
- Project proponent has calculated Benchmark based on WPI mean inflation rate. As per paragraph 16 of Appendix of EB 112, Annex 2, the inflation forecast should be for the duration of the crediting period. The project investor has calculated benchmark using 10 years inflation as Benchmark for the project activity.

The benchmark has been computed in the following manner:

$$\text{Nominal Benchmark}^{17} = \{(1 + \text{Real Benchmark}) * (1 + \text{Inflation rate})\} - 1$$

where,

Real Benchmark = Default Value, i.e., 10.24% (as per Tool 27: Investment Analysis, version 10.0¹⁸, available at the time of investment decision)

Inflation rate = Projected Inflation Rate for India, i.e., 4.00¹⁹

The investment decision for the project was taken on 05-May-2020. The latest Results of the Survey of Professional Forecasters on Macroeconomic Indicators – Round 51 published by Reserve Bank of India on 05-April-2018 has been referred for the projected inflation rate of India.

The nominal benchmark has been calculated as $= \{(1 + 10.24) * (1 + 4.00)\} - 1 = 14.65\%$

The Post tax Equity IRR is evaluated for the entire lifetime of the project activity, i.e., 25 years.

¹⁷ As per Fisher Equation, https://en.wikipedia.org/wiki/Fisher_equation

¹⁸ <https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-27-v10.0.pdf>

¹⁹ <https://www.rbi.org.in/Scripts/PublicationsView.aspx?id=18113>

It is calculated based on the cash outflows from and cash inflows into the project activity. The IRR and Benchmark analysis are calculated in excel spreadsheet and same is submitted to the DoE during verification of project activity. Based on result of IRR excel spreadsheets, equity IRR is less than Benchmark. This substantiates that the investment is not financially attractive (Equity IRR for the project activity is less than the Benchmark). Thus, it can be easily concluded that project activity is additional & is not business as usual scenario. Input values used in all investment analysis shall be valid and applicable at the time of the investment decision taken by the project proponent which can be clearly verified; thus, it complies with guidance 10 of EB 112, Annex 2.

The financial spread sheets for the key assumption (source of parameters) supporting the financial projections are tabulated below:

Parameters	Values	Source
Details of the project		
Project Location	Uttar Pradesh	DPR/ Commissioning certificate
Total Capacity (MW)	0.187	Commissioning certificates
Date of Commissioning	05-March-2021	DPR
Life of the plant (Yrs.)	25	DPR
Generation of electricity		
PLF (%)	16.97%	DPR
Annual generation (kWh)	278,069	Calculated Value
Annual Degradation per year from 2nd year onwards	0.70%	DPR
Tariff rate at the decision making (INR/kWh)	4.00	PPA
Subsidy Receipt (year)		
2023	66%	
2024	17%	
2025	17%	
Operation and maintenance cost and Insurance		
O & M Expenses (INR Mn.)	0.06	DPR
O & M free for (Yr.)	-	DPR
Escalation in the operational expenses (%)	2.00%	DPR
Management Fee (₹ Mn)	0.04	DPR
Escalation (%)	0.00%	DPR
Admin Fee (₹ Mn)	0.02	DPR
Escalation (%)	5.72%	DPR
Salary (₹ Mn)	0.01	DPR
Escalation (%)	5.72%	DPR
Lender's maintenance (₹ Mn)	0.10	DPR
Escalation (%)	5.72%	DPR
Insurance (₹ Mn)	0.01	DPR
Escalation (%)	0.00%	DPR

Financial parameters		
TOTAL COST (INR Mn.)	6.20	DPR
Loan Amount (INR Mn.)	4.34	DPR
Equity Investment (INR Mn.)	1.86	Calculated Amount
Term loan		
Loan Amount (INR Mn.)	4.34	70:30 ratio as per DPR
Interest rate (%)	9.75%	DPR
Loan Tenure (Qtr.)	52	DPR
Moratorium Period (Qtr.)	4	
Repayment Period (Qtr.)	48	Calculated Value
Repayment instalments value (INR Mn.)	0.090	Calculated Value
1st instalment from (Qtr. end)	31-March-22	Considered from the next Quarter End
Book Depreciation (SLM Method)		
Gross Depreciable Value (INR Mn.)	6.2	Calculated
Salvage Value (%)	5.00%	DPR
Salvage value (INR Mn.)	0.31	Calculated
Net Depreciable Value (INR Mn.)	5.89	Calculated
Residual Value (INR Mn.)	0.31	Calculated
IT Depreciation		
IT Depreciation (%)	40.00%	As per IT Act
Income Tax		
Financial Year	FY 2021-22	
Income tax rate (%)	25.00%	As Per Income Tax Rule
Corporate Tax / MAT (%)	0.00%	As Per IT rule
GST (%)	18.00%	As Per Income Tax Rule
Surcharge (%)	7.00%	As Per Income Tax Rule
Health & Education cess (%)	4.00%	As Per Income Tax Rule
Final Tax rates		
Income tax rate (%)	27.82%	Calculated Value
MAT (%)	0.00%	Calculated Value
GST (%)	18.00%	Calculated Value

Considering the input values, Equity IRRs is given below:

Equity IRR	10.64%
Benchmark	14.65%

Therefore, the project activity cannot be considered as financially attractive as the equity IRR for the project activity is less than the Benchmark.

Sub-step 2d: Sensitivity Analysis

The sensitivity analysis done to identify the percentage variation at which the financial indicators will equal/breach the benchmark and the probability of its occurrence.

Addressing section 7 of EB 112, Annex 2, following factors has been subjected to sensitivity analysis:

5. PLF
6. O&M Cost
7. Project Cost
8. Tariff Rate

The rationale of sensitivity is, "The ultimate objective of the sensitivity analysis is to determine the likelihood of the occurrence of a scenario other than the scenario presented, in order to provide a cross-check on the suitability of the assumptions used in the development of the investment analysis."

Variation %	-10%	Base	10%	Breaching value
PLF	6.16%	10.64%	15.49%	8.34%
O&M	11.39%	10.64%	9.89%	-53.67%
Project Cost	14.42%	10.64%	7.86%	-10.51%
Tariff Rate	6.16%	10.64%	15.49%	8.34%

PLF:

PLF considered for financial estimation is as per Third Party report in line with "Guidelines for the reporting and validation of Plant load factors" stated in EB 48 Annex11 option 3(b). Hence, variation in PLF of more than 10% is unlikely to happen as the PLF has been reported as per the Third-Party Report based on long term data.

Project Cost:

The project is already commissioned. The actual project cost can be verified by the CA certificates. Hence, there is no chance of any increase/ decrease in the project cost.

Tariff:

As the project is operational and the power purchase agreement (PPA) for the project is already signed, the actual tariff applicable for the project could be verified. Hence, there is no probability to get variation for the same.

O&M:

The sensitivity analysis reveals that O&M will breach the benchmark at negative values and is hypothetical case. Since the O&M cost is generally subject to escalation and also subject to inflationary pressure, any reduction in the O&M costs is highly unlikely. Hence, the reduction in the O&M cost is highly unlikely.

This substantiates that the investment is not financially attractive (Equity IRR for the project activity is less than the Benchmark Equity IRR) for any of the investor. Thus, it can be easily concluded that project activity is additional and is not business as usual scenario.

For SECI Rooftop (4.05 MW):

- As the proposed project activity generates power utilizing solar energy, Group 1 as per paragraph 5 of Appendix of EB 112, Annex 2 has been identified as a suitable category.
- The investment analysis has been carried out in Nominal terms. Accordingly, default value as given in paragraph 6, Appendix, Annex 2, EB 112 has been adjusted by adding suitable forecasted inflation rate taken from RBI (Central Bank, India).
- Project proponent has calculated Benchmark based on WPI mean inflation rate. As per paragraph 16 of Appendix of EB 112, Annex 2, the inflation forecast should be for the duration of the crediting period. The project investor has calculated benchmark using 10 years inflation as Benchmark for the project activity.

The benchmark has been computed in the following manner:

$$\text{Nominal Benchmark}^{20} = \{(1 + \text{Real Benchmark}) * (1 + \text{Inflation rate})\} - 1$$

where,

Real Benchmark = Default Value, i.e., 10.24% (as per Tool 27: Investment Analysis, version 10.0²¹, available at the time of investment decision)

Inflation rate = Projected Inflation Rate for India, i.e., 4.00²²

The investment decision for the project was taken on 23-January-2020. The latest Results of the Survey of Professional Forecasters on Macroeconomic Indicators – Round 51 published by Reserve Bank of India on 05-April-2018 has been referred for the projected inflation rate of India.

