

VCS GROUPED PROJECT FOR RENEWABLE POWER GENERATION BY ESSEL MINING AND INDUSTRIES LIMITED

Document Prepared By Deloitte Touche Tohmatsu India LLP

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1 PROJECT DETAILS

1.1 Summary Description of the Project

Essel Mining & Industries Limited (EMIL) (hereafter referred as “*project proponent*”) is installing Renewable Energy Power Plants based on solar photovoltaic (PV) technology (hereafter referred as “*proposed project activity*”) at various locations across India as a grouped project activity. EMIL is looking forward to earn carbon credits under VCS mechanism for these solar PV based power plants.

The objective of the grouped project activity is to develop a platform for reducing VCS Registration timelines and process costs for registration of individual projects under VCS.

The proposed grouped project activity will support development of renewable energy generation plants based on Solar PV technology in India and delivering electricity to the grid. Each instance of project activity under this grouped project will consist of one or more renewable power generation plant using solar PV technology. The proposed grouped project is a voluntary action being undertaken by EMIL. All the project activity instances being included in the proposed grouped project are owned by EMIL who is also acting as Coordinating and Managing entity for the Grouped Project activity.

The renewable energy generation plants under the grouped project activity would generate Solar PV based electricity, which otherwise in absence of project activity would have been generated from fossil fuel fired grid connected power plants. The grouped project activity thus leads to reduction in Greenhouse Gas (GHG) emissions.

All the project instances i.e. renewable energy generation plants to be included in this grouped project will be from within India only. Hence the location and geographical boundary of the grouped project can be defined as India. The estimated annual emission reductions over a 10 year period from initial five project activity instances are 77,678 tCO₂e/year

Following project activity instances are being included in the grouped project at the time of registration:

Project activity instances	Title of the project activity	Location	Date of Commissioning	Estimated Annual Average ERs over a 10 year period
Instance – 1	VCS Project for Solar Power Plant at Bhadla, Rajasthan	Bhadla Solar Park, Village – Bhadla, Tehsil – Bap, District – Jodhpur, Rajasthan India	12 th March 2014	29,271
Instance – 2	VCS Project for Solar Power plant at Achampet, Telagana	5 MW Solar Power Plant, Achampet Village and Mandal, Dist. Mehaboobnagar,	07 th July 2014	6,942

		Telangana, India.		
Instance – 3	VCS Project for Solar Power Plant at Kalwakurthy, Dist. Mehabubnagar, Telangana	Ternikal Village, Kalwakurthy Mandal, Dist. Mehaboobnagar, Telangana, India.	30 th June 2014	14,086
Instance – 4	VCS Project for Solar Power Plant at Salakpur, Telangana	Village: Salakpur District: Warangal State: Telengana, India	17 th September 2014	13,504
Instance – 5	VCS Project for Solar Power Plant at Alladurg, Telangana	Village: Bharamdhibba District: Medak State: Telengana, India	28 th July 2014	13,875

More project activity instances will be included in the grouped project activity in future. These new instances will also be grid connected solar power plants generating renewable power and will contribute to GHG emission reductions.

Technical Specifications:

Technical Specifications of initial project activity instances are as follows:

Project activity instances	Capacity	PV Modules	Inverters
Instance – 1: Bhadla	20 MW	36,288 nos. (245 Wp each) 52,488 nos. (250 Wp each) Manufactured by CSun	30 nos.(680 kW each) Manufactured by Schneider
Instance – 2: Achampet	5 MW	18,340 nos. (300 Wp each) Manufactured by CSun	7 nos, (860 kVA each) Manufactured by Schneider Electric
Instance – 3: Kalwakurthy	10 MW	37,940 nos. (290 Wp each) Manufactured by CSun	14 nos, (680 kVA each) Manufactured by Schneider Electric
Instance – 4: Salakpur	10 MW	36,680 nos. (300 Wp each) Manufactured by YINGLI	14 nos, Manufactured by Schneider Electric of capacity 680 kVA each
Instance – 5: Alladurg	10 MW	36,680 nos. (300 Wp each) Manufactured by CSUN	14 nos, (680 KVA) Manufactured by Schneider Electric

Pre project scenario

There was no power generation activity at the project site prior to implementation of the project activity instances. Therefore, in the absence of the proposed project activity instances, the equivalent amount of electricity would have been generated from the connected / new power plants in the grid, while project activity instances in the proposed grouped project are green field

projects. Therein, the main emission source in the pre-project scenario is the power plants connected to the grid and the primary GHG involved is CO₂.

The grouped project activity as a whole would contribute towards sustainable development of the host country India. The key sustainable development benefits because of the grouped project are outlined as follows:

Social Well-being: Installation of the project would generate direct and indirect employment opportunities in the nearby areas of the project sites. Generation of employment opportunities will help in poverty alleviation, improvement in standard of living etc. of nearby communities hence contributing towards social well-being of local communities.

Environmental Well-being: Each of the individual plants under the project activity will be generate renewable electricity through solar PV based power generation system. Use of solar PV technology for electricity generation does not emit any GHG emissions. In the absence of project activity the equivalent amount of electricity would be generated through grid connected fossil fuel fired power plants, thereby leading to increase in GHG and other SO_x, NO_x emissions. As such it is implied that the proposed grouped project would not generate any negative environmental footprint hence leading to environmental well-being.

Economic well-being: Installation and operation of project activity instances as part of the grouped project would generate employment and business opportunities hence contributing towards economic well-being of the local communities.

Technological well-being: Power generation through solar PV technology is environmentally safe and sound technology. Also there are no harmful emissions while operation of the plant. Hence this technology is amongst the cleanest sources of power generation among the other power generation technologies available in the country. Currently, percentage share of total installed capacity of the solar power generation in the total installed grid connected power generation capacity in India is 1.44%¹. The project activity would help in diffusion of the cleaner technology in the country for power generation. This will lead to technological well-being in power generation sector in India.

1.2 Sectoral Scope and Project Type

The project activity under consideration is a grouped project activity. The project activity instances as part of the grouped project will have following parameters:

Sectoral Scope Applicable to project: 01 - Energy (renewable/non-renewable)

Project Type: I – Renewable Energy Projects

Project Category:

For Large Scale Project activity instances as per CDM terminology i.e. project activity instances with capacity more than 15 MW: (ACM0002) Grid-connected electricity generation from renewable sources (Version 16.0) (EB 81, Annex 9)

¹ Explained in detail in section 2.5 of this document.

Web link: <http://cdm.unfccc.int/methodologies/DB/EY2CL7RTEHRC9V6YQHLAR6MJ6VEU83>

For small scale project activity instances as per CDM terminology i.e. project activity instances with capacity less than 15 MW: (AMS-I.D) Grid connected renewable electricity generation (Version 18.0) (EB 81, Annex 24)

Web link: <http://cdm.unfccc.int/methodologies/DB/W3TINZ7KKWCK7L8WTFQQOFQQH4SBK>

1.3 Project Proponent

Organization name	Essel Mining and Industries Limited
Contact person	Gajanan Joshi
Title	Head – Business Development (Solar Business)
Address	4C, Aditya Birla Centre, SK Ahire Marg, Mumbai – 400 030 (Maharashtra) INDIA
Telephone	+91 – 22 – 24996145
Email	gajanan.joshi@adityabirla.com

1.4 Other Entities Involved in the Project

Organization name	Deloitte Touche Tohmatsu India LLP
Role in the project	Consultant for VCS Registration
Contact person	Mr. Shubhranshu Patnaik
Title	Senior Director
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1.5 Project Start Date

The first project activity instance of the grouped project under consideration was commissioned and power generation started on March 12, 2014 at Bhadla in District Jodhpur in the state of Rajasthan in India. Hence the project start date is defined as follows:

Project start date: **12th day of March 2014**

1.6 Project Crediting Period

Project crediting period for grouped project activity is taken as 10 years renewable twice. Accordingly the start date of the crediting period is 12th March 2014 and end date will be 11th March 2024. Crediting period is from 12th March 2014 to 11th March 2024.

1.7 Project Scale and Estimated GHG Emission Reductions or Removals

As per section 3.9.1 of VCS standard, the projects are classified as follows:

- 1) Projects: Less than or equal to 300,000 tonnes of CO₂e per year
- 2) Large projects: Greater than 300,000 tonnes of CO₂e per year

The grouped project activity instances being included currently have less than 300,000 tCO₂e emission reductions, hence these project activity instances are classified as “Projects”

Similarly, the estimated GHG Emission Reductions will depend upon the power generation capacity of individual project activity instances. The tentative Emission Reduction for the five project activity instances being included in the grouped project activity are as follows:

Project activity instances	Estimated annual Emission Reductions over a 10 year period (tCO ₂ e)
Instance – 1: Bhadla	29,271
Instance – 2: Achampet	6,942
Instance – 3: Kalwakurthy	14,086
Instance – 4: Salakpur	13,504
Instance – 5: Alladurg	13,875
Total	77,678

The categorization of project activity instances is as follows:.. All initial five project activity instances fall in the category of ‘Projects’

Project Scale	
Project	√
Large project	

Total emission reductions from the initial five project activity instances being included in the grouped project are as follows:

Years	Estimated GHG emission reductions or removals (tCO ₂ e)
Year 1	57,794
Year 2	79,887
Year 3	79,887
Year 4	79,887
Year 5	79,887

Year 6	79,887
Year 7	79,887
Year 8	79,887
Year 9	79,887
Year 10	79,887
Total estimated ERs	776,777
Total number of crediting years	10
Average annual ERs	77,678

However, emission reductions achieved as part of grouped project activity will increase as per addition of new project activity instances in the future.

1.8 Description of the Project Activity

The project activity is a grouped project activity in which various project instances would be added from time to time. These project activity instances will involve installation of renewable electricity generation projects based on Solar PV technology. The project activity instances will be either small scale project activities (with power generation capacity less than 15 MW) or large scale project activities (with power generation capacity more than 15 MW). All the project activity instances would be connected to the grid and power generated would be dispatched to the grid.

Under the proposed grouped project activity installation of solar PV based power plant and generation of renewable electricity will replace the equivalent amount of electricity generated through other grid connected fossil fuel fired power plants. The project activity thus will lead to reduction in an equivalent amount of GHG emissions

As per the guidelines provide by MNRE²; the capacity of a solar PV power plant is defined as “Maximum Power Output (AC) from the Solar Power Plant which can be scheduled at the point of Injection to the GRID during any time block of the day”.

There is no technology transfer involved in the proposed grouped project activity.

