



SOLAR POWER PROJECT BY SAI SUDHIR ENERGY LIMITED

DOCUMENT PREPARED BY-



ECOCAPITA CONSULTING PRIVATE LIMITED

Project Title	Solar Power project by Sai Sudhir Energy Limited
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Project ID	1093
Monitoring Period	31/05/2012 to 31/12/2017
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1 PROJECT DETAILS

1.1 Summary Description of the Implementation Status of the Project

Saisudhir Energy Limited (SSEL) has commissioned a grid connected 5 MWp solar power project. The project supplies power to the grid and replaces the equal amount of power which would have otherwise been generated by grid connected carbon intensive power plants. The project has been commissioned on 5th January 2012.

The project activity is located at T. Veerapuram village of Anantapur (also called as "Ananthapur") district, in the State of Andhra Pradesh in India.

The project activity uses solar photovoltaic CIS Thin film module for producing the power. The process of generating power through solar energy is a clean technology, as there is no fossil fuel fired or no green-house gases are emitted during the process. The generated power from this project activity is supplied to the Southern grid. The project proponent has signed Power Purchase Agreement (PPA) for 25 years period, with NTPC Vidyut Vyapar Nigam Limited (NVVN), New Delhi, India.

The project activity during monitoring period starting from 31/05/2012 to 31/12/2017 has reduced 45,291 tCO₂e, by displacing 49,448 MWh of power which would otherwise have been generated through the operation power from fossil fuel based electricity generation in the Southern grid.

1.2 Sectoral Scope and Project Type

Type	: I - Renewable Energy Industries
Category	: AMS-I.D. Grid Connected Renewable Electricity Generation ¹
Version	: 17, EB 61
Date	: 03/06/2011
Tools Used	: Tool to calculate the emission factor for an electricity system ² Version 02.2.1 / EB – 63 Annex 19

¹ <http://cdm.unfccc.int/methodologies/DB/W3TINZ7KKWCK7L8WTXFQQOFQQH4SBK>

² http://cdm.unfccc.int/methodologies/PAMethodologies/tools/am-tool-07-v2.2.1.pdf/history_view

: Tool to calculate baseline, project and/or leakage emissions from electricity consumption³ Version 1/ EB – 39 Annex 7

1.3 Project Proponent

Organization name	Sai Sudhir Energy Limited
Contact person	Mr. P. Udayasankar
Title	Director
Address	Saisudhir Energy Limited, 401 GP Elite, 8-2-283/4, Road no 14, Banjara hills, Hyderabad-500034.
Telephone	040 23554038
Email	udayasankar@saisudhirenergy.net

1.4 Other Entities Involved in the Project

Organization name	EcoCapita Consulting Private Limited
Role in the Project	Project Proponent
Contact person	Sahil Wali
Title	VP
Address	Ultimate Plaza 2, First floor, 24, Mandakini Colony, Kolar main road, Bhopal – 452042, M.P
Telephone	+91 62649 02261
Email	projects@ecocapita.in

1.5 Project Start Date

05/01/2012 (date of commissioning of WTGs)

1.6 Project Crediting Period

VCS 1st crediting period: 5th January 2012 to 4th January 2022

1.7 Project Location

The project is located at:

Village - T. Veerapuram

Taluk – Raydurg

District – Anantapur

³ http://cdm.unfccc.int/methodologies/PAMethodologies/tools/am-tool-05-v1.pdf/history_view