The nominal benchmark has been calculated as = $\{(1 + 10.24) * (1 + 4.00)\} - 1 = 14.65\%$

The Post tax Equity IRR is evaluated for the entire lifetime of the project activity, i.e., 25 years.

It is calculated based on the cash outflows from and cash inflows into the project activity. The IRR and Benchmark analysis are calculated in excel spreadsheet and same is submitted to the DoE during verification of project activity. Based on result of IRR excel spreadsheets, equity IRR is less than Benchmark. This substantiates that the investment is not financially attractive (Equity IRR for the project activity is less than the Benchmark). Thus, it can be easily concluded that project activity is additional & is not business as usual scenario. Input values used in all investment analysis shall be valid and applicable at the time of the investment decision taken by the project proponent which can be clearly verified; thus, it complies with guidance 10 of EB 112, Annex 2.

²⁰ As per Fisher Equation, https://en.wikipedia.org/wiki/Fisher_equation

²¹ <https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-27-v10.0.pdf>

²² <https://www.rbi.org.in/Scripts/PublicationsView.aspx?id=18113>

The financial spread sheets for the key assumption (source of parameters) supporting the financial projections are tabulated below:

Parameters	Values	Source
Details of the project		
Project Location	Pondicherry, Telangana, Madhya Pradesh	Commissioning certificates
Total Capacity (MW)	4.05	Commissioning certificates
Date of Commissioning	12-April-2021	DPR
Life of the plant (Yrs.)	25	DPR
Generation of electricity		
PLF (%)	17.85%	DPR
Annual generation (kWh)	6,334,200	Calculated Value
Annual Degradation per year from 2nd year onwards	0.70%	DPR
Tariff rate at the decision making (INR/kWh)	3.30	PPA
Subsidy Receipt (year)		
2023	100%	
2024	0%	
2025	0%	
Operation and maintenance cost and Insurance		
O & M Expenses (INR Mn.)	1.29	DPR
O & M free for (Yr.)	-	DPR
Escalation in the operational expenses (%)	5.72%	DPR
Management Fee (₹ Mn)	0.49	DPR
Escalation (%)	0.00%	DPR
Admin Fee (₹ Mn)	0.50	DPR
Escalation (%)	5.72%	DPR
Salary (₹ Mn)	0.70	DPR
Escalation (%)	5.72%	DPR
Lender's maintenance (₹ Mn)	0.50	DPR
Escalation (%)	5.72%	DPR
Insurance (₹ Mn)	0.31	DPR
Escalation (%)	0.00%	DPR
Financial parameters		
TOTAL COST (INR Mn.)	162.78	DPR
Loan Amount (INR Mn.)	97.67	DPR
Equity Investment (INR Mn.)	65.11	Calculated Amount
Term loan		
Loan Amount (INR Mn.)	97.67	60:40 ratio as per DPR

Interest rate (%)	10.20%	DPR
Loan Tenure (Qtr.)	68	DPR
Moratorium Period (Qtr.)	-	
Repayment Period (Qtr.)	68	Calculated Value
Repayment instalments value (INR Mn.)	1.436	Calculated Value
1st instalment from (Qtr. end)	30-September-21	Considered from the next Quarter End
Book Depreciation (SLM Method)		
Gross Depreciable Value (INR Mn.)	162.78	Calculated
Salvage Value (%)	5.00%	DPR
Salvage value (INR Mn.)	8.14	Calculated
Net Depreciable Value (INR Mn.)	154.64	Calculated
Residual Value (INR Mn.)	8.14	Calculated
IT Depreciation		
IT Depreciation (%)	40.00%	As per IT Act
Income Tax		
Financial Year	FY 2021-22	
Income tax rate (%)	25.00%	As Per Income Tax Rule
Corporate Tax / MAT (%)	0.00%	As Per IT rule
GST (%)	18.00%	As Per Income Tax Rule
Surcharge (%)	7.00%	As Per Income Tax Rule
Health & Education cess (%)	4.00%	As Per Income Tax Rule
Final Tax rates		
Income tax rate (%)	27.82%	Calculated Value
MAT (%)	0.00%	Calculated Value
GST (%)	18.00%	Calculated Value

Considering the input values, Equity IRRs is given below:

Equity IRR	9.03%
Benchmark	14.65%

Therefore, the project activity cannot be considered as financially attractive as the equity IRR for the project activity is less than the Benchmark.

Sub-step 2d: Sensitivity Analysis

The sensitivity analysis done to identify the percentage variation at which the financial indicators will equal/breach the benchmark and the probability of its occurrence.

Addressing section 7 of EB 112, Annex 2, following factors has been subjected to sensitivity analysis:

9. PLF
10. O&M Cost
11. Project Cost
12. Tariff Rate

The rationale of sensitivity is, "The ultimate objective of the sensitivity analysis is to determine the likelihood of the occurrence of a scenario other than the scenario presented, in order to provide a cross-check on the suitability of the assumptions used in the development of the investment analysis."

Variation %	-10%	Base	10%	Breaching value
PLF	4.25%	9.03%	13.52%	12.59%
O&M	10.13%	9.03%	7.83%	-57.70%
Project Cost	13.99%	9.03%	5.44%	-11.12%
Tariff Rate	4.25%	9.03%	13.52%	12.59%

PLF:

PLF considered for financial estimation is as per Third Party report in line with "Guidelines for the reporting and validation of Plant load factors" stated in EB 48 Annex11 option 3(b). Hence, variation in PLF of more than 10% is unlikely to happen as the PLF has been reported as per the Third-Party Report based on long term data.

Project Cost:

The project is already commissioned. The actual project cost can be verified by the CA certificates. Hence, there is no chance of any increase/ decrease in the project cost.

Tariff:

As the project is operational and the power purchase agreement (PPA) for the project is already signed, the actual tariff applicable for the project could be verified. Hence, there is no probability to get variation for the same.

O&M:

The sensitivity analysis reveals that O&M will breach the benchmark at negative values and is hypothetical case. Since the O&M cost is generally subject to escalation and also subject to inflationary pressure, any reduction in the O&M costs is highly unlikely. Hence, the reduction in the O&M cost is highly unlikely.

This substantiates that the investment is not financially attractive (Equity IRR for the project activity is less than the Benchmark Equity IRR) for any of the investor. Thus, it can be easily concluded that project activity is additional and is not business as usual scenario.

3.6 Methodology Deviations

There are no methodology deviations applicable for this monitoring period.

4 ESTIMATED GHG EMISSION REDUCTIONS AND REMOVALS

4.1 Baseline Emissions

For Solar grid connected rooftop systems:

As per paragraph 20 of AMS-I.F. version 05.0, the baseline emissions for other systems are the product of amount electricity displaced with the electricity produced by the renewable generating unit and an emission factor.

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

where,

BE_y = Baseline emissions in year y (tCO₂/yr)

$EG_{BL,y}$ = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the project activity in year y (MWh/yr)

$EF_{CO_2,y}$ = Emission factor (tCO₂/MWh)

Emission factor of a grid is calculated as per the procedures provided in AMS-I.F:

As per methodology, combined grid emission factor as per the “Tool 07: Tool to calculate the emission factor for an electricity system” version 07 is calculated as below.

CO₂ Baseline Database for the Indian Power Sector, Version 18, December 2022²³ published by Central Electricity Authority (CEA), Government of India has been used for the calculation of emission reduction.

As per Methodological tool: Tool 07 - Tool to calculate the emission factor for an electricity system (Version 7.0, EB 100, Annex 4), following six steps have been followed:

- a) **Step 1:** Identify the relevant electricity systems;
- b) **Step 2:** Choose whether to include off-grid power plants in the project electricity system (optional);
- c) **Step 3:** Select a method to determine the operating margin (OM);
- d) **Step 4:** Calculate the operating margin emission factor according to the selected method;
- e) **Step 5:** Calculate the build margin (BM) emission factor;

²³ https://cea.nic.in/wp-content/uploads/baseline/2023/01/Approved_report_emission__2021_22.pdf

- f) **Step 6:** Calculate the combined margin (CM) emission factor.