Details of system configuration, age and average lifetime of the equipment etc. for individual project activity instances are as follows:

Instance – 1: Bhalda

The project at Bhalda is solar power plant of capacity 20 MW. Major components installed as part of the project activity are as follows:

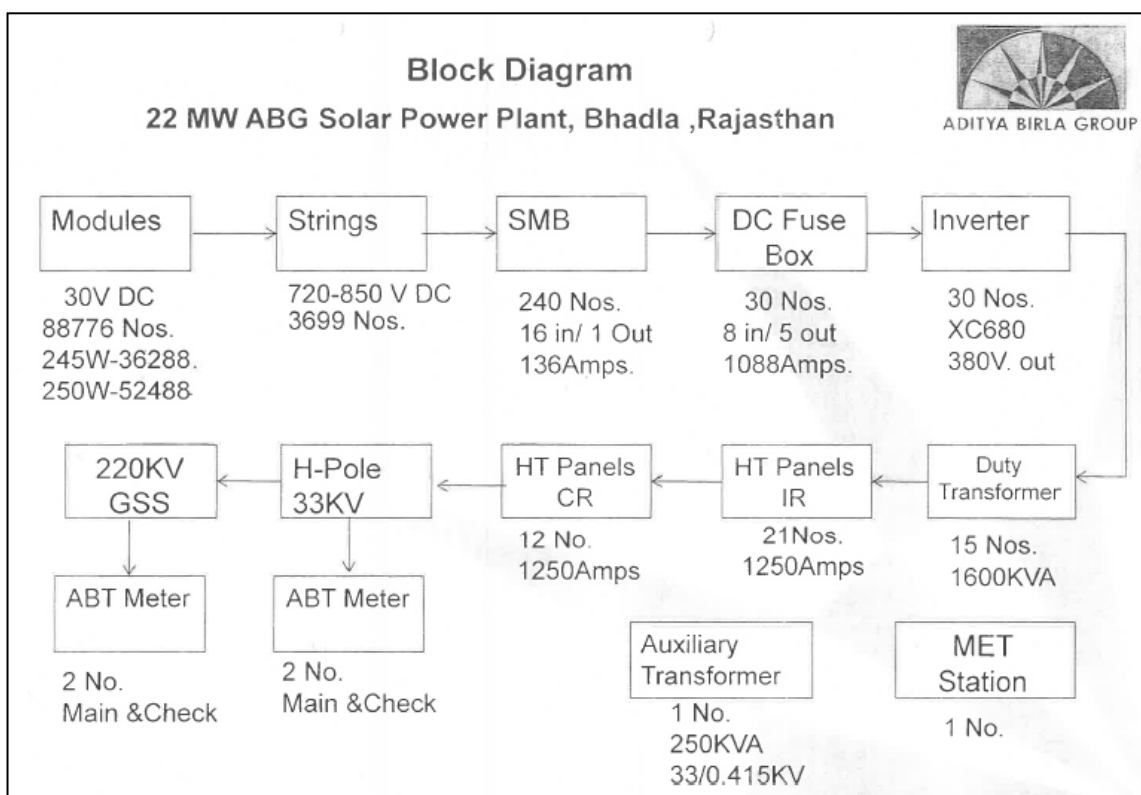
- Solar PV modules
- Inverters
- Transformers

Specifications of key components is as follows:

² The document is available on <http://www.nvvn.co.in/Elaboration%20of%20Provisions%201.pdf>

PV Modules	36,288 nos. (245 Wp each) 52,488 nos. (250 Wp each) Manufactured by CSun
Module technology	Poly Crystalline
Inverters	30 nos.(680 kW each) Manufactured by Schneider
Power Delivery point	33 kV grid sub-station (GSS) at Bhadla, District – Jodhpur
DC Capacity of the plant	22 MWp
AC Capacity of the plant	20 MW

Block diagram indicating system configuration of the project activity is indicated as follows:



The renewable power generated through the proposed project activity will be sold to Rajasthan Renewable Energy Cooperation Limited (RREC).

Total generation is governed by the DC capacity as solar panels only convert the light to electricity. DC capacity of the plant is 22 MW based on number of connected modules and their wattages. This capacity is under Standard Testing condition (STC) which is defined as AM1.5 irradiance (1000 W/m²) at an ambient temperature of 25 °C.

The energy produced in the module suffers many losses before it is fed to the grid. The highest loss is because of temperature, which is to the tune of 8-10% on an average basis. Thus, the

energy flowing out of module itself is reduced by 8-10%. Besides temperature, energy is lost because of reflection from the module surface (2-3%), Module Mismatch Loss (1.5%), module quality loss (1.5%), DC cable loss (1-2%), AC cable loss (1%), Inverter Efficiency Loss (2-3%), Transformer Loss (1-1.5%), Losses in fuses, switches and connectors (1-1.5%), Soiling Loss (2-3%), Shadow Loss (1.5-3%). Thus, the total loss until power is fed to the grid is to the tune of 22-25%. These losses are accounted for in the PV plant in one number, known as Performance Ratio (PR). Performance ratio of crystalline plants in India is in the range of 75-78%. Even if we consider the higher PR (78%), the AC capacity will be 78% of DC, i.e. 17.16 MW only.

Hence, based on above; at any point of injection to GRID during any time block of the day, the amount of electricity being fed into the grid cannot be more than 20 MW (AC) from the project activity power plant under consideration.

The estimated lifetime of the project activity is considered as 25 years according to the limited warranty provided by supplier of solar PV modules.

Instance – 2: Achampet

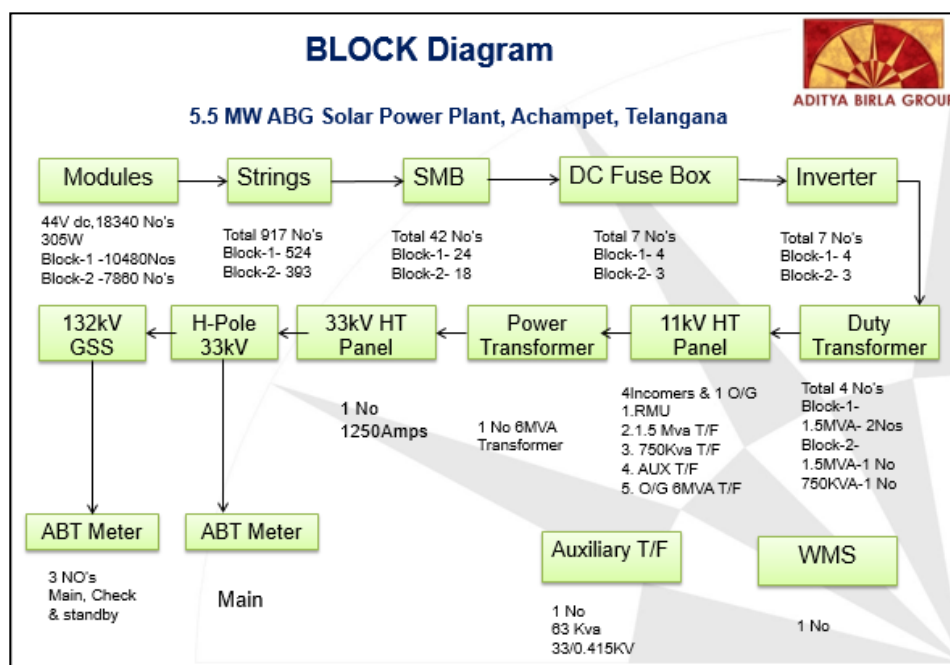
The project activity instance at Achampet is a solar power plant with capacity of 5 MW. Major components installed as part of the project activity are as follows:

- Solar PV modules
- Inverters
- Transformers

Specifications of key components is as follows:

PV Modules	18,380 nos. (300 Wp each) Manufactured by CSun
Module technology	Poly Crystalline
Inverters	7 nos. (860 kVA each) Manufactured by Schneider Electric
Power Delivery point	132/33 kV grid substation at Achampet, Dist. Mehaboobnagar, Telangana
DC Capacity of the plant	5.5 MWp
AC Capacity of the plant	5 MW

Block diagram indicating system configuration of the project activity is indicated as follows:



The renewable power generated through the proposed project activity will be sold to Central Power Distribution Company of Andhra Pradesh (DISCOM).

Total generation is governed by the DC capacity as solar panels only convert the light to electricity. DC capacity of the plant is 5.5 MW based on number of connected modules and their wattages. This capacity is under Standard Testing condition (STC) which is defined as AM1.5 irradiance (1000 W/m^2) at an ambient temperature of 25°C .

The energy produced in the module suffers many losses before it is fed to the grid. The highest loss is because of temperature, which is to the tune of 8-10% on an average basis. Thus, the energy flowing out of module itself is reduced by 8-10%. Besides temperature, energy is lost because of reflection from the module surface (2-3%), Module Mismatch Loss (1.5%), module quality loss (1.5%), DC cable loss (1-2%), AC cable loss (1%), Inverter Efficiency Loss (2-3%), Transformer Loss (1-1.5%), Losses in fuses, switches and connectors (1-1.5%), Soiling Loss (2-3%), Shadow Loss (1.5-3%). Thus, the total loss until power is fed to the grid is to the tune of 22-25%. These losses are accounted for in the PV plant in one number, known as Performance Ratio (PR). Performance ratio of crystalline plants in India is in the range of 75-78%. Even if we consider the higher PR (78%), the AC capacity will be 78% of DC, i.e. 4.29 MW only.

Hence, based on above; at any point of injection to GRID during any time block of the day, the amount of electricity being fed into the grid cannot be more than 5 MW (AC) from the project activity power plant under consideration.

The estimated lifetime of the project activity is considered as 25 years according to the limited warranty provided by supplier of solar PV modules.

Instance – 3: Kalwakurthy

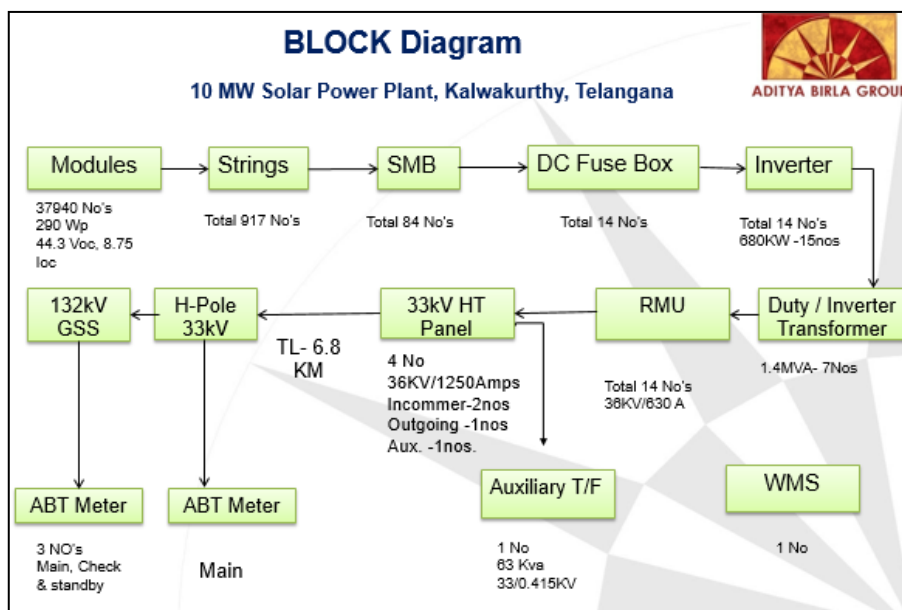
The project activity instance at Kalwakurthy is a solar power plant with capacity of 10 MW. Major components installed as part of the project activity are as follows:

- Solar PV modules
- Inverters
- Transformers

Specifications of key components is as follows:

PV Modules	37,940 nos. (290 Wp each) Manufactured by CSun
Module technology	Poly Crystalline
Inverters	14 nos. (680 kVA each) Manufactured by Schneider Electric
Power Delivery point	132/33 kV grid substation at Kalwakurthy, Dist. Mehaboobnagar, Telangana
DC Capacity of the plant	11 MWp
AC Capacity of the plant	10 MW

Block diagram indicating system configuration of the project activity is indicated as follows:



The renewable power generated through the proposed project activity will be sold to Central Power Distribution Company of Andhra Pradesh (DISCOM).