The coordinates of the site are

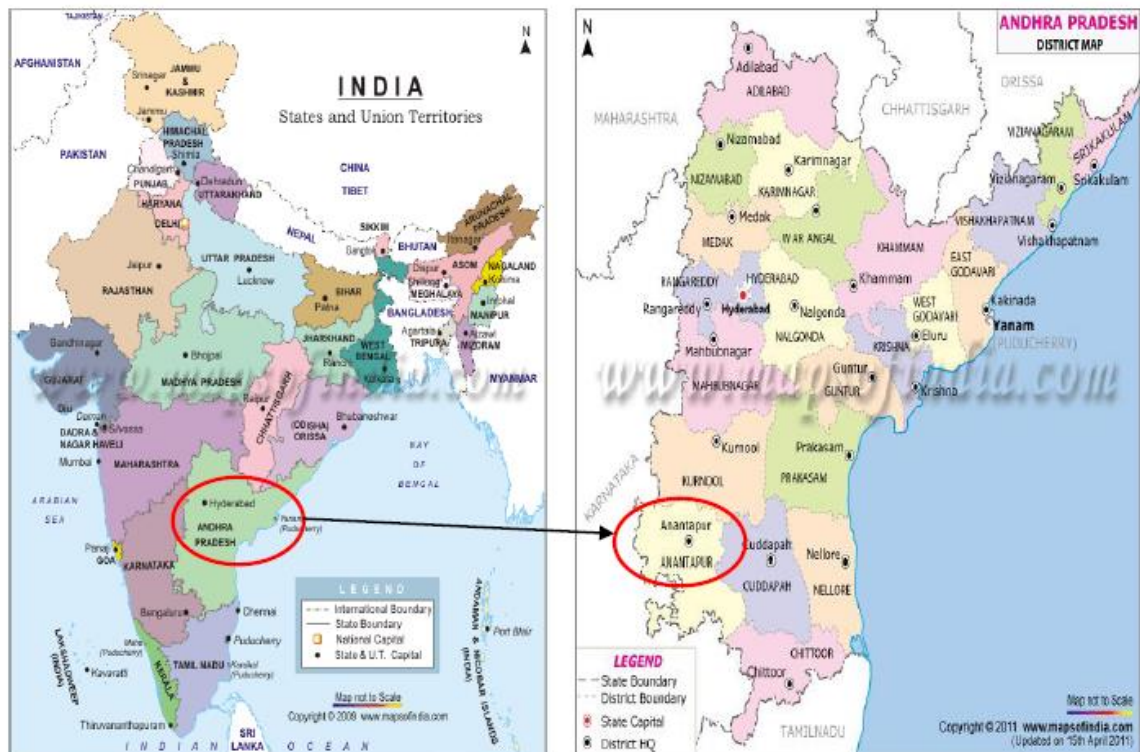
Latitude : 14° 45' 41.97" N

Longitude : 76° 57' 03.86" E

The location map is as given below.

<http://www.mapsofindia.com/maps/andhrapradesh/andhrapradesh-district.htm>

<http://www.mapsofindia.com/maps/india/indiastateandunion.htm>



1.8 Title and Reference of Methodology

The project activity is a small scale project activity and conforms to Appendix B of the simplified modalities and procedures for small-scale CDM project activities.

Type : I - Renewable Energy Industries

Category : AMS-I.D. Grid Connected Renewable Electricity Generation⁴

⁴ <http://cdm.unfccc.int/methodologies/DB/RSCTZ8SKT4F7N1CFDXCSA7BDQ7FU1X>

Version : 17, EB 61

Date : 03/06/2011

Tools Used : Tool to calculate the emission factor for an electricity system⁵ Version 02.2.1 / EB – 63 Annex 19

: Tool to calculate baseline, project and/or leakage emissions from electricity consumption⁶ (Version 1/ EB – 39 Annex 7)

1.9 Participation under other GHG Programs

The project is registered under CDM program.

CDM Project registration no - 6317⁷

PP has no intention to claim credits under CDM.

1.10 Other Forms of Credit

Not Applicable

1.11 Sustainable Development Contributions

The project activity has impactfully contributed to the sustainable development of the region during the monitoring period by providing employment opportunities for professional, skilled and unskilled labour for engineering, procurement operation and maintenance of the project activity. The project activity has significantly contributed towards the new investment in solar reach economy of scale.

The project activity is using solar radiation helps conserve foreign exchange by reducing the need to import fossil fuels to meet the country's growing energy demand. The project activity has also contributed to economic activity in local area. The project activity will act as a nucleus for other economic activities such as setting up of cottage industries, shops, hotels etc. around the area, contributing to the economic development around the project area.

The project led to utilization of environmentally safe and sound technologies in similar sector projects. The project proponent has selected to install Copper Indium

⁵ http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v2.2.1.pdf/history_view

⁶ http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-05-v1.pdf/history_view

⁷ <https://cdm.unfccc.int/Projects/DB/RINA1338475072.72/view>

Selenium (CIS) modules which comply with IEC 61646 for quality and IEC 61730 safety standards. Setting up of this project also increase the private sector participation in this project category thereby contributing to add more green power to the grid system.