Step 1: Identify the relevant electricity systems

As described in tool “For determining the electricity emission factors, identify the relevant project electricity system. Similarly, identify any connected electricity systems”. It also states that “If the DNA of the host country has published a delineation of the project electricity system and connected electricity systems, these delineations should be used”. Keeping this into consideration, the Central Electricity Authority (CEA), Government of India have Indian grid.

However, since August 2006, however, all regional grids except the Southern Grid had been integrated and were operating in synchronous mode, i.e. at same frequency. Consequently, the Northern, Eastern, Western and North-Eastern grids were treated as a single grid named as NEWNE grid from FY 2007-08 onwards for the purpose of this CO₂ Baseline Database. As of 31 December 2013, the Southern grid has also been synchronized with the NEWNE grid, hence forming one unified Indian Grid. Since the project supplies electricity to the Indian grid, emissions generated due to the electricity generated by the Indian grid as per CM calculations will serve as the baseline for this project.

Table: Geographical Scope of Indian Electricity Grid

Northern	Eastern	Western	North-Eastern	Southern
Chandigarh	Bihar	Chhattisgarh	Arunachal Pradesh	Andhra Pradesh
Delhi	Jharkhand	Gujarat	Assam	Karnataka
Haryana	Orissa	Daman & Diu	Manipur	Kerala
Himachal Pradesh	West Bengal	Dadar & Nagar Haveli	Meghalaya	Tamil Nadu
Jammu & Kashmir	Sikkim	Madhya Pradesh	Mizoram	Telangana
Punjab	Andaman & Nicobar	Maharashtra	Nagaland	Puducherry
Rajasthan		Goa	Tripura	Lakshadweep
Uttar Pradesh				
Uttarakhand				

Step 2: Choose whether to include off-grid power plants in the project electricity system (optional)

The project proponent may choose between the following two options to calculate the operating margin and build margin emission factor:

Option I: Only grid power plants are included in the calculation.

Option II: Both grid power plants and off-grid power plants are included in the calculation.

The project proponent has chosen only grid power plants in the calculation.

Step 3: Select a method to determine the operating margin (OM)

The calculation of the operating margin emission factor ($EF_{grid,OM,y}$) is based on one of the following methods, which are described under Step 4:

- (a) Simple OM; or
- (b) Simple adjusted OM; or
- (c) Dispatch data analysis OM; or
- (d) Average OM.

The data required to calculate Simple adjusted OM and Dispatch data analysis OM is not possible due to lack of availability of data to project developers. The choice of other two options for calculating operating margin emission factor depends on generation of electricity from low-cost/ must-run sources. In the context of the methodology low cost/must run resources typically include hydro, geothermal, solar, low-cost biomass, nuclear and solar generation.

Share of Must-Run (Hydro/Nuclear) (% of Net Generation)

	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22
India	14.6%	14.3%	14.5%	17.0%	16.5%	15.8%

Data Source: Central Electricity Authority (CEA) database Version 18, December 20222021²⁴

The above data clearly shows that the percentage of total grid generation by low-cost/ must-run plants (on the basis of average of five most recent years) for the Indian grid is less than 50 % of the total generation. Thus, the Average OM method cannot be applied, as low cost/must run resources constitute less than 50% of total grid generation.

The simple OM emission factor is calculated as the generation-weighted average CO₂ emissions per unit net electricity generation (tCO₂/MWh) of all generating power plants serving the system, not including low-cost/must-run power plants/units.

For the simple OM, the simple adjusted OM and the average OM, the emissions factor can be calculated using either of the two following data vintages:

- (a) **Ex-ante option:** if the ex-ante option is chosen, the emission factor is determined once at the validation stage, thus no monitoring and recalculation of the emissions factor during the crediting period is required.

OR

²⁴ https://cea.nic.in/wp-content/uploads/baseline/2023/01/Approved_report_emission__2021_22.pdf

(b) **Ex-post option:** if the ex-post option is chosen, the emission factor is determined for the year in which the project activity displaces grid electricity, requiring the emissions factor to be updated annually during monitoring.

Project Proponent has chosen ex-ante option for calculation of Simple OM emission factor using a 3-year generation-weighted average, based on the most recent data available at the time of submission of the PD to the DOE for validation.

OM determined at validation stage will be the same throughout the crediting period. There will be no requirement to monitor and recalculate the emission factor during the crediting period.

Step 4: Calculate the operating margin emission factor ($EF_{grid, OMSimple, y}$) according to the selected method

The operating margin emission factor has been calculated using a 3-year data vintage:

Net Generation in Operating Margin (GWh) (incl. Imports)			
	2019-20	2020-21	2021-22
INDIAN Grid	965,009	958,218	1,035,672

Simple Operating Margin (tCO ₂ /MWh) (incl. Imports)			
	2019-20	2020-21	2021-22
INDIAN Grid	0.9541	0.9402	0.9605

Weighted Generation Operating Margin	
INDIAN Grid	0.9518

Step 5: Calculate the build margin (BM) emission factor ($EF_{grid, BM, y}$)

As per Methodological tool: “Tool 07: Tool to calculate the emission factor for an electricity system” (Version 7.0, EB 100, Annex 4) para 72:

In terms of vintage of data, the project proponent can choose between one of the following two options:

(a) **Option 1** - For the first crediting period, calculate the build margin emission factor ex ante based on the most recent information available on units already built for sample group m at the time of PD submission to the DOE for validation. For the second crediting period, the build margin emission factor should be updated based on the most recent information available on units

already built at the time of submission of the request for renewal of the crediting period to the DOE. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used. This option does not require monitoring the emission factor during the crediting period.

(b) **Option 2** - For the first crediting period, the build margin emission factor shall be updated annually, ex post, including those units built up to the year of registration of the project activity or, if information up to the year of registration is not yet available, including those units built up to the latest year for which information is available. For the second crediting period, the build margin emissions factor shall be calculated ex ante, as described in Option 1 above. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used.

Option 1 as described above is chosen by Project proponent to calculate the build margin emission factor for the project activity. BM is calculated ex-ante based on the most recent information available at the time of submission of PD and is fixed for the entire crediting period.

Build Margin (tCO ₂ /MWh) (not adjusted for imports)	
	2021-22
INDIAN Grid	0.8687

Step 6: Calculate the combined margin (CM) emission factor ($EF_{grid, CM, y}$)

As per Methodological tool: “Tool 07: Tool to calculate the emission factor for an electricity system” (Version 7.0, EB 100, Annex 4) para 81:

The calculation of the combined margin (CM) emission factor ($EF_{grid, CM, y}$) is based on one of the following methods:

- (a) Weighted average CM; or
- (b) Simplified CM.

Project proponent has chosen option (a) i.e., weighted average CM to calculate the combined margin emission factor for the project activity.

The combined margin emissions factor is calculated as follows:

$$EF_{grid, BM, y} = EF_{grid, OM, y} * W_{OM} + EF_{grid, BM, y} * W_{BM}$$

where:

$EF_{grid, BM, y}$ = Build margin CO₂ emission factor in year y (tCO₂e/MWh)

$EF_{grid, OM, y}$ = Operating margin CO₂ emission factor in year y (tCO₂e/MWh)

W_{OM} = Weighting of operating margin emissions factor (%)

W_{BM} = Weighting of build margin emissions factor (%)

The following default values should be used for W_{OM} and W_{BM} :

For solar project activities: $W_{OM} = 0.75$ and $W_{BM} = 0.25$ (owing to their intermittent and non-dispatchable nature) for the second crediting period and for subsequent crediting periods. Since project activity is of power generation by using solar, the above weightage has been considered for OM and BM.

$$\begin{aligned} \text{Therefore, } EF_{\text{grid, CM, y}} &= 0.8687 * 0.25 + 0.9518 * 0.75 \\ &= 0.9310 \text{ tCO}_2\text{e/MWh} \end{aligned}$$

Therefore, referring to the applied methodology AMS.I.F. Version 5.0, the $EF_{\text{CO}_2, y}$ for grid connected and mini grid project instances would be $EF_{\text{grid, CM, y}}$ i.e., 0.9310 tCO₂e/MWh. The baseline emission factor is ex- ante parameter and will remain constant throughout the crediting period.

$$BE_y = 7,900 * 0.9310 = 7,355 \text{ tCO}_2\text{e} \text{ (estimated value for first year of operation for Kochi Metro Rail Limited 2)}$$

4.2 Project Emissions

As per the approved consolidated Methodology AMS.I.F. Version 5.0 “For most renewable energy power generation project activities, $PE_y = 0$. However, some project activities may involve project emissions that can be significant. These emissions shall be accounted for as project emissions by using the following equation:

$$PE_y = PE_{FF, y} + PE_{GP, y} + PE_{HP, y}$$

Where:

PE_y = Project emissions in year y (tCO₂e/yr)

$PE_{FF, y}$ = Project emissions from fossil fuel consumption in year y (tCO₂e/yr)

$PE_{GP, y}$ = Project emissions from the operation of dry, flash steam or binary geothermal power plants in year y (tCO₂e/yr)

$PE_{HP, y}$ = Project emissions from water reservoirs of hydro power plants in year y (tCO₂e/yr)

As the project activity is the installation of a new grid-connected solar power plant and does not involve any project emissions from fossil fuel, operation of dry, flash steam or binary geothermal power plants, and from water reservoirs of hydro power plants. Therefore $PE_{FF, y}$, $PE_{GP, y}$, $PE_{HP, y}$ is equal to zero and thus, $PE_y = 0$.