Total generation is governed by the DC capacity as solar panels only convert the light to electricity. DC capacity of the plant is 5.5 MW based on number of connected modules and their

wattages. This capacity is under Standard Testing condition (STC) which is defined as AM1.5 irradiance (1000 W/m²) at an ambient temperature of 25 °C.

The energy produced in the module suffers many losses before it is fed to the grid. The highest loss is because of temperature, which is to the tune of 8-10% on an average basis. Thus, the energy flowing out of module itself is reduced by 8-10%. Besides temperature, energy is lost because of reflection from the module surface (2-3%), Module Mismatch Loss (1.5%), module quality loss (1.5%), DC cable loss (1-2%), AC cable loss (1%), Inverter Efficiency Loss (2-3%), Transformer Loss (1-1.5%), Losses in fuses, switches and connectors (1-1.5%), Soiling Loss (2-3%), Shadow Loss (1.5-3%). Thus, the total loss until power is fed to the grid is to the tune of 22-25%. These losses are accounted for in the PV plant in one number, known as Performance Ratio (PR). Performance ratio of crystalline plants in India is in the range of 75-78%. Even if we consider the higher PR (78%), the AC capacity will be 78% of DC, i.e. 8.58 MW only.

Hence, based on above clarification; at any point of injection to GRID during any time block of the day, the amount of electricity being fed into the grid cannot be more than 10 MW (AC) from the project activity power plant under consideration.

The estimated lifetime of the project activity is considered as 25 years according to the limited warranty provided by supplier of solar PV modules.

Instance – 4: Salakpur

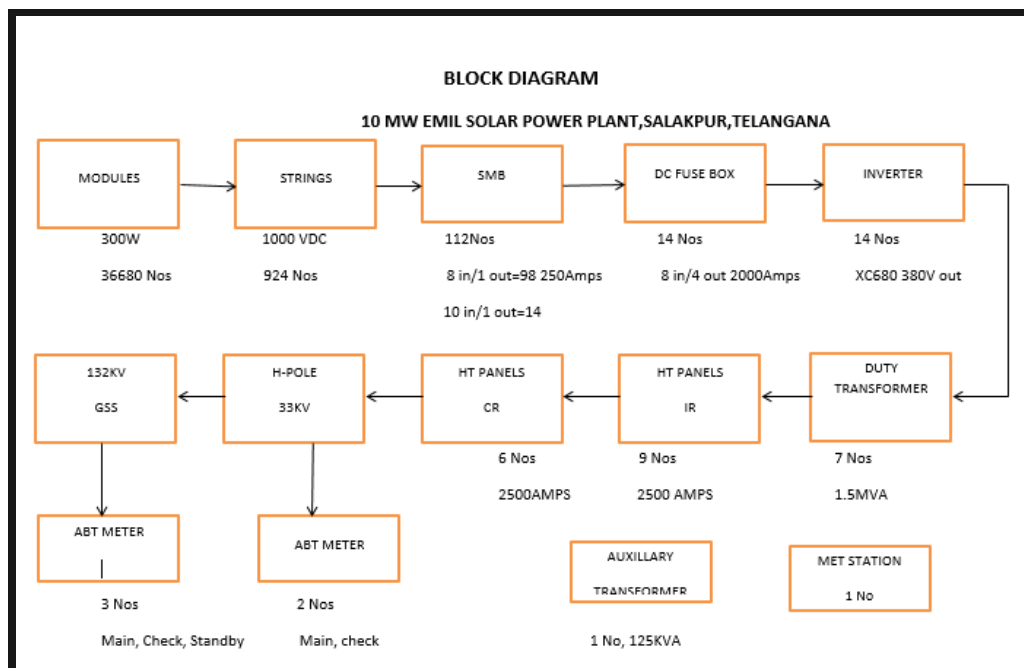
The project activity instance at Salakpur involves installation of solar PV based power plant. The installed capacity of the power plant is 10 MW. Following are major components involved in the installation of project activity:

- Solar Photovoltaic modules
- Inverters
- Transformers

Specifications for some key components are as follows:

PV Modules	36,680 nos. (300 Wp each) Manufactured by YINGLI
Module technology	Poly Crystalline
Inverters	14 nos. (680 kVA each) Manufactured by Schneider Electric
Power Delivery point	132 kV Grid Substation at Mustyal, Telengana which is the commercial metering point
DC Capacity of the plant	11 MWp
AC Capacity of the plant	10 MW

The schematic block diagram of the power plant is as indicated in the figure below:



The renewable power generated through the proposed project activity will be sold to Northern Power Distribution Company of Andhra Pradesh (DISCOM) through the grid.

Total generation is governed by the DC capacity as solar panels only convert the light to electricity. DC capacity is 11.004 MW based on number of connected modules and their wattages. This capacity is under Standard Testing condition (STC) which is defined as AM1.5 irradiance (1000 W/m²) at an ambient temperature of 25 deg. C.

The energy produced in the module suffers many losses before it is fed to the grid. The highest loss is because of temperature, which is to the tune of 8-10% on an average basis. Thus, the energy flowing out of module itself is reduced by 8-10%. Besides temperature, energy is lost because of reflection from the module surface (2-3%), Module Mismatch Loss (1.5%), module quality loss (1.5%), DC cable loss (1-2%), AC cable loss (1%), Inverter Efficiency Loss (2-3%), Transformer Loss (1-1.5%), Losses in fuses, switches and connectors (1-1.5%), Soiling Loss (2-3%), Shadow Loss (1.5-3%). Thus, the total loss until power is fed to the grid is to the tune of 22-25%. These losses are accounted for in the PV plant in one number, known as Performance Ratio (PR). Performance ratio of crystalline plants in India is in the range of 75-78%. Even if we consider the higher PR (78%), the AC capacity will be 78% of DC, i.e. 8.58 MW only.

Hence, based on above clarification; at any point of injection to GRID during any time block of the day, the amount of electricity being fed into the grid cannot be more than 10 MW (AC) from the project activity power plant under consideration.

The estimated lifetime of the project activity is considered as 25 years according to the limited warranty provided by supplier of solar PV modules.

Instance – 5: Alladurg

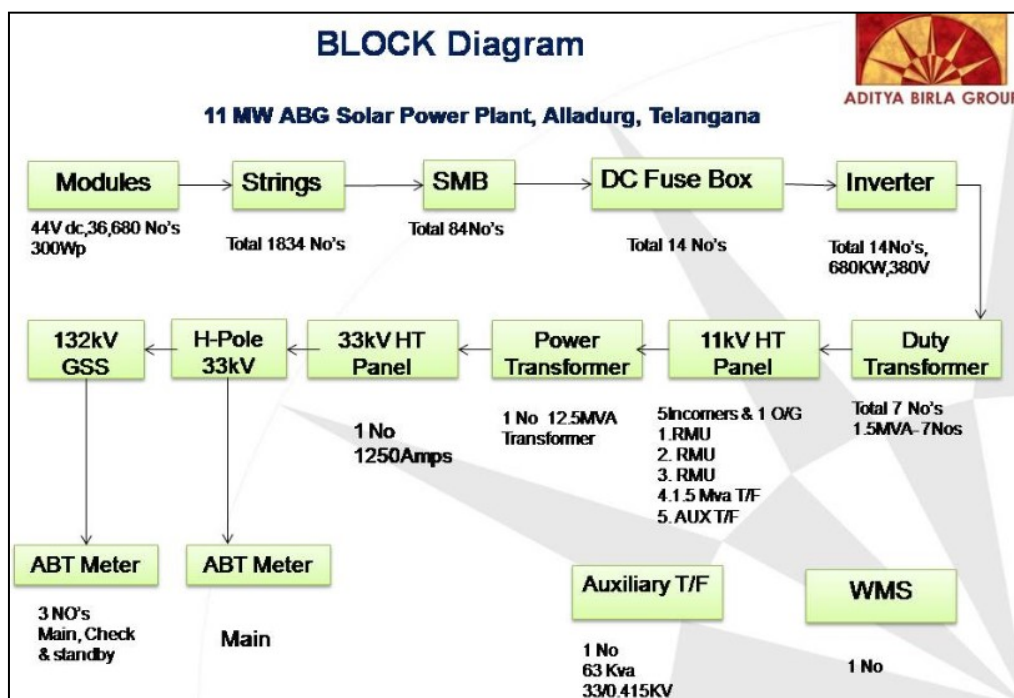
The project activity instance at Alladurg involves installation of solar PV based power plant. The installed capacity of the power plant is 10 MW. Following are major components involved in the installation of project activity:

- Solar Photovoltaic modules
- Inverters
- Transformers

Specifications for some key components are as follows:

PV Modules	36,680 nos. (300 Wp each) Manufactured by CSUN300-72P
Module technology	Poly Crystalline
Inverters	14 nos. (680 kVA each) Manufactured by Schneider Electric
Power Delivery point	132 kV Grid Substation at Peddashankarampet which is the commercial metering point
DC Capacity of the plant	11.004 MWp
AC Capacity of the plant	10 MW

The schematic block diagram of the power plant is as indicated in the figure below:



The renewable power generated through the proposed project activity will be sold to Central Power Distribution Company of Andhra Pradesh (DISCOM).

Total generation is governed by the DC capacity as solar panels only convert the light to electricity. DC capacity is 11.004 MW based on number of connected modules and their wattages. This capacity is under Standard Testing condition (STC) which is defined as AM1.5 irradiance (1000 W/m²) at an ambient temperature of 25 deg. C.

The energy produced in the module suffers many losses before it is fed to the grid. The highest loss is because of temperature, which is to the tune of 8-10% on an average basis. Thus, the energy flowing out of module itself is reduced by 8-10%.

Besides temperature, energy is lost because of reflection from the module surface (2-3%), Module Mismatch Loss (1.5%), module quality loss (1.5%), DC cable loss (1-2%), AC cable loss (1%), Inverter Efficiency Loss (2-3%), Transformer Loss (1-1.5%), Losses in fuses, switches and connectors (1-1.5%), Soiling Loss (2-3%), Shadow Loss (1.5-3%). Thus, the total loss until power is fed to the grid is to the tune of 22-25%. These losses are accounted for in the PV plant in one number, known as Performance Ratio (PR). Performance ratio of crystalline plants in India is in the range of 75-78%. Even if we consider the higher PR (78%), the AC capacity will be 78% of DC, i.e. 8.58 MW only.