Table 1: Sustainable Development Contributions

Row number	SDG Target	SDG Indicator	Net Impact on SDG Indicator	Current Project Contributions	Contributions Over Project Lifetime
Sequential row number	SDG Target number	Number and text of SDG indicator or, if no official SDG indicator is applicable, user-defined indicator	Indicate the project's contribution to the SDG Indicator (implemented activities to increase or decrease)	Brief description of the quantifiable impact of the project's activities related to the SDG indicator, during the monitoring period.	Brief description of the cumulative quantifiable impact of the project's activities related to the SDG indicator, over the project lifetime.
1)	7.2	7.2.1 Renewable energy share in the total final energy consumption	Implemented activities to increase	The project yielded a total net power generation of 49447.7 MWh during the reporting period. The entirety of the production was consumed by grid users, therefore increasing renewable energy share in the total final energy consumption.	The project has yielded a total net power generation of 53,322.7 MWh over its monitored lifetime. The entirety of the production was consumed by grid users, therefore increasing renewable energy share in the total final energy consumption.
2)	13.0	Tons of greenhouse gas emissions avoided or removed	Implemented activities to decrease	The project replaced anthropogenic emissions of greenhouse gases (GHG) of 45,291 tCO ₂ e during the reporting period.	The project has replaced anthropogenic emissions of greenhouse gases (GHG) of 49,141 tCO ₂ e over its lifetime.

2 SAFEGUARDS

2.1 No Net Harm

There were no harm identified from the project and hence no mitigations measures are applicable.

As per the notification from MoEF dated September 14, 2006⁸ and its amendment notification S.O.- 3067(E) dated 1/12/2009⁹, the list of project activities which require prior environmental clearance is stipulated. This does not include the proposed small scale project activity type as it involves solar power generation. Hence the proposed project activity does not require any Environmental impact assessment.

The various factors of the environment which is likely to be affected by the power plant are:

Land and Soil: Since the project activity doesn't have any moving parts to disturb the land or soil at the project activity, there will not be any impact of the project activity on the soil.

Water: There is a very minimal requirement of water for the regular cleaning of the panels. Since only the dust is being washed from the panels, there is no impact of the project activity on the availability of water or quality of water.

Noise: The solar panels operate silently and have no moving parts with it. Thus the project activity doesn't create any noise pollution near the project site.

Air Quality: Solar panel doesn't release carbon dioxide, nitrogen oxide, sulphur dioxide, or mercury into the atmosphere as many traditional forms of electrical generation do. Hence, the impact of the project activity on air quality is minimal.

2.2 Local Stakeholder Consultation

During current monitoring period no complains raised by stakeholders, also no issues were identified in previous stakeholder meeting, which requires change in process or mitigation measures. The project proponent has shared the contact details of site

⁸ http://environmentclearance.nic.in/writereaddata/EIA_Notifications/1_SO1533E_14092006.pdf

⁹ http://environmentclearance.nic.in/writereaddata/EIA_Notifications/4_SO3067E_01122009.pdf

in-charge and as per procedure any stakeholder can interact or drop complaint related to project activity if any, which has been analyzed by EcoCapita for if any action required. No negative comments/complaint raised during current monitoring period.

2.3 AFOLU-Specific Safeguards

Not applicable as its renewable energy project.

3 IMPLEMENTATION STATUS

3.1 Implementation Status of the Project Activity

The project activity was commissioned on 5th January 2012 and operational since then. The project activity was operational with planned operation and maintenance during current monitoring period i.e. from 31/05/2012 to 31/12/2017. There were no incidents occurred during current monitoring period, which may impact applicability of monitoring methodology and GHG emission reduction calculation. The project activity is operated as per detailed provided in registered VCS PD.

There were no major shutdowns during current monitoring period.

3.2 Deviations

3.2.1 Methodology Deviations

There has been no methodology deviation applied during this monitoring period of the project activity.

3.2.2 Project Description Deviations

CDM crediting period: Ten years (from 31st May 2012 to 30th May 2022).

Earlier VCS 1st crediting period: 05th January 2012 to 30th May 2012

Revised 1st Crediting period: 05th January 2012 to 04th January 2022

The crediting period is revised as the PP has opted to avail Emission reductions only from VCS (VERRA) during the revised crediting period.