4.3 Leakage

Since the project activity is a renewable energy rooftop project based on solar PV technology, no leakage emissions are considered - in line with paragraph 29 of the small-scale methodology AMS.I.F. (version 5.0).

4.4 Estimated Net GHG Emission Reductions and Removals

As per the paragraph 30 of AMS-I.F. version 5.0, the formula to calculate the emission reduction is:

$$ER_y = BE_y - PE_y - LE_y$$

As the project activity is a solar project, there is no any leakage emissions from the project activity.

Hence, $LE_y = 0$

Therefore, Emission Reductions for this project activity are calculated as follows:

$$ER_y = BE_y - PE_y$$

where:

ER_y	=	Emission reductions in year y (tCO ₂ e/yr)
BE_y	=	Baseline emissions in year y (tCO ₂ e/yr)
PE_y	=	Project emissions in year y (tCO ₂ e/yr)

Therefore, Net GHG Emission Reductions and Removals are calculated as follows:

$$ER_y = BE_y - PE_y$$

Year	Estimated baseline emissions or removals (tCO ₂ e)	Estimated project emissions or removals (tCO ₂ e)	Estimated leakage emissions (tCO ₂ e)	Estimated net GHG emission reductions or removals (tCO ₂ e)
Year 1 (05-March-2021 to 04-March-2022)	13,492	0	0	13,492
Year 2 (05-March-2022 to 04-March-2023)	13,395	0	0	13,395
Year 3 (05-March-2023 to 04-March-2024)	13,302	0	0	13,302

Year 4 (05-March-2024 to 04-March-2025)	13,208	0	0	13,208
Year 5 (05-March-2025 to 04-March-2026)	13,112	0	0	13,112
Year 6 (05-March-2026 to 04-March-2027)	13,018	0	0	13,018
Year 7 (05-March-2027 to 04-March-2028)	12,924	0	0	12,924
Total	92,451	0	0	92,451

5 MONITORING

5.1 Data and Parameters Available at Validation

Data / Parameter	EF_{grid, OM, y}
Data unit	tCO ₂ e/MWh
Description	Operating Margin CO ₂ emission factor in year y
Source of data	CO ₂ Emission Database, Version 18.0, December - 2022 published by Central Electricity Authority (CEA), Government of India.
Value applied:	0.9518
Justification of choice of data or description of measurement methods and procedures applied	Calculated as the last 3-year (2019-20, 2020-21, 2021-22) generation-weighted average, sourced from Baseline CO ₂ Emission Database, Version 18.0, December - 2022 published by Central Electricity Authority (CEA), Government of India.
Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	$EF_{grid, BM, y}$
Data unit	tCO ₂ e/MWh
Description	Build Margin CO ₂ emission factor in year y
Source of data	CO ₂ Emission Database, Version 18.0, December - 2022 published by Central Electricity Authority (CEA), Government of India.
Value applied:	0.8687
Justification of choice of data or description of measurement methods and procedures applied	Calculated as the last 3-year (2019-20, 2020-21, 2021-22) generation-weighted average, sourced from Baseline CO ₂ Emission Database, Version 18.0, December - 2022 published by Central Electricity Authority (CEA), Government of India.
Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	$EF_{grid, CM, y}$
Data unit	tCO ₂ e/MWh
Description	Combined Margin CO ₂ emission factor in year y
Source of data	CO ₂ Emission Database Version 18.0, December - 2022 published by Central Electricity Authority (CEA), Government of India.
Value applied:	0.9310
Justification of choice of data or description of measurement methods and procedures applied	The combined margin emissions factor is calculated as follows: $EF_{grid, CM, y} = EF_{grid, OM, y} * W_{OM} + EF_{grid, BM, y} * W_{BM}$ Where: $EF_{grid, BM, y}$ = Build margin CO₂ emission factor in year y (tCO₂/MWh) $EF_{grid, OM, y}$ = Operating margin CO₂ emission factor in year y (tCO₂e/MWh) W_{OM} = Weighting of operating margin emissions factor (%) = 75%

	W_{BM} = Weighting of build margin emissions factor (%) = 25%
Purpose of Data	Calculation of baseline emissions
Comments	-

5.2 Data and Parameters Monitored

Data / Parameter	$EG_{BL, y}$
Data unit	MWh/y
Description	Quantity of net electricity displaced in year y as a result of the implementation of the project activity (MWh)
Source of data	Monthly Joint Meter Readings taken at the project site
Description of measurement methods and procedures applied	Each rooftop and ground mounted installation site has single or multiple metering points. The Joint Meter Readings (JMR) taken every month from each meter are added up to arrive at the net value of electricity supplied by the project proponents to each customer. The summation value metered energy as per the month forms the basis for the project proponents to raise monthly invoices to the individual customers.
Frequency of monitoring/recording	Continuous measurement & monthly recording
Value applied:	14,391

Monitoring equipment	Type of meter	Energy meter
	Location of meter	Interconnection point/ Substation
	Accuracy of meter	0.5s or better
	Serial number of meters	The meter details are added in Appendix 2.
	Calibration frequency	As per Central Electricity Authority (Installation and Operation of Meters) (Amendment) Regulations, 2019 ²⁵ , all Interface Meters shall be tested on-site using accredited test laboratory for routine accuracy testing at least once in five years and recalibrated if required.
QA/QC procedures applied	Net electricity supplied to the grid by the project activity is cross checked with the monthly invoices submitted by the project proponents to each individual customer.	
Purpose of data	Calculation of baseline emissions	
Calculation method	Each rooftop and ground mounted installation site has single or multiple metering points. The Joint Meter Readings (JMR) taken every month from each meter are added up to arrive at the net value of electricity supplied by the project proponents to each customer. The summation value metered energy as per the month forms the basis for the project proponents to raise monthly invoices to the individual customers. The metering points along with the meter details at each rooftop installation units are given in Appendix 2. Apportioning Methodology in case the start date and end date of the monitoring period falls within the joint meter reading/ invoicing cycle, the generation shall be considered based on the daily generation readings recorded by the project proponent at the site.	
Comments	-	

5.3 Monitoring Plan

The monitoring plan is developed in accordance with the modalities and procedures for the project activities. The monitoring plan, which is implemented by the project participant describes

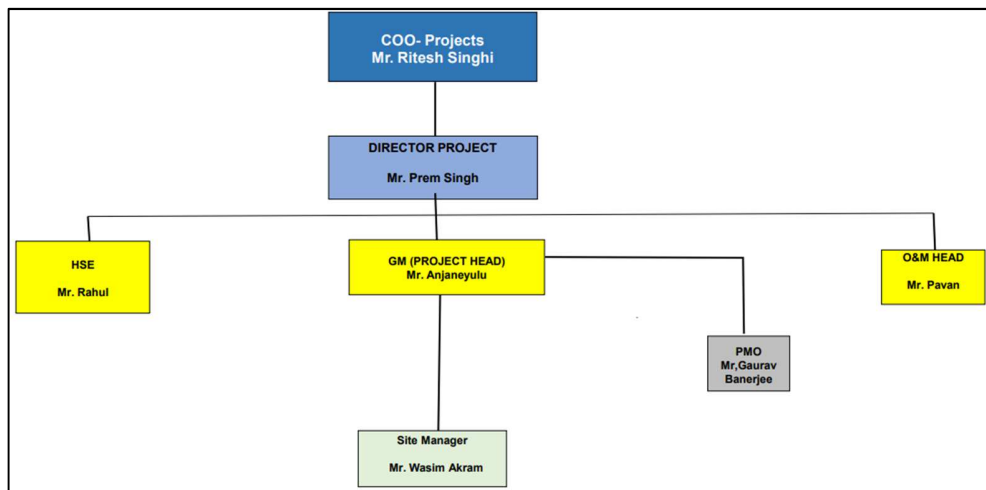
²⁵ https://cea.nic.in/old/reports/regulation/CEA_metering_regulation_amendment_2019.pdf

about the monitoring organisation, parameters to be monitored, monitoring practices, quality assurance, quality control procedures, data storage and archiving.