Hence, based on above clarification; at any point of injection to GRID during any time block of the day, the amount of electricity being fed into the grid cannot be more than 10 MW (AC) from the project activity power plant under consideration.

The estimated lifetime of the project activity is considered as 25 years according to the limited warranty provided by supplier of solar PV modules.

1.9 Project Location

All the project activity instances in the proposed grouped project activity would be located within geographical boundaries of Republic of India. Thus geographical area of grouped project is India.

The geographical boundary³ is delineated in the form of extreme geographic coordinates as follows:

North: 33.24902°N 76.82704°E

South: 6.74678°N 93.84260°E

East: 27.12622°N 97.16712°E

West: 23.71307°N 68.03215°E

The map is as indicated in the following figure:



³ The map of India is available at:

<https://www.google.co.in/maps/place/India/@20.1505369,64.4808043,4z/data=!3m1!4b1!4m2!3m1!1s0x30635ff06b92b791:0xd78c4fa1854213a6>

The geographic boundaries, geo-coordinates for project activity instance to be included in the grouped project activity during registration are as follows:

Project activity instances	Address	Geo-coordinates
Instance – 1: Bhadla	Plot no. 5 & 11, Bhadla Solar Park, Village – Bhadla, Tehsil – Bap, District – Jodhpur Nearest Airport: Jodhpur Nearest Railway Station: Bikaner and Jodhpur	Latitude: 27.561° N Longitude: 71.929° E
Instance – 2: Achampet	5 MW Solar Power Plant, Survey No. 194/A/1, 194/A/2, 194/A/3, 195/Aa/1, 203/A, 203/Aa, 203/E. and 203/Ee, Achampet Village and Mandal, Dist. Mehaboobnagar, Telangana, India. Nearest Airport: Hyderabad Nearest Railway Station: Secunderabad	Latitude: 16.4° N Longitude: 78.6° E
Instance – 3: Kalwakurthy	10 MW Solar Power Plant, Survey No. 517, and 520 Ternikal Village, Kalwakurthy Mandal, Dist. Mehaboobnagar, Telangana, India. Nearest Airport: Hyderabad Nearest Railway Station: Secunderabad	Latitude: 16.7° N Longitude: 78.5° E
Instance – 4: Salakpur	Village: Salakpur District: Warangal State: Telangana, India Nearest Airport: Hyderabad Nearest Railway Station: Secunderabad	Latitude: 17.89° N Longitude: 79.05° E
Instance – 5: Alladurg	Village: Bharamdhibba District: Medak State: Telangana, India Nearest Airport: Hyderabad Nearest Railway Station: Secunderabad	Latitude: 17.94° N Longitude: 77.92° E

These project activity instance can be represented on the map as follows:

Instance – 1: Bhadla



Instance – 2: Achampet



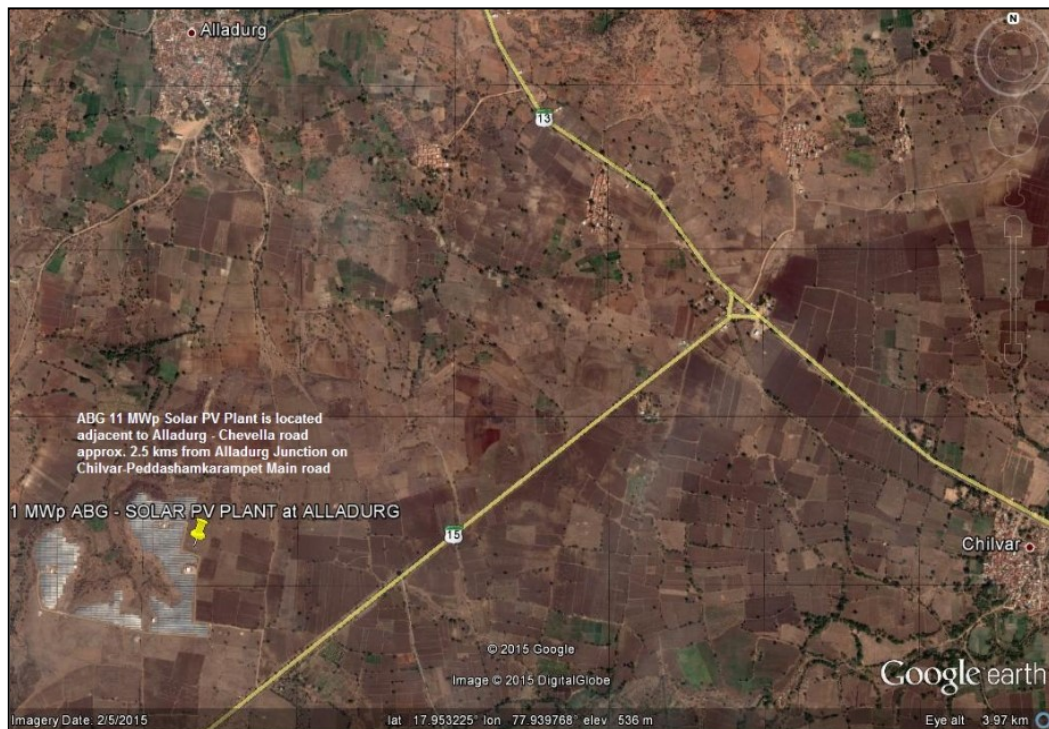
Instance – 3: Kalwakurthy



Instance – 4: Salakpur



Instance – 5: Alladurg



1.10 Conditions Prior to Project Initiation

The project activity instances as part of the proposed grouped project activity are Greenfield renewable power generation projects. These will be installed at locations where there was no power generation activity at the site. In the absence of the project activity instances as part of the proposed grouped project activity, the equivalent amount of electricity would have been generated from the existing/new power plants connected to the grid. Therein, the main emission source in the pre-project scenario are the grid connected power plants and the primary GHG involved is CO₂.

1.11 Compliance with Laws, Statutes and Other Regulatory Frameworks

Compliance related to following aspects will be provided for each of the project activity instance to be included in the grouped project activity:

- Consent to establish under section 25/26 of water 1974 is provided by State Pollution Control Board
- Consent to operate provided by State Pollution Control Board
- Power evacuation clearance obtained from relevant authorities

For the project activity instances to be included in the grouped project, following are details of compliances:

Project activity instances	Compliance of the project activity with relevant local, regional and national laws, statutes and regulatory frameworks
Instance – 1: Bhadla	• Consent to establish under section 25/26 of water 1974 has been provided by Rajasthan State Pollution Control Board (Order No.: 2013-2014/Jodhpur/1738 dated 28/02/2014) • Consent to operate has been provided by Rajasthan State Pollution Control Board (Order No.: 2015-2016/Jodhpur/2215 dated 07/04/2015) • Power evacuation clearance obtained from Rajasthan DISCOMS Power Procurement Centre (RDPPC) (Letter No. SE (PP)/Xen (PP)/RDPPC/F.Solar/D782 dated 04/03/2014)
Instance – 2: Achampet	• Consent to establish under section 25 of water (Prevention & Control of Pollution) Act 1974 and under section 21 of Air (P&C of P) Act 1981 is provided by Telangana State Pollution Control Board (order no. 802/TSPCB/ROH/MBNR/CFE/2014-216 dated 01/10/2014) • Consent to operate under section 25/26 of water (P&C of P) Act 1974 and under section 21 of Air (P&C of P) Act 1981 is provided by Telangana State Pollution Control Board (order no. 802/PCB/ROH/MBNR/ 2015-641 dated 31/01/2015) • Power evacuation clearance obtained from southern power distribution company of T. G. Limited (Letter no. CGM (Comm & RAC)/SE (IPC)/F.Essel/D.No.940 dated 15/09/2014)
Instance – 3: Kalwakurthy	• Consent to establish under section 25 of water (Prevention & Control of Pollution) Act 1974 and under section 21 of Air (P&C of P) Act 1981 is provided by Telangana State Pollution Control Board (order no. 802/TSPCB/ROH/MBNR/CFE/2014-247 dated 04/10/2014) • Consent to operate under section 25/26 of water (P&C of P) Act 1974 and under section 21 of Air (P&C of P) Act 1981 is provided by Telangana State Pollution Control Board (order no. 802/PCB/ROH/MBNR/ 2014-532 dated 03/01/2015)

Project activity instances	Compliance of the project activity with relevant local, regional and national laws, statutes and regulatory frameworks
	Power evacuation clearance obtained from southern power distribution company of T. G. Limited (Letter no. CGM (Comml & RAC)/SE (IPC)/F.Essel/D.No.882 dated 03/07/2014)
Instance – 4: Salakpur	- Consent to establish under section 25 of water (Prevention & Control of Pollution) Act 1974 and under section 21 of Air (P&C of P) Act 1981 is provided by Telangana State Pollution Control Board (order no. 1769/PCB/RO-WGL/CFE/2014-446 dated 27/10/2014) - Consent to operate under section 25/26 of water (P&C of P) Act 1974 and under section 21 of Air (P&C of P) Act 1981 is provided by Telangana State Pollution Control Board (order no. 1769/PCB/RO-WGL/W&A/2014-586 dated 19/12/2014) - Power evacuation clearance obtained from. Transmission Corporation of Telangana Limited (Letter no. SE/OMC/Wgl/Tech/D.No.733 dated 16/09/2014)
Instance – 5: Alladurg	- Consent to establish under section 25 of water (Prevention & Control of Pollution) Act 1974 and under section 21 of Air (P&C of P) Act 1981 is provided by Telangana State Pollution Control Board (order no. 629/PCB/RO-I:SRD/MDK/CFE/2014-1751 dated 19/09/2014) - Consent to operate under section 25/26 of water (P&C of P) Act 1974 and under section 21 of Air (P&C of P) Act 1981 is provided by Telangana State Pollution Control Board (order no. 629/PCB/RO-I:SRD/MDK /W&A/2015-2036 dated 31/01/2015) - Power evacuation clearance obtained from Southern Power Distribution Company of T. G. Limited (Letter no. CGM (Comml & RAC) /SE (IPC) /F.Essel/ D.No.944/14 dated 16/09/2014).

1.12 Ownership and Other Programs

1.12.1 Right of Use

The solar PV equipment & infrastructure installed at site of each of the project activity instances as part of the proposed grouped project activity are under ownership of the Project Proponent – Essel Mining and Industries Limited. This is evident by equipment supply contracts, , power purchase agreement for individual project activity instances.

This demonstrates the right of use according to clause 3.11.1 (3) of VCS Standard (v3.5) – “a right of use arising by virtue of a statutory, property or contractual right in the plant, **equipment** or process that generates GHG emission reductions and/or removals”.

1.12.2 Emissions Trading Programs and Other Binding Limits

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

The initial project activity instances - Instance – 1: Bhadla, Instance – 2: Achampet, Instance – 3: Kalwakurthy, Instance – 4: Salakpur and Instance – 5: Alladurg are not participating in any other emission trading programme and other binding limits.