Also, the change in the crediting period doesn't have any impact on the additionality of the project. Apart from this there has been no project description

deviation applied during validation & previous verifications as well as in the current monitoring period for the project activity.

3.3 Grouped Projects

The project is not a grouped project activity.

4 DATA AND PARAMETERS

4.1 Data and Parameters Available at Validation

Data / Parameter	EF _{grid,OM,y}
Data unit	tCO ₂ /MWh
Description	Operational Margin of the Southern Grid
Source of data	Central Electricity Authority(CEA) of India Database version 6.0 http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm
Value applied	0.967
Justification of choice of data or description of measurement methods and procedures applied	Calculated using data provided by CEA for all the regional grids in India
Purpose of Data	Calculation of baseline emissions
Comments	The value is fixed ex-ante.

Data / Parameter	EF _{grid,BM,y}
Data unit	tCO ₂ /MWh
Description	Build Margin of the Southern Grid
Source of data	Central Electricity Authority(CEA) of India Database version 6

	http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm
Value applied	0.763
Justification of choice of data or description of measurement methods and procedures applied	Calculated using data provided by CEA for all the regional grids in India. Specifically meant for use in CDM project activities.
Purpose of Data	Calculation of baseline emissions
Comments	The value is fixed ex-ante.

Data / Parameter	EF _{grid,CM,y}
Data unit	tCO ₂ /MWh
Description	Combined Margin of the Southern Grid
Source of data	Fixed ex-ante combined margin emission factor as per Central Electricity Authority (CEA) of India's Database version 6 http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm
Value applied	0.916
Justification of choice of data or description of measurement methods and procedures applied	Calculated using data provided by CEA for all the regional grids in India. Specifically meant for use in CDM project activities. As per the EB guidelines a weightage of 75:25 is assumed in the calculation of emission factor as this is a solar based power generation project. The latest available information on CM emission factor value at the time of submission of project for request for registration would be used and this is fixed ex-ante
Purpose of Data	Calculation of baseline emissions
Comments	The value is fixed ex-ante.

4.2 Data and Parameters Monitored

Data Parameter /	EG _{BL,y}																		
Data unit	MWh																		
Description	Net quantity of electricity exported to the grid during the year y.																		
Source of data	Monthly Statement by APTRANSCO																		
Description of measurement methods and procedures to be applied	The net electricity exported to the grid by the project activity connected to the sub-station is measured by electronic tri-vector meters of accuracy class 0.2s. Net electricity supplied to the grid would be calculated based on export & import data (EG_{BL,y} = EG_{BL,y, export} – EG_{BL,y, import}). The export and import energy will be measured continuously using above mentioned Main & Check meters. Export & Import readings of Main & Check meters shall be taken on monthly basis by authorized officer of APCPDCL (Central Power Distribution Company of AP Limited) in the presence of PP or representative of PP. The meter reading will be taken jointly and signed by the representatives of the APCPDCL and SSEL. Based on the main meter readings, invoices will be raised by SSEL to NVVN.																		
Frequency of monitoring/recording	Monthly																		
Value monitored	<table><tr><th>Period</th><th>Net quantity of electricity exported to the grid, EG_{BL,y} in (in MWh)</th></tr><tr><td>31/05/2012 to 31/12/2012</td><td>5278.2</td></tr><tr><td>01/01/2013 to 31/12/2013</td><td>9043.8</td></tr><tr><td>01/01/2014 to 31/12/2014</td><td>8953.8</td></tr><tr><td>01/01/2015 to 31/12/2015</td><td>9063.7</td></tr><tr><td>01/01/2016 to 31/12/2016</td><td>8471.2</td></tr><tr><td>01/01/2017 to 31/12/2017</td><td>8637</td></tr><tr><td>Total</td><td>49447.7</td></tr></table>			Period	Net quantity of electricity exported to the grid, EG _{BL,y} in (in MWh)	31/05/2012 to 31/12/2012	5278.2	01/01/2013 to 31/12/2013	9043.8	01/01/2014 to 31/12/2014	8953.8	01/01/2015 to 31/12/2015	9063.7	01/01/2016 to 31/12/2016	8471.2	01/01/2017 to 31/12/2017	8637	Total	49447.7
Period	Net quantity of electricity exported to the grid, EG _{BL,y} in (in MWh)																		
31/05/2012 to 31/12/2012	5278.2																		
01/01/2013 to 31/12/2013	9043.8																		
01/01/2014 to 31/12/2014	8953.8																		
01/01/2015 to 31/12/2015	9063.7																		
01/01/2016 to 31/12/2016	8471.2																		
01/01/2017 to 31/12/2017	8637																		
Total	49447.7																		
Monitoring equipment	Previous meter - ABT cum Trivector Meter <table><tr><th>Parameters</th><th>Main meter</th><th>Check Meter</th></tr><tr><td>Make</td><td>L&T</td><td>L&T</td></tr></table>			Parameters	Main meter	Check Meter	Make	L&T	L&T										
Parameters	Main meter	Check Meter																	
Make	L&T	L&T																	