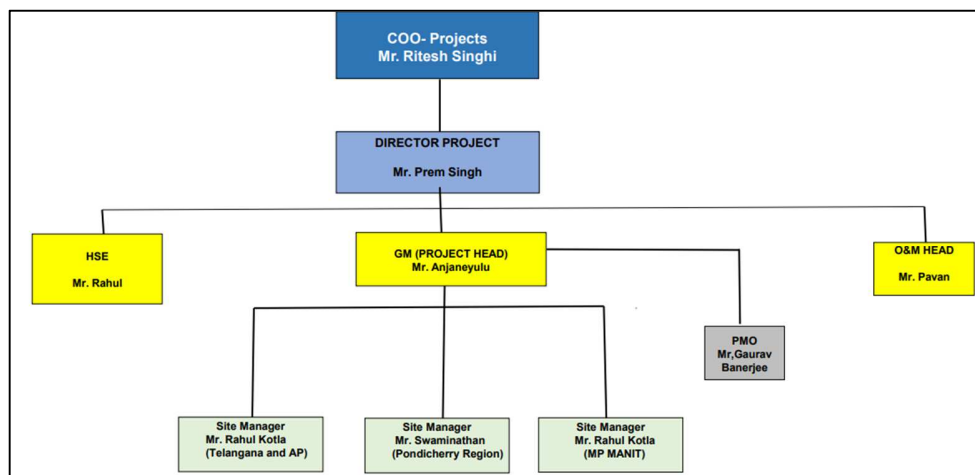
Organizational structure and responsibilities:

The authority and responsibility for registration, monitoring, measurement, reporting and reviewing of the data rests with the project proponents. The project proponents proposed the following structure for data monitoring, collection, data archiving and calibration of equipment for this project activity.

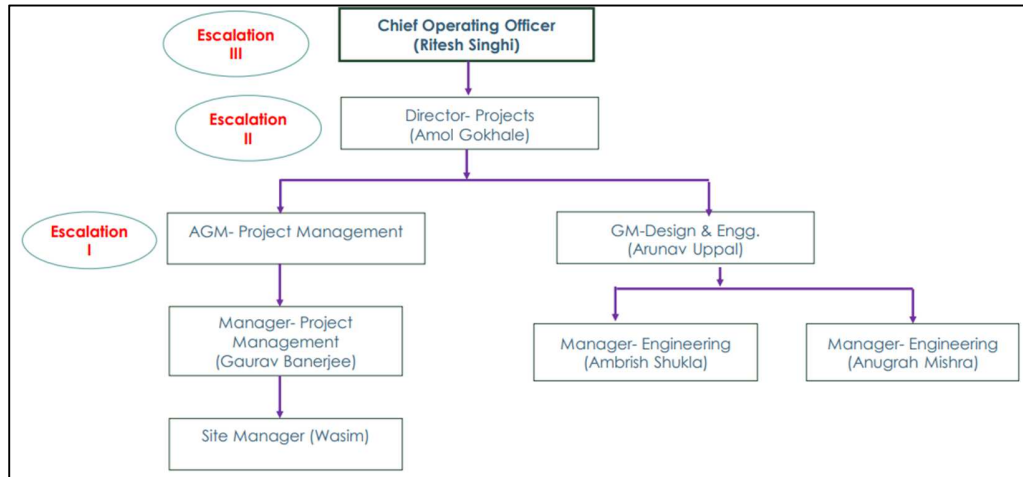
Kochi Metro Rail Limited Organizational Structure:



SECI Rooftop Organizational Structure:



Subros Limited Organizational Structure:



Roles and responsibilities of Site Managers:

- Oversee, manage, and direct construction projects from begging to end
- Review and monitor the project in-depth
- Material tracking and delivery of all the material as per the schedule
- Prepare Project reports pertaining to the status of the Project
- Plan to prevent problems and resolve any emerging ones
- Train and give feedback to construction workers and subcontractors
- Ensure availability of required tools, materials and equipment
- Manage and mitigate risks
- Always ensure quality construction standards

Data Measurement

The net electricity displaced by project is measured continuously using above mentioned energy meter located after inverters. Readings of meters are taken on monthly basis by authorized officer of developer in the presence of PP or representative of PP. In the event of failure of generation meter, the user energy meter or inverter generation value is used in monitoring the electricity generation data.

In case of multiple failure of meters and no alternate available, zero emission reduction will be claimed. Such scenario has not yet occurred at any of the project site.

Data collection and archiving

Readings from meters is collected in the presence of the plant in-charge. Net electricity displaced by project is recorded and stored in logs as well as in electronic form on a daily basis. The records

are checked periodically by the plant manager and discussed thoroughly with the plant supervisor. The period of storage of the monitored data is 2 years after the end of crediting period or till the last issuance of VERs for the project activity whichever occurs later.

Emergency preparedness

The project activity will not result in any unidentified activity that can result in substantial emissions from the project activity. No need for emergency preparedness in data monitoring is visualized.

QA/ QC Procedures

Their energy meters of 0.5s or better accuracy class is installed at the respective project site. The calibration of all the meters will be undertaken at required intervals (once is five years as per CEA notification) and faulty meters will be duly replaced immediately. Records of calibration certificates will be maintained for verification purposes. Hence, a reliable method will be ensured with monitoring of the parameters. The invoice records will be used and kept for cross checking the consistency of the recorded data.

Internal Audit procedure

The site manager regularly prepares and maintains the net electricity generation reports. These reports are shared periodically with the project heads. The project heads review the data and shares the consolidated reports with the senior officials of the project proponent. The officials conduct the internal audits of the project sites to check for any non-conformities in the monitoring parameters. If any non-conformities are observed, then immediate corrective actions are taken to address them and resolve.

During the current monitoring period, no non-conformities were identified during the internal audit.

Sampling Approaches

Not required

Personnel training

In order to ensure a proper functioning of the project activity and a properly monitoring of emission reductions, the staff is trained. The plant helpers are trained in equipment operation, data recording, reports writing, operation and maintenance and emergency procedures in compliance with the monitoring plan.

6 ACHIEVED GHG EMISSION REDUCTIONS AND REMOVALS

6.1 Data and Parameters Monitored

Data / Parameter	$EG_{BL,y}$
Data unit	MWh/y
Description	Quantity of net electricity displaced in year y as a result of the implementation of the project activity (MWh)
Value applied:	14,391
Comments	-

6.2 Baseline Emissions

Baseline emission is the product of Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity multiplied by the Combined margin CO₂ emission factor for grid connected power generation

$$BE_y = EG_{PJ,y} * EF_{grid,y}$$

where,

BE_y = Baseline Emissions in year y; tCO₂

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

$EF_{grid,y}$ = Combined margin CO₂ emission factor for grid connected power generation in year y calculated using the latest version of the “Tool 07: Tool to calculate the emission factor for an electricity system Version 7.0” (tCO₂/MWh)

Therefore, baseline emissions or removals for the current monitoring period is:

$$BE_y = 14,391 * 0.9310 = 13,398 \text{ tCO}_2\text{e}$$

6.3 Project Emissions

As per methodology AMS I.F. Version 5.0, for renewable energy projects, there is no any project emissions occurred.

Hence, $PE_y = 0$

6.4 Leakage

As per methodology AMS I.F. Version 5.0, for renewable energy projects, there is no any leakage emissions occurred.