1.12.3 Other Forms of Environmental Credit

The proposed grouped 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.

The initial project activity instances - Instance – 1: Bhadla, Instance – 2: Achampet, Instance – 3: Kalwakurthy, Instance – 4: Salakpur and Instance – 5: Alladurg 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.

1.12.4 Participation under Other GHG Programs

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

The initial project activity instances - Instance – 1: Bhadla, Instance – 2: Achampet, Instance – 3: Kalwakurthy, Instance – 4: Salakpur and Instance – 5: Alladurg are not participating in any other GHG program.

1.12.5 Projects Rejected by Other GHG Programs

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

The initial project activity instances - Instance – 1: Bhadla, Instance – 2: Achampet, Instance – 3: Kalwakurthy, Instance – 4: Salakpur and Instance – 5: Alladurg are not participating in other Environmental credits, other GHG programs and have not been rejected by other GHG programs.

1.13 Additional Information Relevant to the Project

Eligibility Criteria

The project is a grouped project and following are the eligibility criteria for inclusion of new project activity instances into the grouped project activity:

- 1) **Applicability Conditions:** The project activity instances shall meet applicability conditions for applicable methodology as defined in section 2.2
- 2) **Geographical Area:** The project activity instances to be included in the grouped project activity will be activities involving grid connected renewable electricity generation using solar technology located within India

- 3) **Baseline scenario:** All Project Activity Instances shall meet the baseline definition as defined in respective methodology and as explained in section 2.4
- 4) **Technology type:** The project activity instances to be included in the grouped project activity will be Greenfield activities involving grid connected renewable electricity generation using solar PV technology
- 5) **Additionality:** The project activity instances to be added as part of the grouped project will meet additionality criteria as set out in respective methodologies - for Small Scale Project instances the methodology applicable will be AMS-ID and for Large Scale Project instances methodology applicable will be ACM0002. For small scale projects as per CDM terminology, Tool for demonstration of additionality for small scale project activities will be used

Further for inclusion of Large Scale project activity instances with solar photovoltaic technology in to the grouped project, following condition will be fulfilled at the time of inclusion of project activity instance into the grouped project for the project to be considered automatically additional as per positive list of technologies as per para 30 of ACM 0002 ver 16:

The percentage share of total installed capacity of the specific technology (solar PV) in the total installed grid connected power generation capacity in the host country is equal to or less than two per cent.

- 6) **Start Date:** The start date of each project activity instance under the grouped project should not be prior to the start date of the grouped project. The start date of each project activity instance will be determined through documentary evidence.
- 7) Conditions that avoid double counting of emission reductions like unique identifications of project and claiming emission reduction only under one GHG program.
- 8) The Grouped Project specific requirements stipulated by the Entity responsible for coordinating and managing grouped project for conducting local stakeholder consultations and environmental impact assessment (EIA), as applicable.
- 9) The project activity using solar PV project will supply electricity to grid.

The following table demonstrates how the five project activity instances being included in the grouped project activity fulfil above mentioned applicability conditions:

S.no.	Eligibility Criteria	Project Activity instances eligibility
1	Applicability Conditions: The project activity instances shall meet applicability conditions for applicable methodology as defined in section 2.2	Details of applicability conditions for initial project activity instances - Instance – 1: Bhadla, Instance – 2:

		Achampet, Instance – 3: Kalwakurthy, Instance – 4: Salakpur and Instance – 5: Alladurg according to respective methodologies are provided in subsequent sections of this document. All initial project activity instances meet respective applicability conditions of methodology, hence this eligibility criteria is fulfilled.
2	Geographical Area: The project activity instances to be included in the grouped project activity will be activities involving grid connected renewable electricity generation using solar technology located within India	The initial project activity instances - Instance – 1: Bhadla, Instance – 2: Achampet, Instance – 3: Kalwakurthy, Instance – 4: Salakpur and Instance – 5: Alladurg being included in the grouped project are located within geographic boundaries of India. Hence this condition is fulfilled.
3	Baseline scenario: All Project Activity Instances shall meet the baseline definition as defined in respective methodology and as explained in section 2.4	The initial project activity instances - Instance – 1: Bhadla, Instance – 2: Achampet, Instance – 3: Kalwakurthy, Instance – 4: Salakpur and Instance – 5: Alladurg have same baseline as per methodology as detailed in subsequent sections, hence this eligibility criteria is fulfilled
4	Technology type: The project activity instances to be included in the grouped project activity will be Greenfield activities involving grid connected renewable electricity generation using solar PV technology	The initial project activity instances - Instance – 1: Bhadla, Instance – 2: Achampet, Instance – 3: Kalwakurthy, Instance – 4: Salakpur and Instance – 5: Alladurg being included in the grouped project activity are solar PV power plants supplying electricity to grid. Hence this condition is fulfilled.

5	Additionality: The project activity instances to be added as part of the grouped project will meet additionality criteria as set out in respective methodologies - for Small Scale Project instances the methodology applicable will be AMS-ID and for Large Scale Project instances methodology applicable will be ACM0002. For small scale projects as per CDM terminology, Tool for demonstration of additionality for small scale project activities will be used Further for inclusion of Large Scale project activity instances with solar photovoltaic technology in to the grouped project, following condition will be fulfilled at the time of inclusion of project activity instance into the grouped project for the project to be considered automatically additional as per positive list of technologies as per para 30 of ACM 0002 ver 16: The percentage share of total installed capacity of the specific technology (solar PV) in the total installed grid connected power generation capacity in the host country is equal to or less than two per cent.	The additionality for the initial project activity instances - Instance – 1: Bhadla, Instance – 2: Achampet, Instance – 3: Kalwakurthy, Instance – 4: Salakpur and Instance – 5: Alladurg to be included in the grouped project has been demonstrated in subsequent sections of report. As per CDM Tool for demonstration of additionality for small scale project activities, solar PV projects with capacity upto 15 MW fall in positive list of technologies termed as automatically additional. Hence four project instances Instance – 2: Achampet, Instance – 3: Kalwakurthy, Instance – 4: Salakpur and Instance – 5: Alladurg are automatically additional Accordingly, applicability of additionality is explained in subsequent section of this document. Currently, during registration of grouped project activity, Instance -1 – Bhadla is the large scale project activity instance being included in the grouped project activity. Accordingly, the percentage share of total installed capacity of solar PV technology in India is 1.44% which is less than two percent, hence this project activity instance is also automatically additional. This is further explained in detail in section 2.5 of this document. Accordingly, this condition is fulfilled.
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6	Start Date: The start date of each project activity instance under the grouped project should not be prior to the start date of the grouped project. The start date of each project activity instance will be determined through documentary evidence.	The start date of The initial project activity instances - Instance – 1: Bhadla, Instance – 2: Achampet, Instance – 3: Kalwakurthy, Instance – 4: Salakpur and Instance – 5: Alladurg have been considered as mentioned in the commissioning certificate. The start date of grouped project is considered as 12 March 2014 which is commissioning date of project activity instance at Bhadla and start date of all other project activity instances is after this date. Hence this condition is fulfilled.
7	Conditions that avoid double counting of emission reductions like unique identifications of project and claiming emission reduction only under one GHG program	The initial project activity instances - Instance – 1: Bhadla, Instance – 2: Achampet, Instance – 3: Kalwakurthy, Instance – 4: Salakpur and Instance – 5: Alladurg are identified by latitude and longitude and location of the plant. Declaration has been provided and these project activity instances are not participating in any other GHG program. Hence this condition is fulfilled.
8	The Grouped Project specific requirements stipulated by the Entity responsible for coordinating and managing grouped project for conducting local stakeholder consultations and environmental impact assessment (EIA), as applicable.	Local stakeholder consultation has been conducted at the project site for initial project activity instances - Instance – 1: Bhadla, Instance – 2: Achampet, Instance – 3: Kalwakurthy, Instance – 4: Salakpur and Instance – 5: Alladurg. Details are mentioned in subsequent section of this document. There is no requirement for carrying out EIA for these projects in India,

		hence this condition is fulfilled.
9	The project activity using solar PV project will supply electricity to grid	The initial project activity instances - Instance – 1: Bhadla, Instance – 2: Achampet, Instance – 3: Kalwakurthy, Instance – 4: Salakpur and Instance – 5: Alladurg being included in the grouped project activity are solar PV power plants supplying electricity to grid. Hence this condition is fulfilled.

Leakage Management

Since the project activity instances to be included into the grouped project activity are renewable energy projects based on solar PV technology, no leakage emissions are considered - in line with paragraph 42 of the small scale methodology AMS.I.D (version 18.0) and paragraph 60 of the large scale methodology ACM0002 (version 16.0).

Commercially Sensitive Information

Not applicable. There is no commercially sensitive information.

Further Information

The grouped project activity as a whole would contribute towards sustainable development of the host country India. The key sustainable development benefits because of the grouped project are outlined as follows:

Social Well-being: Installation of the project would generate direct and indirect employment opportunities in the nearby areas of the project sites. Generation of employment opportunities will help in poverty alleviation, improvement in standard of living etc. of nearby communities hence contributing towards social well-being of local communities.

Environmental Well-being: Each of the individual plants under the project activity will be generate renewable electricity through solar PV based power generation system. Use of solar PV technology for electricity generation does not emit any GHG emissions. In the absence of project activity the equivalent amount of electricity would be generated through grid connected fossil fuel fired power plants, thereby leading to increase in GHG and other SOx, NOx emissions. As such it is implied that the proposed grouped project would not generate any negative environmental footprint hence leading to environmental well-being.

Economic well-being: Installation and operation of project activity instances as part of the grouped project would generate employment and business opportunities hence contributing towards economic well-being of the local communities.

Technological well-being: Power generation through solar PV technology is environmentally safe and sound technology. Also there are no harmful emissions while operation of the plant. Hence this technology is amongst the cleanest sources of power generation among the other power generation technologies available in the country. Currently, percentage share of total installed capacity of the solar power generation in the total installed grid connected power generation capacity in India is 1.44%⁴. The project activity would help in diffusion of the cleaner technology in the country for power generation. This will lead to technological well-being in power generation sector in India.

⁴ Explained in detail in section 2.5 of this document.