	Type	3 phase 4W		3 phase 4W	
	Serial no	11080369		11080360	
	Accuracy class	0.2s		0.2s	
	Calibration	Date of Calibration	Calibration due date	Date of Calibration	Calibration due date
		01/12/2011	01/12/2012	01/12/2011	01/12/2012
		01/12/2012	01/12/2013	01/12/2012	01/12/2013
		29/11/2013	29-11-2014	29/11/2013	29-11-2014
		28/11/2014	28-11-2015	28/11/2014	28-11-2015
	The above meters being replaced dated 31/10/2015 by new ABT cum Trivector meters as per details below:				
	Parameters	Main meter		Check Meter	
	Make	Secure		Secure	
	Type	E3M024		E3M024	
	Serial no	APX00365		APX00366	
	Accuracy class	0.2s		0.2s	
	Calibration	Date of Calibration	Calibration due date	Date of Calibration	Calibration due date
		04-02-2015	04-02-2016	04-02-2015	04-02-2016
		03-02-2016	03-02-2017	03-02-2016	03-02-2017
		03-02-2017	03-02-2018	03-02-2017	03-02-2018
QA/QC procedures to be applied	The monthly recorded readings will be archived in joint meter reading sheets. SSEL will ensure that the metering system is tested for accuracy annually. The calibration of meters will be done by a government accredited agency. The value of net electricity exported can be cross checked with the invoice raised by SSEL to NVVN. In case of any failure in the main meter, the invoice will be raised to NVVN based on the check meter readings. Also, the main meter will be replaced immediately with the calibrated back up meter				
Purpose of the data	Calculation of baseline emissions				
Calculation method	NA				
Comments	The data will be kept for two years after the crediting period or from last issuance.				

4.3 Monitoring Plan

The proposed power plant is headed by the plant manager, holding the full charge of the power plant operations, reporting directly to the project promoters. The staffing recommended here takes care of the operation, maintenance and record keeping.

The plant manager is in charge for both technical and administrative functions. The organization under plant manager is divided into operation and maintenance group.