Hence, $LE_y = 0$

6.5 Net GHG Emission Reductions and Removals

Year	Baseline emissions or removals (tCO ₂ e)	Project emissions or removals (tCO ₂ e)	Leakage emissions (tCO ₂ e)	Net GHG emission reductions or removals (tCO ₂ e)
05-March-2021 to 31-December-2021	2,876	0	0	2,876
01-January-2022 to 31-December-2022	10,522	0	0	10,522
Total	13,398	0	0	13,398

Comparison with ex-ante estimations:

For Subros Limited - 0.187 MW:

Working days duration	From	To
	05-March-2021	31-December-2022
No. of Working days during the monitoring period		667
Annual Estimated Emission Reductions for this project site		253
Estimated Emission Reductions as per Joint PD MR for the current Monitoring Period		462

Actual Net Generation for this monitoring period	389
Actual CERs Generated for this Monitoring Period	362
Change in emission reduction	-21.67%

For Kochi Metro Rail Limited - 5.192 MW:

Working days duration	From	To
	06-May-2021	31-December-2022
No. of Working days during the monitoring period	605	
Annual Estimated Emission Reductions for this project site	7,200	
Estimated Emission Reductions as per Joint PD MR for the current Monitoring Period	11,934	
Actual Net Generation for this monitoring period	7,444	
Actual CERs Generated for this Monitoring Period	6,930	
Change in emission reduction	-41.93%	

For Pondicherry University (SECI Rooftop) - 2.389MW:

Working days duration	From	To
	12-April-2021	31-December-2022
No. of Working days during the monitoring period	629	
Annual Estimated Emission Reductions for this project site	3,401	
Estimated Emission Reductions as per Joint PD MR for the current Monitoring Period	5,861	
Actual Net Generation for this monitoring period	4,610	
Actual CERs Generated for this Monitoring Period	4,292	
Change in emission reduction	-26.77%	

For MGPGI (SECI Rooftop) - 199.66 kW:

Working days duration	From	To
	29-September-2021	31-December-2022
No. of Working days during the monitoring period	459	
Annual Estimated Emission Reductions for this project site	286	
Estimated Emission Reductions as per Joint PD MR for the current Monitoring Period	360	
Actual Net Generation for this monitoring period	277	
Actual CERs Generated for this Monitoring Period	258	
Change in emission reduction	-28.18%	

For RIVER (SECI Rooftop) - 200 kW:

Working days duration	From	To
	07-October-2021	31-December-2022
No. of Working days during the monitoring period		451
Annual Estimated Emission Reductions for this project site		283
Estimated Emission Reductions as per Joint PD MR for the current Monitoring Period		350
Actual Net Generation for this monitoring period		228
Actual CERs Generated for this Monitoring Period		213
Change in emission reduction		-39.16%

For IGMC (SECI Rooftop) - 348.4 kW:

Working days duration	From	To
	20-October-2021	31-December-2022
No. of Working days during the monitoring period		438
Annual Estimated Emission Reductions for this project site		497
Estimated Emission Reductions as per Joint PD MR for the current Monitoring Period		596
Actual Net Generation for this monitoring period		328
Actual CERs Generated for this Monitoring Period		306
Change in emission reduction		-48.75%

For RGGWCH (SECI Rooftop) - 109.21 kW:

Working days duration	From	To
	20-October-2021	31-December-2022
No. of Working days during the monitoring period		438
Annual Estimated Emission Reductions for this project site		154
Estimated Emission Reductions as per Joint PD MR for the current Monitoring Period		185
Actual Net Generation for this monitoring period		107
Actual CERs Generated for this Monitoring Period		100
Change in emission reduction		-45.85%

For CGG (SECI Rooftop) - 290 kW:

Working days duration	From	To
	15-September-2021	31-December-2022
No. of Working days during the monitoring period		473
Annual Estimated Emission Reductions for this project site		401

Estimated Emission Reductions as per Joint PD MR for the current Monitoring Period	520
Actual Net Generation for this monitoring period	479
Actual CERs Generated for this Monitoring Period	446
Change in emission reduction	-14.17%

For Accounts General Audit (SECI Rooftop) - 167.5 kW:

Working days duration	From	To
	17-September-2021	31-December-2022
No. of Working days during the monitoring period	471	
Annual Estimated Emission Reductions for this project site	239	
Estimated Emission Reductions as per Joint PD MR for the current Monitoring Period	308	
Actual Net Generation for this monitoring period	158	
Actual CERs Generated for this Monitoring Period	147	
Change in emission reduction	-52.37%	

For SPA (SECI Rooftop) - 119.93 kW:

Working days duration	From	To
	19-September-2021	31-December-2022
No. of Working days during the monitoring period	469	
Annual Estimated Emission Reductions for this project site	165	
Estimated Emission Reductions as per Joint PD MR for the current Monitoring Period	212	
Actual Net Generation for this monitoring period	106	
Actual CERs Generated for this Monitoring Period	99	
Change in emission reduction	-53.40%	

For MANIT (SECI Rooftop) - 230 kW:

Working days duration	From	To
	19-August-2021	31-December-2022
No. of Working days during the monitoring period	500	
Annual Estimated Emission Reductions for this project site	329	
Estimated Emission Reductions as per Joint PD MR for the current Monitoring Period	451	
Actual Net Generation for this monitoring period	264	
Actual CERs Generated for this Monitoring Period	246	
Change in emission reduction	-45.49%	

The actual emission reductions have been observed to be less in comparison with the ex-ante emissions, which is due to natural phenomena and nature dependent. The variability in the environmental conditions is beyond the control of the project proponent which is the main reason for the variation in emission reductions values. Also, some breakdowns have been observed during the monitoring period of the project activity. Breakdown details are added in Appendix 3.

APPENDIX 1: PROJECT ACTIVITY DETAILS

S.I No.	Project Company	Name of the project owner	Installation Location	Address of the installation site	Capacity (kW)	Date of commissioning
1	AMPSolar Power Generation Private Limited	Kochi Metro Rail Limited, Kerala	Aluva	Periyar Nagar, Aluva, Kerala 683101	52.26	06-May-2021
			Company Paddy	Thaikkattukara, Choornikkara, Aluva, Kerala, 683106	49.58	
			Kalamassery	NH544, South Kalamassery, Kalamassery, Ernakulam, Kerala	36.85	
			Pathadipalam	Koonamthai Pathadipalam Residence Association Block A, Koonamthai, Edappally, Ernakulam, Kerala 682024	39.53	
			Edappally oppo	Edappally, Kochi, Kerala 682024	58.29	
			Palarivattom	Palarivattom - Edappally Rd, Sonia Nagar, Mamangalam, Palarivattom, Ernakulam, Kerala 682565	75.04	
			JLN Stadium	JLN Metro Station, 4th Floor Kaloar, Ernakulam 682017	201	
			Town Hall	Ernakulam North, Kaloar, Ernakulam, Kerala 682017	58.96	
			MG Road	Postmaster, Kochi M.G.Road S.O, Ernakulam, Kerala, India (IN), Pin Code:- 682016	40.2	
			Maharaja collage	KPCC Junction, Opp Maharajas Ground, Shenoy, Ernakulam, Kerala, 682011	56.28	

S.I No.	Project Company	Name of the project owner	Installation Location	Address of the installation site	Capacity (kW)	Date of commissioning
			Ernakulam South	S Railway Station Rd, Kalathiparambil, Ernakulam South, Ernakulam, Kerala 682016	137.35	
			Kadavanthra	Elamkulam, Ernakulam, Kerala 682020	174.2	
			Elamkulam	Arya bhang Pinnacle , S.A.Road, Elamkulam, Kadavanthra, Kochi, Kerala 682020	176.545	
			Vytilla	Vyttila, Ernakulam, Kerala 682019	241.2	
			Thykoodam	SH15, Thykoodam, Vyttila, Ernakulam, Kerala 682019	160.8	
			Thykoodam RSS	SH15, Thykoodam, Vyttila, Ernakulam, Kerala 682019	24.12	
			Petta	SH15, Upasana Nagar, Maradu, Ernakulam, Kerala 682304	181.57	
			P-way & ASS3	P-way (87.1 kw): Choornikkara, muttom, Aluva, Kerala 683106 ASS 3 (48.24 kw): Alstom Transport India Limited KS1-Warehouse & Office, Near Kochi Metro Muttom Depot, Thaikkattukara PO, Aluva, Ernakulam-683106, Kerala 683106	135.34	