2 APPLICATION OF METHODOLOGY

2.1 Title and Reference of Methodology

The project activity instances as part of the proposed grouped project activity will be either small scale project activity instances with power generation capacity less than 15 MW or large scale project activity instances with power generation capacity more than 15 MW as per CDM terminology. Accordingly one of the following methodologies will be used for each of the project activity instance based on its capacity:

For Small Scale Project Activity Instances (including instance – 2 to instance – 5):

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

Methodology: AMS.I.D
Project Type: Type-I: Renewable Energy Projects
Title: Grid connected renewable electricity generation
Version No.: Version 18; EB 81
Reference: CDM Methodologies:
<http://cdm.unfccc.int/methodologies/DB/W3TINZ7KKWCK7L8WTXFQQOFQQH4SBK>

The methodology refers to following CDM Tools:

- Tool to calculate emission factor for an electricity system (Version 05.0)
<http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v5.0.pdf>)
- Tool to calculate project or leakage CO2 emissions from fossil fuel combustion (Version 02)
<http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-03-v2.pdf>)
- Tool to determine the remaining lifetime of equipment (Version 01)
<http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-10-v1.pdf>)
- Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period (Version 03.0.1)
<http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-11-v3.0.1.pdf>)

For Large Scale Project Activity Instances (including instance – 1):

The methodology for large scale project activity instances will be the approved methodology for large-scale CDM project activities. The details of the methodology are as follows:

Methodology: ACM002
Project Type: Type-I: Renewable Energy Projects
Title: Grid-connected electricity generation from renewable sources
Version No.: Version 16; EB 81

Reference: CDM Methodology:
<http://cdm.unfccc.int/methodologies/DB/EY2CL7RTEHRC9V6YQHLAR6MJ6VEU83>

The methodology refers to following CDM Tools:

- Tool for the demonstration and assessment of additionality (Version 07.0.0)
(<http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v7.0.0.pdf>)
- Combined tool to identify the baseline scenario and demonstrate additionality (Version 06.0)
(<http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-02-v6.0.pdf>)
- Tool to calculate project or leakage CO2 emissions from fossil fuel combustion (Version 02)
(<http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-03-v2.pdf>)
- Tool to calculate emission factor for an electricity system (Version 05.0)
(<http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v5.0.pdf>)
- Tool to determine the remaining lifetime of equipment (Version 01)
(<http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-10-v1.pdf>)
- Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period (Version 03.0.1)
(<http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-11-v3.0.1.pdf>)

2.2 Applicability of Methodology

The proposed grouped project consists of small scale as well as large scale project activity instances. The applicability of methodology is chosen as per conditions described in previous sections of this document. The demonstration and justification of how the project activity(s) meets each of the applicability conditions of the chosen methodology, and tools will be described as follows:

For project activity instance -1 and for Large Scale Project Activity Instances to be included in the grouped project in future – Applicability Conditions of ACM0002 (Version 16; EB 81) are explained as follows:

Methodology Criteria	Applicability
This methodology is applicable to grid-connected renewable energy power generation project activities that a) install a Greenfield power plant; b) involve a capacity addition to (an) existing plant(s); c) involve a retrofit of (an) existing plant(s)/unit(s); d) Involve a rehabilitation of (an) existing plant(s)/unit(s); or e) Involve a replacement of (an) existing plant(s)/unit(s).	The proposed grouped project activity including instance -1 – Bhadla involves installation of greenfield grid connected solar power plant. Hence the applicability condition is fulfilled.
The methodology is applicable under the following conditions:	a) The grouped project activity including instance-1 is a renewable energy power

a) The project activity may include renewable energy power plant/unit of one of the following types: hydro power plant/unit with or without reservoir, wind power plant/unit, geothermal power plant/unit, solar power plant/unit, wave power plant/unit or tidal power plant/unit; b) In the case of capacity additions, retrofits, rehabilitations or replacements (except for wind, solar, wave or tidal power capacity addition projects the existing plant/unit started commercial operation prior to the start of a minimum historical reference period of five years, used for the calculation of baseline emissions and defined in the baseline emission section, and no capacity expansion, retrofit, or rehabilitation of the plant/unit has been undertaken between the start of this minimum historical reference period and the implementation of the project activity.	plants based on solar PV technology. Hence this condition is fulfilled. b) The grouped project activity including instance -1 – Bhadla does not involve capacity additions, retrofits, rehabilitations or replacements, hence this condition is not applicable.
In case of hydro power plants, one of the following conditions shall apply: a) The project activity is implemented in existing single or multiple reservoirs, with no change in the volume of any of the reservoirs; or b) The project activity is implemented in existing single or multiple reservoirs, where the volume of the reservoir(s) is increased and the power density calculated using equation (3), is greater than 4 W/m²; or c) The project activity results in new single or multiple reservoirs and the power density, calculated using equation (3), is greater than 4 W/m²; or (d) The project activity is an integrated hydro power project involving multiple reservoirs, where the power density for any of the reservoirs, calculated using equation (3), is lower than or equal to 4 W/m², all of the following conditions shall apply: (i) The power density calculated using the total installed capacity of the integrated project, as per equation (4), is greater than 4 W/m²; (ii) Water flow between reservoirs is not used by any other hydropower unit which is not a part of the project activity; (iii) Installed capacity of the power plant(s) with power density lower than or equal to 4 W/m² shall be: a. Lower	Not applicable The proposed grouped project activity including instance -1 – Bhadla does not include any hydro power project. Hence, this clause is not applicable.

than or equal to 15 MW; and b. Less than 10 per cent of the total installed capacity of integrated hydro power project.	
In the case of integrated hydro power projects, project proponent shall: 1. Demonstrate that water flow from upstream power plants/units spill directly to the downstream reservoir and that collectively constitute to the generation capacity of the integrated hydro power project; or 2. Provide an analysis of the water balance covering the water fed to power units, with all possible combinations of reservoirs and without the construction of reservoirs. The purpose of water balance is to demonstrate the requirement of specific combination of reservoirs constructed under CDM project activity for the optimization of power output. This demonstration has to be carried out in the specific scenario of water availability in different seasons to optimize the water flow at the inlet of power units. Therefore this water balance will take into account seasonal flows from river, tributaries (if any), and rainfall for minimum five years prior to implementation of CDM project activity.	Not applicable The proposed grouped project activity including instance -1 – Bhadla does not include any hydro power project. Hence, this clause is not applicable.
The methodology is not applicable to the following: a) Project activities that involve switching from fossil fuels to renewable energy sources at the site of the project activity, since in this case the baseline may be the continued use of fossil fuels at the site; b) Biomass fired power plants/units.	Not applicable The grouped project activity including instance -1 – Bhadla includes green field solar PV power plants and do not involve switching from fossil fuels to renewable energy sources at the sites of the projects. Biomass fired power plants/units are also not involved in the project.
In the case of retrofits, rehabilitations, replacements, or capacity additions, this methodology is only applicable if the most plausible baseline scenario, as a result of the identification of baseline scenario, is “the continuation of the current situation, that is to use the power generation equipment that was already in use prior to the implementation of the project activity and undertaking business as usual maintenance”.	Not applicable No capacity additions, retrofits, rehabilitations and replacements are involved in the grouped project activity including instance -1 – Bhadla as part of the proposed grouped project.

The applicability conditions of tools included in the tools as referred in the methodology ACM0002 (Version 16) are explained as follows:

- Tool to calculate the emission factor of an electricity system (Version 05.0):** The project activity instance -1 and other large scale project activity instances to be included in the proposed grouped project activity replace fossil fuel dominated grid electricity by renewable electricity. Accordingly, this tool has been used to determine the grid emission factor which is used to estimate the amount of baseline emissions. The Central Electricity Authority compiled CO₂ baseline database for the Indian Power Sector. CO₂ baseline database Version 10.0⁵ has been used as reference for the emission factor. This CO₂ database has been compiled in conjunction with the “Tool to calculate the emission factor for an electricity system”.
- Tool for the demonstration and assessment of additionality (version 07.0.0):** The additionality of the large scale project activity instances is being demonstrated in accordance with paragraph 29 of the methodology ACM0002 (Version 16) – Simplified Procedure to Demonstrate Additionality. Hence application of “Tool for the demonstration and assessment of additionality” (version 07.0.0) is not required.
- Combined tool to identify the baseline scenario and demonstrate additionality (version 05.0.0):** The large scale project activity instances to be included in the proposed grouped project will be greenfield power plants. The baseline scenario of the project activity is as defined in paragraph 23 of the methodology ACM0002 (version 16). **Hence application of “Combined tool to identify the baseline scenario and demonstrate additionality” is not required for the proposed project activity.**
- Tool to calculate project or leakage CO₂ emissions from fossil fuel combustion (version 02):** In accordance with applicable approved methodology ACM0002 (version 16), the project activity instances to be included in the proposed grouped project activity does not involve the project emissions. Further the net metering approach will be used to calculate amount of electricity generated from the power plant, thus **the said tool has not been used for the project activity under consideration.**
- Tool to determine the remaining lifetime of equipment (Version 01):** The tool provides guidance to determine the remaining lifetime of baseline or project equipment. However, the project activity instances to be included in the proposed grouped project activity will be greenfield projects and there will be no baseline or project equipment. **Hence application of the said tool is not required for the grouped project activity under consideration.**
- Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period (Version 03.0.1):** This tool provides a stepwise procedure to assess the continued validity of the baseline and to update the baseline at **the renewal of a crediting period.** However, the proposed grouped project activity is requesting registration, hence **the said tool is not applicable.**

⁵ CEA CO₂ baseline database Version 10.0 published in December 2014 is available at http://cea.nic.in/reports/others/thermal/tpece/cdm_co2/database_10.zip and the user guide is available at http://cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver10.pdf

For project activity instance – 2, instance – 3, instance – 4 and instance – 5 (and small scale project activity instances to be included in the grouped project in future) – the applicability conditions of AMS.I.D (Version 18) are explained as follows:

Methodology Criteria	Applicability
This methodology comprises Renewable energy generation units, such as photovoltaic, hydro, tidal/wave, wind, geothermal and renewable biomass: a) Supplying electricity to a national or a regional grid; or b) Supplying electricity to an identified consumer facility via national/regional grid through a contractual arrangement such as wheeling	The grouped project activity including project activity instances - Instance – 2: Achampet, Instance – 3: Kalwakurthy, Instance – 4: Salakpur and Instance – 5: Alladurg to be included in the proposed grouped project activity are renewable electricity generation units based on solar photovoltaic technology and each of the said project activity instances will supply electricity to the national grid. Hence this applicability condition is fulfilled.
Illustration of respective situations under which each of the methodology (i.e. “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 the appendix	Table 1 of appendix of AMS-I.D, (Version 18.0) further substantiates that the project which generates and supplies electricity to a national grid falls under AMS-I.D. The grouped project activity including project activity instances - Instance – 2: Achampet, Instance – 3: Kalwakurthy, Instance – 4: Salakpur and Instance – 5: Alladurg supply electricity to grid, hence this condition is applicable
This methodology is applicable to project activities that: a) Install a Greenfield plant; b) Involve a capacity addition in (an) existing plant(s); c) Involve a retrofit of (an) existing plant(s); d) Involve a rehabilitation of (an) existing plant(s)/unit(s); or e) Involve a replacement of (an) existing plant(s).	The grouped project activity including instances - Instance – 2: Achampet, Instance – 3: Kalwakurthy, Instance – 4: Salakpur and Instance – 5: Alladurg to be included in the proposed grouped project activity are the installation of a new solar photovoltaic (PV) power plant at the project site where there was no renewable energy power plant operating prior to the implementation of respective project activity instance. Thus the project activity instances to be included into the grouped project activity under consideration will be Greenfield plants. Hence the applicability condition is fulfilled.
Hydro power plants with reservoirs that satisfy at least one of the following conditions are eligible to apply this methodology:	Not applicable. The grouped project activity including instances - Instance – 2: Achampet,