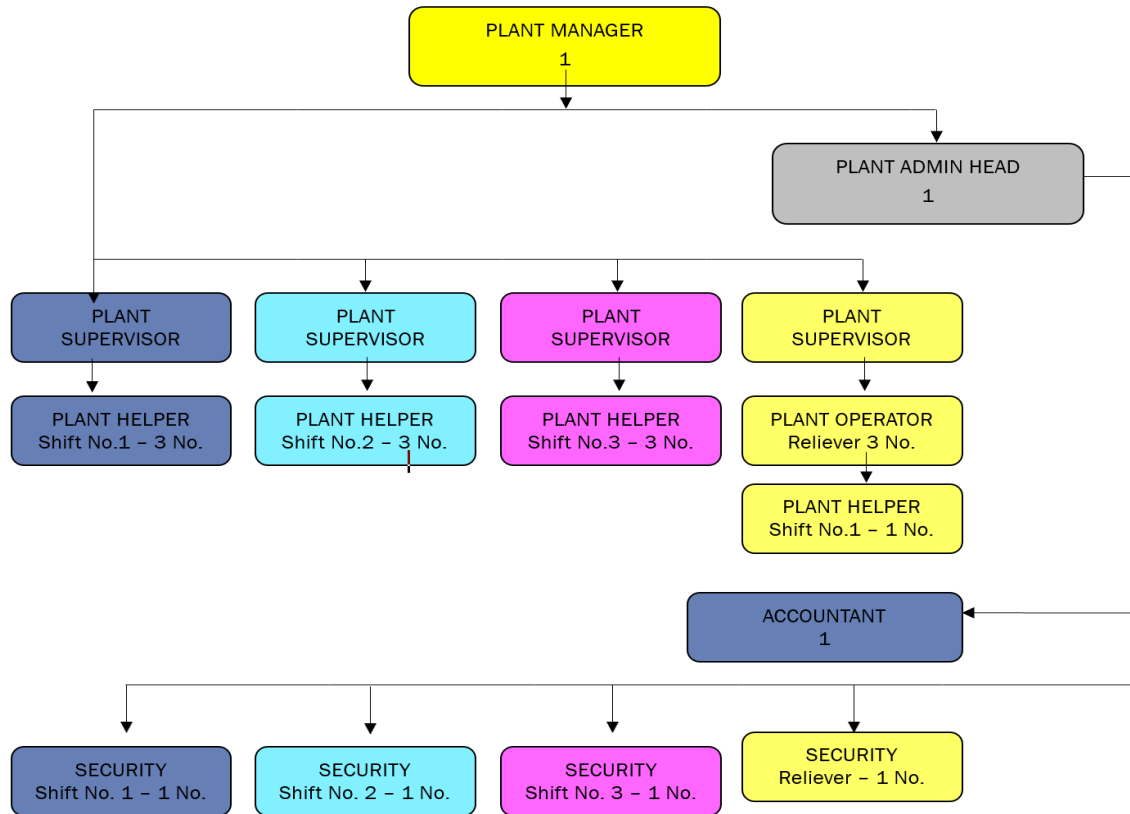
The plant operation team will work in three shifts per day. Each shift will be controlled by a shift supervisor. There will be an additional shift supervisor who will function as reliever.

Data Measurement:

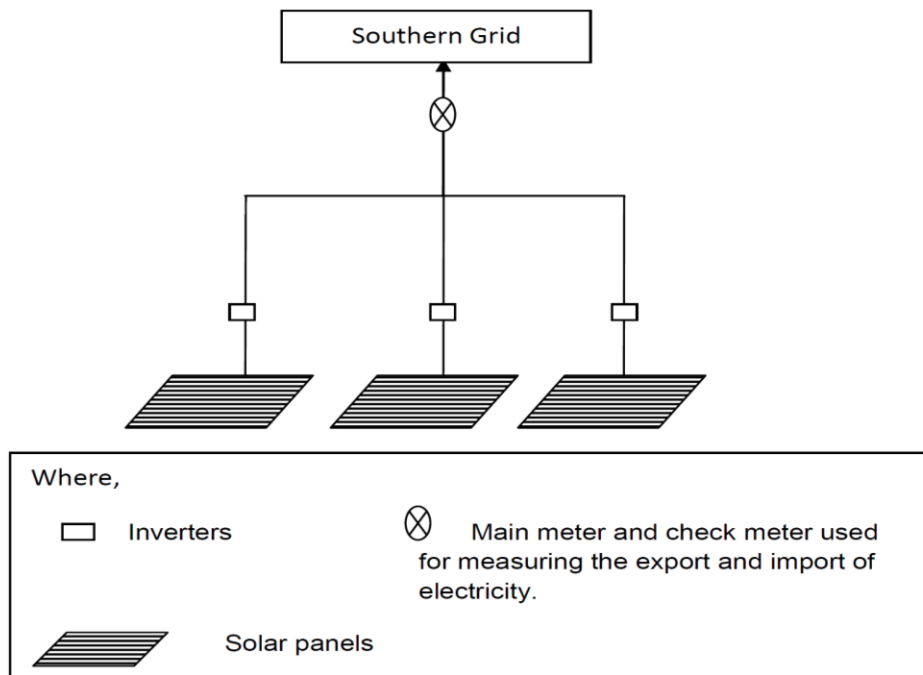
The export and import energy will be measured continuously using above mentioned Main & Check meters. Export & Import readings of Main & Check meters shall be taken on monthly basis by authorized officer of APCPDCL in the presence of PP or representative of PP. The meter reading will be taken jointly and signed by the representatives of the APCPDCL and SSEL. Based on the readings, invoices will be raised by SSEL to NVVN. These invoices can be used for cross checking the meter readings taken for the project activity. Also, there is an online arrangement for the monitoring of the electricity generation data and a report on monthly basis is submitted to MNRE through the NVVN.