S.I No.	Project Company	Name of the project owner	Installation Location	Address of the installation site	Capacity (kW)	Date of commissioning
			Muttom Depot – ground mount, Kerala	Alstom Transport India Limited KS1- Warehouse & Office, Near Kochi Metro Muttom Depot, Thaikkattukara PO, Aluva, Ernakulam- Kerala 683106	824.10	07-January-2022
			Muttom Depot – SBL Shed, Kerala	Choornikkara, Muttom, Aluva, Kerala 683106	928.20	31-March-2022
			Muttom Depot – Track A shed, Kerala		556.92	31-March-2022
			Muttom Depot – Track B Shed, Kerala		316.68	18-March-2022
			Road Area – Muttom Depot, Kerala		655.2	29-August-2022
			Track B - Muttom Depot, Kerala		10.92	29-August-2022
2	AMP Energy Green (C&I) Private Limited	Subros Limited	Subros Limited (Research and development centre), Noida, Uttar Pradesh	C-51, Distt: Phase 2, Noida, Uttar Pradesh – 201305	187.11	05-March-2021
3		SECI Rooftop	Pondicherry University, Puducherry	R Venkataraman Nagar, Kalapet, Puducherry- 605014	2389.22	12-April-2021

S.I No.	Project Company	Name of the project owner	Installation Location	Address of the installation site	Capacity (kW)	Date of commissioning
			Mahatma Gandhi Post Graduate Institute of Dental Science (MGPGIDS), Puducherry	Mahatma Gandhi Postgraduate Institute of Dental Sciences (MGPGI) Indra Nagar Gorimedu Pondicherry-605006	199.66	29-September-2021
			Rajiv Gandhi Institute of Veterinary Education & Research (RIVER), Puducherry	Rajiv Gandhi Institute of Veterinary Education and Research (RIVER) Vazhudhavur Road, Kurumbapet, Puducherry - 605009	200	07-October-2021
			Indira Gandhi Medical College & Research Institute (IGMC&R), Puducherry	Indira Gandhi Medical College & Research Institute (IGMC) Vazhudhavur Road, Kathirkanam, Puducherry - 605009	348.4	20-October-2021
			Rajiv Gandhi Government Women & Children Hospital (RGGWCH), Puducherry	Rajiv Gandhi Government Women and Children Hospital (RGGWCH) Ellaiipillaichavadi, Puducherry -605009	109.21	20-October-2021
			Centre For Good Governance Hyderabad, Telangana	Survey No.91, Near Outer Ring Road, Chowrasta, Gachibowli, Hyderabad, Telangana - 500032	290	15-September-2021
			Accounts General Audit Hyderabad, Telangana	Ambedkar Colony, Khairtabad, Hyderabad, Telangana - 500004	167.50	17-September-2021
			School of Planning & Architecture Vijaywada,	Survey No. 4/4, ITI Road, Vijaywada, Andhra Pradesh - 520008	119.93	19-September-2021

S.I No.	Project Company	Name of the project owner	Installation Location	Address of the installation site	Capacity (kW)	Date of commissioning
			Andhra Pradesh			
			MANIT, Bhopal, Madhya Pradesh	Link Road No.3, Near Mata Mandir, Bhopal, Madhya Pradesh - 462003	230	19-August-2021
Total					9433.05 kW (9.43 MW)	

APPENDIX 2: METER DETAILS

Kochi Metro Rail Limited:

S.I No.	Site Name	Meter Make	Class	Meter Serial Number	Meter Initial Calibration Date
1	ALUVA	Secure Premier 300	0.5s	X1444243	06-May-2021
2	COMPANYPADY	Secure Premier 300	0.5s	X1444246	06-May-2021
3	KALAMASSERY	Secure Premier 300	0.5s	X1444247	06-May-2021
4	PATHADIPPALAM	Secure Premier 300	0.5s	X1597085	06-May-2021
5	EDAPPALLY	Secure Premier 300	0.5s	X1597083	06-May-2021
6	PALARIVATTOM	Secure Premier 300	0.5s	X1444242	06-May-2021
7	JLN Stadium ²⁶	Secure Premier 300	0.5s	X0668419	06-May-2021
				X1904869	30-April-2022
8	TOWNHALL	Secure Premier 300	0.5s	X1444245	06-May-2021
9	MG ROAD	Secure Premier 300	0.5s	X1444244	06-May-2021
10	MAHARAJAS	Secure Premier 300	0.5s	X1597084	06-May-2021
11	ERNAKULAM SOUTH	Secure Premier 300	0.5s	X1444296	06-May-2021
12	KADAVANTRA	Secure Premier 300	0.5s	X1444298	06-May-2021
13	ELAMKULAM	Secure Premier 300	0.5s	X1444297	06-May-2021
14	VYTILLA	Secure Premier 300	0.5s	X1444301	06-May-2021
15	THYKODAM	Secure Premier 300	0.5s	X1444299	06-May-2021

²⁶ The old meter bearing serial number X0668419 was faulty as reading beyond generation 99999kWh was not getting updated and getting started with 0 reading. The meter was replaced on 30-April-2022 with meter having serial number X1904869

16	THYKODAM RSS	Secure Premier 300	0.5s	X1444248	06-May-2021
17	PETTA	Secure Premier 300	0.5s	X1444300	06-May-2021
18	P-WAY & ASS 3	Secure Premier 300	0.5s	X1597082	06-May-2021
19	Muttom Depot	L&T	0.2s	21000026	07-January-2022

Subros Ltd.:

S.I No.	Site Name	Meter Make	Class	Meter Serial Number	Meter Initial Calibration Date
1	Subros (Main Meter)	Secure Premier 300	0.5s	XG483952	05-March-2021
2	Subros (Check Meter)	Secure Elite 440	0.5s	X1491638	05-March-2021

SECI Rooftop:

S.I No.	Project Site	Location	Meter Make	Class	Meter Serial Number	Meter Initial Calibration Date
1	Pondicherry University	Science block - 1	Secure	0.5S	X1585522	12-April-2021
2		Department of Physics	Secure	0.5S	X1585542	12-April-2021
3		Department of Earth Science	Secure	0.5S	X1585541	12-April-2021
4		Science block - 2	Secure	0.5S	X1585524	12-April-2021
5		Ground Mount - 1	Secure	0.5S	X1585523	12-April-2021
6		Department of Biotechnology	Secure	0.5S	X1585526	12-April-2021
7		Lecture Hall Complex - II	Secure	0.5S	X1585528	12-April-2021
8		School of Management	Secure	0.5S	X1596296	12-April-2021
9		Anandarangapillai Library	Secure	0.5S	X1585534	12-April-2021
10		Ground Mount - 2	Secure	0.5S	X1585525	12-April-2021
11		School of Social Science	Secure	0.5S	X1585527	12-April-2021

12		School of Humanities	Secure	0.5S	X1585532	12-April-2021
13		Sri Aurobindo Hostel (Boys)	Secure	0.5S	X1596297	12-April-2021
14		Ground Mount - 3	Secure	0.5S	X1585529	12-April-2021
15		Mega Mess	Secure	0.5S	X1585540	12-April-2021
16		Department of Electronic Media	Secure	0.5S	X1585536	12-April-2021
17		Marie Curie Research Scholar	Secure	0.5S	X1585530	12-April-2021
18		Narmada Hostel (Girls)	Secure	0.5S	X1585543	12-April-2021
19		Ground Mount - 4	Secure	0.5S	X1585531	12-April-2021
20		Elevated Structure (Rooftop) - 1	Secure	0.5S	X1585539	12-April-2021
21		Elevated Structure (Rooftop) - 2	Secure	0.5S	X1585535	12-April-2021
22		Ground Mount - 5	Secure	0.5S	X1585533	12-April-2021
23	Mahatma Gandhi Post Graduate Institute of Dental Science (MGPGIDS)	Hospital Block	Secure	0.5S	X1585537	29-September-2021
24	Rajiv Gandhi Institute of Veterinary Education & Research (RIVER)	Block- 1	Secure	0.5S	X1596294	7-October-2021
25		Block - 2	Secure	0.5S	X1585538	7-October-2021
26		Block - 3	L&T	0.5S	X1596295	7-October-2021
27	Indira Gandhi Medical	College Block	L&T	0.5S	19133267	20-October-2021

28	College & Research Institute (IGMC&R)	Mess Block	L&T	0.5S	19133408	20-October-2021
29	Rajiv Gandhi Government Women & Children Hospital (RGGWCH)	Hospital Block	Secure	0.5S	19133415	20-October-2021
30	Accounts General Audit		Secure	0.5S	X1703540	17-September-2021
31	Centre For Good Governance		Secure	0.5S	X1703541	15-September-2021
32	School of Planning & Architecture		Secure	0.5S	X1589197	19-September-2021
33	MANIT		Secure	0.5S	X1835543	19-August-2021

As it mentioned that the meters will be calibrated once in 5 years and since the projects commissioning period till date is less than 5 years, so the calibration frequency will be followed.