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 the project emissions section, is greater than 4 W/m²; c) The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the project emissions section, is greater than 4 W/m².	Instance – 3: Kalwakurthy, Instance – 4: Salakpur and Instance – 5: Alladurg to be included in the grouped project activity under consideration are not be hydro power projects. Hence, this clause is not applicable.
If the new unit has both renewable and non-renewable components (e.g. a wind/diesel unit), the eligibility limit of 15 MW for a small-scale CDM project activity applies only to the renewable component. If the new unit co-fires fossil fuel, the capacity of the entire unit shall not exceed the limit of 15 MW.	There will be no non-renewable components in the The grouped project activity including instances - Instance – 2: Achampet, Instance – 3: Kalwakurthy, Instance – 4: Salakpur and Instance – 5: Alladurg to be included in the grouped project under consideration. However, the said project activity instances will not exceed eligibility limit of 15 MW for small scale project activity as per CDM terminology. There is no co-firing of fossil fuel.
Combined heat and power (co-generation) systems are not eligible under this category.	The grouped project activity including instances - Instance – 2: Achampet, Instance – 3: Kalwakurthy, Instance – 4: Salakpur and Instance – 5: Alladurg to be included in the grouped project activity under consideration does not involve combined heat and power (co-generation) systems. Hence this condition is fulfilled.
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.	Not applicable The grouped project activity including instances - Instance – 2: Achampet, Instance – 3: Kalwakurthy, Instance – 4: Salakpur and Instance – 5: Alladurg to be included in the grouped project activity under consideration are greenfield power plants. Hence this condition is not applicable.
In the case of retrofit, rehabilitation or replacement, to qualify as a small-scale project,	Not applicable The grouped project activity including

the total output of the retrofitted, rehabilitated or replacement power plant/unit shall not exceed the limit of 15 MW.	instances Instance – 2: Achampet, Instance – 3: Kalwakurthy, Instance – 4: Salakpur and Instance – 5: Alladurg to be included in the grouped project activity under consideration will be greenfield power plants that does not involve any retrofit, replacement or capacity addition. Hence this clause is not applicable.
In the case of landfill gas, waste gas, wastewater treatment and agro-industries projects, recovered methane emissions are eligible under a relevant Type III category. If the recovered methane is used for electricity generation for supply to a grid then the baseline for the electricity component shall be in accordance with procedure prescribed under this methodology. If the recovered methane is used for heat generation or cogeneration other applicable Type-I methodologies such as “AMS-I.C.: Thermal energy production with or without electricity” shall be explored.	Not applicable The grouped project activity including instances - Instance – 2: Achampet, Instance – 3: Kalwakurthy, Instance – 4: Salakpur and Instance – 5: Alladurg to be included in the grouped project activity under consideration are greenfield power plants based on solar PV technology and will not involve landfill gas, waste gas, wastewater treatment and agro-industries projects. Hence this clause is not applicable.
In case biomass is sourced from dedicated plantations, the applicability criteria in the tool “Project emissions from cultivation of biomass” shall apply.	Not applicable The grouped project activity including instances - Instance – 2: Achampet, Instance – 3: Kalwakurthy, Instance – 4: Salakpur and Instance – 5: Alladurg to be included in the grouped project activity under consideration are greenfield power plants based on solar PV technology and will not involve use of biomass. Hence this clause is not applicable.

Applicability conditions of tools referred in the methodology AMS.I.D (version 18) are explained as follows:

- Tool to calculate project or leakage CO₂ emissions from fossil fuel combustion (version 02):** In accordance with applicable approved methodology AMS.I.D (version 18), the individual small scale project activity instances to be included in the grouped project activity under consideration does not involve the project emissions. Also, net metering approach will be used for calculating amount of electricity generated from the plant. Hence application of the said tool is not relevant to the grouped project activity under consideration.
- Tool to calculate the emission factor of an electricity system (Version 05.0):** The individual small scale project activity instances to be included in the grouped project activity under consideration replace fossil fuel dominated grid electricity by renewable electricity. Accordingly, this tool has been used to determine the grid emission factor which is used to

estimate the amount of baseline emissions. The Central Electricity Authority compiled CO₂ baseline database for the Indian Power Sector. CO₂ baseline database Version 10.0⁶ has been used as reference for the emission factor. This CO₂ database has been compiled in conjunction with the “Tool to calculate the emission factor for an electricity system”.

- **Tool to determine the remaining lifetime of equipment (Version 01):** The tool provides guidance to determine the remaining lifetime of baseline or project equipment. However, individual small scale project activity instances to be included in the grouped project activity under consideration are greenfield projects and there will be no baseline or project equipment. Hence application of the said tool is not relevant to the grouped project activity under consideration.
- **Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period (Version 03.0.1):** This tool provides a stepwise procedure to assess the continued validity of the baseline and to update the baseline at **the renewal of a crediting period**. However, the proposed grouped project activity is requesting registration, hence the said tool is not applicable.

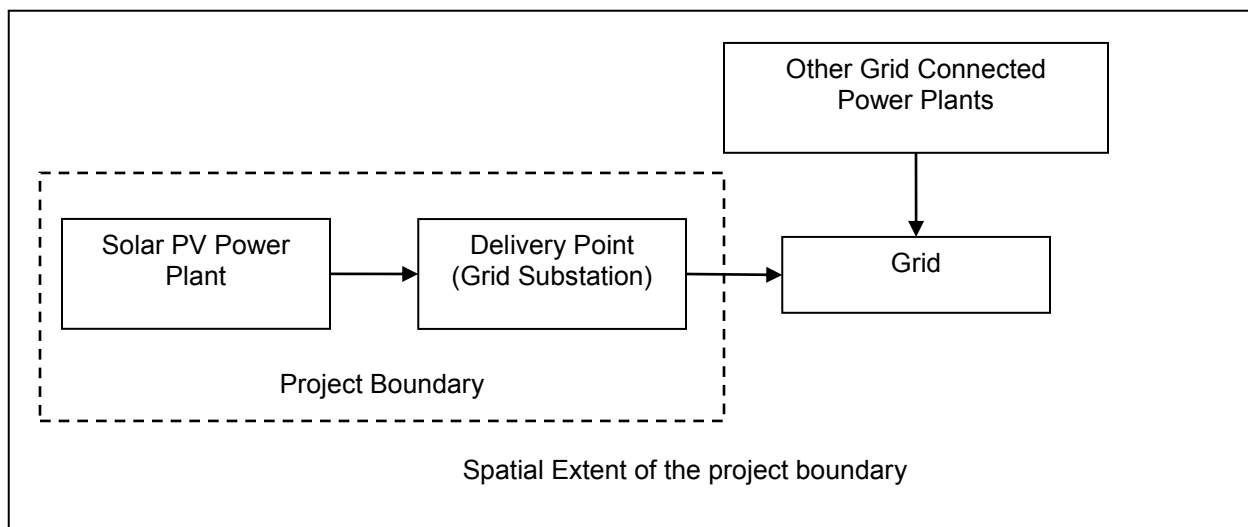
2.3 Project Boundary

Referring to the paragraph 18 of the methodology AMS.I.D (Version 18) and paragraph 21 of the methodology ACM002 (Version 16), the project boundary includes the project power plant and all power plants connected physically to the electricity system that the project activity power plant is connected to. Thus, the project boundary for each of the project activity instance as part of the proposed grouped project activity will consist of PV installation, connected substations, metering equipment and the grid.

Accordingly, the project boundary for five project activity instances - Instance – 1: Bhadla, Instance – 2: Achampet, Instance – 3: Kalwakurthy, Instance – 4: Salakpur and Instance – 5: Alladurg being included in the grouped project activity will respective PV installation, connected substation, metering equipment and grid including all power plants connected physically to the electricity system.

The project boundary and the spatial extent of the project boundary for each of the project instances as part of the proposed grouped project activity is diagrammatically represented as follows:

⁶ CEA CO₂ baseline database Version 10.0 published in December 2014 is available at http://cea.nic.in/reports/others/thermal/tpece/cdm_co2/database_10.zip and the user guide is available at [s](#)



According to the methodology AMS ID (version 16.0) and ACM0002 (version 18.0) the following gases are to be considered for the boundary:

Source		Gas	Included?	Justification/Explanation
Baseline	Fossil fuel fired power plants connected to integrated Grid of Indian Electricity System	CO ₂	Yes	Main Emission Source
		CH ₄	No	Excluded for simplification. This is conservative
		N ₂ O	No	Excluded for simplification. This is conservative
Project	Not Applicable	CO ₂	No	All the project activity instances would be renewable energy power generation through solar PV technology. Hence according to paragraph 39 of methodology AMS.I.D (Version 18) and paragraph 35 of methodology ACM002 (Version 16), the project emissions will be zero.
		CH ₄	No	
		N ₂ O	No	

2.4 Baseline Scenario

The grouped project activity will include small scale (**i.e. project activity instances with capacity less than 15 MW**) as well as large scale (**i.e. project activity instances with capacity more than 15 MW**) project activity instances as per CDM terminology. Accordingly the baseline scenario is defined as follows:

- **For small scale project activity instances** as per CDM terminology (**i.e. project activity instances with capacity less than 15 MW**):

The baseline for small scale project activity instances to be included in the grouped project under consideration is determined in accordance with the methodology AMS I.D (version 18) of Appendix B to the Simplified modalities and procedures for small scale CDM project

activities. The paragraph 19 of AMS.I.D (version 18) defines baseline scenario for greenfield power plants as – *“The baseline scenario is that the electricity delivered to the grid by the project activity would have **otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources into the grid**”.*

- **For large scale project activity instances as per CDM terminology (i.e. project activity instances with capacity more than 15 MW):**

The baseline for large scale project activity instances to be included in the grouped project under consideration is determined in accordance with approved CDM methodology ACM0002 (version 16). The paragraph 23 of ACM0002 (version 16) defines baseline scenario as – *“If the project activity is the installation of a Greenfield power plant, the baseline scenario is electricity delivered to the grid by the project activity would have **otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources**, as reflected in the combined margin (CM) calculations described in the “Tool to calculate the emission factor for an electricity system”.*

Accordingly, the baseline scenario for initial five project activity instances being included in the grouped project activity are as follows:

- **For project activity instance – 1- Bhadla:**

The baseline for project activity instance – 1 is determined in accordance with approved CDM methodology ACM0002 (version 16). The paragraph 23 of ACM0002 (version 16) defines baseline scenario as – *“If the project activity is the installation of a Greenfield power plant, the baseline scenario is electricity delivered to the grid by the project activity would have **otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources**, as reflected in the combined margin (CM) calculations described in the “Tool to calculate the emission factor for an electricity system”.*

- **For project activity instances – Instance – 2: Achampet, Instance – 3: Kalwakurthy, Instance – 4: Salakpur and Instance – 5: Alladurg:**

The baseline for small scale project activity Instance – 2: Achampet, Instance – 3: Kalwakurthy, Instance – 4: Salakpur and Instance – 5: Alladurg is determined in accordance with the methodology AMS I.D (version 18) of Appendix B to the Simplified modalities and procedures for small scale CDM project activities. The paragraph 19 of AMS.I.D (version 18) defines baseline scenario for greenfield power plants as – *“The baseline scenario is that the electricity delivered to the grid by the project activity would have **otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources into the grid**”.*

As mentioned above, for Greenfield projects, same baseline is prescribed by CDM methodologies AMS-I.D ver 18 and ACM 0002 ver 16. As all the initial project activity instances in grouped project are Greenfield projects, same baseline is defined for entire geographical area i.e. India. This meets requirements of grouped projects for baseline as per VCS standard ver 3.5.