Data collection and archiving: Export & Import readings from main & check meter was collected under the supervision of the plant supervisor. The net electricity supplied to grid has been calculated based on export & import readings. Export and Import data would be 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 will be 2 years after the end of crediting period or till the last issuance of CERs for the project activity whichever occurs later.

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



Line diagram for the project activity:



5 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

5.1 Baseline Emissions

Baseline for the project activity is power generated from renewable energy source multiplied by the grid emission factor of Southern grid calculated in transparent and conservative manner.

Baseline emissions, $BE_y = EG_{BL,y} * EF_{CO2,grid,y}$

$EG_{BL,y}$ - Quantity of electricity supplied to the grid as a result of the implementation of the project activity during the monitoring period

Year	Net quantity of electricity exported to the grid, $EG_{BL,y}$ (MWh)
31/05/2012 to 31/12/2012	5278.2
01/01/2013 to 31/12/2013	9043.8
01/01/2014 to 31/12/2014	8953.8
01/01/2015 to 31/12/2015	9063.7
01/01/2016 to 31/12/2016	8471.2
01/01/2017 to 31/12/2017	8637
Total	49447.7

$EF_{CO2,grid,y}$ - Emission factor of Southern grid (0.916 tCO₂e/MWh) (Fixed for crediting period)

Baseline emissions, BE_y

Year	Net quantity of electricity exported to the grid, $EG_{BL,y}$ (MWh)	$EF_{CO2,Grid,y}$ (in tCO ₂ e /MWh)	$BE_y = EG_{BL,y} * EF_{CO2,grid,y}$ (in tCO ₂ e)
31/05/2012 to 31/12/2012	5278.2	0.916	= 5278.2 x 0.916 = 4834.83 = 4834 (rounded down)
01/01/2013 to 31/12/2013	9043.8	0.916	= 9043.8 x 0.916 = 8284.12 = 8284 (rounded down)
01/01/2014 to 31/12/2014	8953.8	0.916	= 8953.8 x 0.916

			= 8201.68 = 8201 (rounded down)
01/01/2015 to 31/12/2015	9063.7	0.916	= 9063.7 x 0.916 = 8302.34 = 8302 (rounded down)
01/01/2016 to 31/12/2016	8471.2	0.916	= 8471.2 x 0.916 = 7759.61 = 7759 (rounded down)
01/01/2017 to 31/12/2017	8637.0	0.916	= 8637.0 x 0.916 = 7911.49 = 7911 (rounded down)
Total	49447.7		45291

5.2 Project Emissions

As per para 20 of AMS-I.D. ver 17, for renewable power (solar power) projects, project emissions,

$$PE_y = 0 \text{ tCO}_2\text{e}$$

5.3 Leakage

The project activity is a Greenfield project and there is no transfer of energy generating equipment from another activity. Hence there is no leakage within the project boundary as per para 22 of AMS-I.D. ver17.

$$LE_y = 0 \text{ tCO}_2\text{e}$$

5.4 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)
2012	4,834	0	0	4,834
2013	8,284	0	0	8,284
2014	8,201	0	0	8,201
2015	8,302	0	0	8,302
2016	7,759	0	0	7,759
2017	7,911	0	0	7,911
Total	45,291	0	0	45,291

The emission reduction during current monitoring period is lower than ex-ante estimation in registered PD for current monitoring period (2041 days) i.e. 46,180 tCO₂e. The actual emission reduction achieved i.e. 45,291 tCO₂e is lower than ex-ante estimation for same period due to minor difference in PLF which is not in the control of project participant.

APPENDIX 1: SDG EVIDENCES



Figure 1- Classroom sessions of Grade 1 - Foundational Literacy and Numeracy



Figure 2- Sai Sudhir Energy employee teaching the students about Introductory session and about their solar project on first day of class.

As the certificates of the candidates are bigger in size, the same is submitted to DOE as a separate file.