APPENDIX 3: BREAKDOWN DETAILS

Kochi Metro Rail Limited:

Fault Date	Reason for Fault	Fault Type	Plant Stop Time	Plant Start Time	Breakdown Hours
19-June-2021	Termination fault	breakdown	06:20:00	18:48:00	12.47
19-June-2021	Termination fault	breakdown	06:16:00	18:48:00	12.53
19-June-2021	Termination fault	breakdown	06:27:00	18:52:00	12.42
01-July-2021	Termination fault	breakdown	06:16:00	18:39:00	12.38
02-July-2021	Termination fault	breakdown	06:22:00	18:48:00	12.43
03-July-2021	Termination fault	breakdown	06:20:00	18:46:00	12.43
04-July-2021	Termination fault	breakdown	06:18:00	18:36:00	12.30
06-September-2021	Termination fault	breakdown	06:29:00	18:29:00	12.00
07-September-2021	Termination fault	breakdown	06:25:00	18:29:00	12.07
08-September-2021	Termination fault	breakdown	06:23:00	18:34:00	12.18
07-April-2022	UV/OV, Earth fault	breakdown	06:32:00	18:46:00	12.23
02-June-2022	String fault	breakdown	06:23:00	18:30:00	12.12
03-June-2022	String fault	breakdown	06:27:00	18:33:00	12.10
04-June-2022	String fault	breakdown	06:25:00	18:32:00	12.12
10-July-2022	Inverter off Aluva station	Breakdown	06:49:00	18:24:00	11.58
26-August-2022	INV-3 SMB load reduced due to IGBT cooling fan issue	Breakdown	06:44:00	17:55:00	11.18

Subros Ltd.:

Fault Date	Reason for Fault	Plant Stop Time	Plant Start Time	Breakdown Hours
18-August-2022	Inverter Internally fault	06:00	18:00	12.00
19-August-2022	Inverter Internally fault	06:00	18:00	12.00
20-August-2022	Inverter Internally fault	06:00	18:00	12.00
21-August-2022	Inverter Internally fault	06:00	18:00	12.00
22-August-2022	Inverter Internally fault	06:00	18:00	12.00
23-August-2022	Inverter Internally fault	06:00	18:00	12.00
24-August-2022	Inverter Internally fault	06:00	18:00	12.00
25-August-2022	Inverter Internally fault	06:00	18:00	12.00
26-August-2022	Inverter Internally fault	06:00	18:00	12.00
27-August-2022	Inverter Internally fault	06:00	18:00	12.00

SECI Rooftop:

Fault Date	Project Site	Location	Reason for Fault	Plant Stop Date	Plant Start Date	Breakdown Days
06-September-2021	Pondicherry University	Carport - 1	PID Repairing	06-September-2021	24-September-2021	18
30-October-2021	Pondicherry University	Physics	Display Failure	30-October-2021	03-November-2021	4
03-December-2021	Pondicherry University	Ground Mount 5	PID Repairing	03-December-2021	09-December-2021	6
04-December-2021	Pondicherry University	Biotech	Fan Failure	04-December-2021	09-December-2021	5
03-March-2022	RIVER	Block 2	PID Repairing	03-March-2022	11-March-2022	8

10-June-2022	RIVER	Block 1	Fan Failure	10-June - 2022	15-June - 2022	5
17-June - 2022	Pondicherry University	Library	PID Repairing	17-June - 2022	27-June-2022	10
21-July-2022	Pondicherry University	Madam Curie	Relay Chk failure	21-July-2022	29-July-2022	8
14-September-2022	Pondicherry University	GM-1	FAN Alaram	14-September -2022	17-September - 2022	3
14-September - 2022	Pondicherry University	GM-4	FAN Alaram	14-September -2022	17-September - 2022	3
04-November-2022	Pondicherry University	GM5	PID Repairing	04-November - 2022	13-November - 2022	9
18-November - 2022	Pondicherry University	Social Science	Display Failure	18-November - 2022	25-November-2022	7
-	MGPGI	-	NIL	-	-	-
-	IGMC	-	NIL	-	-	-
-	RGGWCH	-	NIL	-	-	-
-	CGG	-	NIL	-	-	-
-	SPA	-	NIL	-	-	-
-	AG Office	-	NIL	-	-	-
-	MANIT	-	NIL	-	-	-

APPENDIX 4: EMPLOYEE DETAILS

Kochi Metro Rail Limited:

Sr. No.	Name	Designation
1	Adarsh K	Site engineer
2	Badush Babu	Site engineer
3	Shijil Sunil	Supporting staff
4	Vyshak KR	Supporting staff
5	MD. Nasir	Supporting staff
6	Sumesh KS	Supporting staff

Subros Ltd.:

Sr. No.	Name	Designation
7	Mr. Imran Usmani	Site engineer
8	Mr. Wasim Akram	Supporting staff
9	Mr. Dharmendra	Supporting staff
10	Mr. Ravi	Supporting staff

Pondicherry University (SECI Rooftop):

Sr. No.	Name	Designation
11	Mukesh	Sr. Site Engineer
12	Sathish	Site Engineer
13	Mohamarangan	Site Engineer
14	Loganathan	Civil Engineer
15	Rahul Singh	Civil Engineer
16	Akilesh	Electrical
17	Phatak Ali	Electrical
18	Imbran	Skilled Labour
19	Mithun	Skilled Labour
20	Sukhram	Skilled Labour
21	Jithendra	Skilled Labour

22	Raheem	Skilled Labour
----	--------	----------------

Mahatma Gandhi Post Graduate Institute of Dental Science (MGPGI)- SECI Rooftop:

Sr. No.	Name	Designation
23	Shankar	Sr. Site Engineer
24	Muthu	Civil Engineer
25	Rahul Kumar	Electrical
26	Imran	Skilled Labour
27	Lakhan	Skilled Labour

Rajiv Gandhi Institute of Veterinary Education & Research (RIVER) – SECI Rooftop:

Sr. No.	Name	Designation
28	Sankaram	Sr. Site Engineer
29	Aminathan	Civil Engineer
30	Vishal Sharma	Skilled Labour
31	Amit	Skilled Labour
32	Sukhlal	Skilled Labour

Indira Gandhi Medical College & Research Institute (IGMC&R) – SECI Rooftop:

Sr. No.	Name	Designation
33	Bipin	Site Engineer
34	Yakub	Civil Engineer
35	Sunil	Electrical
36	Shahjad	Electrical
37	Ansari	Skilled Labour
38	Asish	Skilled Labour
39	Atul	Skilled Labour
40	Mukesh	Skilled Labour

Rajiv Gandhi Government Women & Children Hospital (RGGWCH) – SECI Rooftop:

Sr. No.	Name	Designation
---------	------	-------------

41	Raghav	Site Engineer
42	Ali	Civil Engineer
43	Sanjay	Electrical
44	Anshul	Skilled Labour
45	Daya	Skilled Labour
46	Ram	Site Engineer

Centre For Good Governance and Accounts General Audit – SECI Rooftop:

Sr. No.	Name	Designation
47	Ajit	Site Manager
48	Abhishek	Site Engineer
49	Chaithanya	Civil
50	Ramana	Electrical
51	Rameshwar	Skilled Labour
52	Vishal	Skilled Labour
53	Varun	Skilled Labour
54	Chottu	Skilled Labour
55	Shiv	Skilled Labour
56	Prathap	Skilled Labour
57	Ramparasd	Skilled Labour

School of Planning & Architecture – SECI Rooftop:

Sr. No.	Name	Designation
58	Mahipal Reddy	Site Engineer
59	Ashruf Ali	Civil
60	Shiva Reddy	Electrical
61	Usmani	Skilled Labour
62	Nadeem	Skilled Labour
63	Srinu	Skilled Labour

MANIT – SECI Rooftop:

Sr. No.	Name	Designation
---------	------	-------------

64	Mr. Anil Singh	Site Engineer
65	Mr. Jitendra Kumar	Civil
66	Mr. Ganga Thakur	Electrical
67	Mr. Pappu Thakur	Skilled Labour
68	Mr. Ashish Sadan	Skilled Labour
69	Mr. Sushil Sahu	Skilled Labour
70	Mr. Ravi Chaudhary	Skilled Labour