2.5 Additionally

As described in earlier sections of this document, the grouped project activity under consideration will consist of small scale project activity instances as well as large scale project activity instances. Accordingly the additionality for respective types of project activity instances is demonstrated as follows:

For small scale project activity instances (i.e. project activity instances with capacity less than 15 MW as per CDM terminology): Additionality for the small scale project activity instances to be included in the proposed grouped project activity is defined as follows:

Methodological tool – Demonstration of additionality for small scale project activities⁷ (paragraph 10) refers to demonstrate that the project activity would not have occurred anyway due to at least one of the following barriers:

- a) **Investment barrier:** a financially more viable alternative to the project activity would have led to higher emissions;
- b) **Technological barrier:** a less technologically advanced alternative to the project activity involves lower risks due to the performance uncertainty or low market share of the new technology adopted for the project activity and so would have led to higher emissions
- c) **Barrier due to prevailing practice:** prevailing practice or existing regulatory or policy requirements would have led to implementation of a technology with higher emissions;
- d) **Other barriers:** Without the project activity, for another specific reason identified by the project participant, such as institutional barriers or limited information, managerial resources, organizational capacity, financial resources, or capacity to absorb new technologies, emissions would have been higher.

Further, paragraph 11 of the said methodological tool refers that, documentation of barriers is not required for the positive list of technologies and project activity types that are defined as automatically additional for project sizes up to and including the small-scale CDM thresholds (e.g. installed capacity up to 15 MW). The positive list comprises of:

- a) Solar technologies (photovoltaic and solar thermal electricity generation);
- b) Off-shore wind technologies;
- c) Marine technologies (wave, tidal).
- d) Building-integrated wind turbines or household rooftop wind turbines of a size up to 100 kW;

The small scale project activity instances to be included in the proposed grouped project activity are grid connected solar photovoltaic electricity generation projects having capacity less than 15 MW and hence, will fall under the positive list of technologies as mentioned above. This

⁷ Available at <https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-21-v1.pdf>

demonstrates the additionality for small scale project activity instances to be included in the proposed grouped project activity is demonstrated.

Initially, there are four Solar PV project instances with capacity less than 15MW are included under the grouped project. The four project activities with capacity less than 15MW are 5 MW Solar Project at Achampet in Telangana, 10 MW Solar Project at Kalwakurthy in Telangana, 10MW Solar Project at Mustyal in Telangana, 10MW Solar Project at Pedda in Telangana. Thus, these will fall under the positive list of technologies that are automatically additional as mentioned above.

For large scale project activity instances (i.e. project activity instances with capacity more than 15 MW as per CDM terminology): Additionality for the large scale project activity instances (capacity more than 15 MW) to be included in the grouped project activity under consideration is defined as follows:

For demonstration of additionality of large scale project activity instances, Simplified procedure to demonstrate additionality is used in line with paragraph 29 of methodology ACM0002 (version 16.0). Section “**5.3.1. Simplified procedure to demonstrate additionality**” of ACM0002 (version 16.) states following:

The simplified procedure to demonstrate additionality is applicable to the following grid connected electricity generation technologies (positive list):

- (a) *Solar photovoltaic technologies;*
- (b) *Solar thermal electricity generation including concentrating Solar Power (CSP);*
- (c) *Off-shore wind technologies;*
- (d) *Marine wave technologies;*
- (e) *Marine tidal technologies.*

The large scale project activity instances to be included into the grouped project activity will use Solar Photovoltaic Technology for power generation. Hence in line with requirements specified above, the Simplified procedure to demonstrate additionality can be used for demonstrating additionality of the project activity instances.

Further, paragraph 30 of the methodology ACM0002 (version 16.0) states as follows:

A specific technology in the positive list is defined as automatically additional if at the time of PDD submission any of the following conditions is met:

- (a) *The percentage share of total installed capacity of the specific technology in the total installed grid connected power generation capacity in the host country is equal to or less than two per cent; or*
- (b) *The total installed capacity of the technology in the host country is less than or equal to 50 MW.*

All India Installed Capacity of Power Stations report⁸ published by CEA provides details of installed capacity in India according to technology of power generation. According to this report, percentage share of total installed capacity of the solar power generation in the total installed grid connected power generation capacity in India is 1.44% which is well below two percent. It may also be noted that the solar power generation capacity as defined in the said report includes Solar PV Technology along with Solar Thermal Power Generation technology. Hence the percentage share of total installed capacity of Solar Photovoltaic technology is less than 1.44%. The details of installed capacities of various technologies is provided in tables below.

The technology wise breakup of total installed power generation capacity in India as provided in the CEA's said report is as follows:

Technology	Thermal	Nuclear	Hydro	Renewable Energy Sources	Total
All India Installed Capacity (MW)	195,604.44	5,780.00	42,473.42	36,470.64	280,328.50

The report provides breakup of Renewable Energy Sources' installed capacity is as follows:

Technology	Wind Power	Bio Power – BM Power / Cogeneration	Bio Power – Waste to energy	Solar Power	Total
All India Installed Capacity (MW)	23,762.81	4,418.55	127.08	4,060.65	36,470.64

This demonstrates that the total installed capacity of solar power technology is 4,060.65 MW out of total installed capacity in India of 280,328.50 MW. As per the data from the CEA, it can be concluded that percentage share of total installed capacity of the solar power generation in the total installed grid connected power generation capacity in India is 1.44%.

Hence in accordance with paragraph 29 and 30 of methodology ACM0002 (version 16.0) the **additionality has been demonstrated for large scale project activity instance – 1 at Bhadla. Thus project activity instance at Bhadla fall under positive list of technologies that are automatically additional as per methodology. The project activity instances** to be included in the grouped project activity in future, will follow the additionality..

Steps for the demonstration of additionality are the same for all of the project activity instances (including the initial project activity instances and new instances will be added to the grouped project) for the geographical area and new project instances will follow this additionality criteria.. All of the project activity instances (including the initial project activity instances and new instances will be added to the grouped project) are additional. Therefore, the rationale for the demonstration of additionality are the same for all of the project activity instances, including the

⁸ Report available at: http://www.cea.nic.in/reports/monthly/installedcapacity/2015/installed_capacity-10.pdf

initial project activity instances and new instances will be added to the grouped project. For new project activity instances to be added in future, eligibility condition on additionality is included

2.6 Methodology Deviations

Not applicable.

3 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

3.1 Baseline Emissions

Baseline emissions include only CO₂ emissions from electricity generation in grid connected power plants that would have generated equivalent amount of electricity in the absence of the project activity. The baseline scenario assumes that all project electricity generation would have been generated by existing/new grid-connected power plants. The baseline emissions for the project activity instances to be included in the grouped project activity under consideration are estimated as follows:

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

Where:

BE_y = Baseline emissions in year y (t CO₂)

$EG_{PJ,y}$ = Quantity of net electricity generation that is generated and fed into the grid as a result of the implementation of the CDM 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 to calculate the emission factor for an electricity system” (t CO₂/MWh)

Determination of combined margin CO₂ emission factor for grid:

The combined margin emission factor is calculated using the methodological tool – Tool to calculate the emission factor for an electricity system (version 05.0).

The Central Electricity Authority, Ministry of Power, Government of India publishes CO₂ baseline database for Indian Power Sector. The latest database – version 10⁹ was published in December 2014. This latest version has been prepared in line with requirements as specified in CDM methodological tool – Tool to calculate the emission factor for an electricity system (version 05.0).

Simple operating margin emission factor as per the said database is as represented in the table below:

Simple Operating Margin (tCO ₂ /MWh) (excl. Imports) (1)					
	2009-10	2010-11	2011-12	2012-13	2013-14
NEWNE	0.99	0.98	0.98	1.00	1.00
South	0.94	0.93	0.95	0.99	1.02
India	0.98	0.97	0.97	1.00	1.01

⁹ Available at: http://www.cea.nic.in/reports/others/thermal/tpece/cdm_co2/database_10.zip

Build margin emission factor as per the said database is as represented in the table below:

Build Margin (tCO₂/MWh) (excl. Imports)					
	2009-10	2010-11	2011-12	2012-13	2013-14
NEWNE	0.82	0.87	0.93	0.98	0.95
South	0.80	0.83	0.87	0.95	0.96
India	0.82	0.86	0.92	0.97	0.95

Paragraph 80 of the tool to calculate emission factor for an electricity system (version 05.0) specifies calculation of weighted average combined margin emission factor as follows:

$$EF_{\text{grid,CM,y}} = EF_{\text{grid,OM,y}} * w_{\text{OM}} + EF_{\text{grid,BM,y}} * w_{\text{BM}}$$

Where:

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

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

w_{OM} = Weighting of operating margin emissions factor (per cent)

w_{BM} = Weighting of build margin emissions factor (per cent)

Paragraph 81 of the said tool provides default values to be used for w_{OM} and w_{BM} :

- Wind and solar power generation project activities: $w_{\text{OM}} = 0.75$ and $w_{\text{BM}} = 0.25$ (owing to their intermittent and non-dispatchable nature) for the first crediting period and for subsequent crediting periods;
- All other projects: $w_{\text{OM}} = 0.5$ and $w_{\text{BM}} = 0.5$ for the first crediting period, and $w_{\text{OM}} = 0.25$ and $w_{\text{BM}} = 0.75$ for the second and third crediting period, unless otherwise specified in the approved methodology which refers to this tool.

Since the grouped project activity under consideration involve project activity instances of solar power generation activities, hence $w_{\text{OM}} = 0.75$ and $w_{\text{BM}} = 0.25$ will be used for the first crediting period and for subsequent crediting periods for all the project activity instances to be included in the grouped project activity under consideration.

Accordingly, the emission factor for NEWNE grid is calculated as follows:

$$\begin{aligned} EF_{\text{grid,CM,y}} &= EF_{\text{grid,OM,y}} * w_{\text{OM}} + EF_{\text{grid,BM,y}} * w_{\text{BM}} \\ &= 0.9862 * 0.75 + 0.9495 * 0.25 \\ &= 0.9770 \text{ t CO}_2/\text{MWh} \end{aligned}$$

Accordingly, the emission factor for Southern grid is calculated as follows:

$$\begin{aligned} EF_{\text{grid,CM,y}} &= EF_{\text{grid,OM,y}} * w_{\text{OM}} + EF_{\text{grid,BM,y}} * w_{\text{BM}} \\ &= 0.9887 * 0.75 + 0.9609 * 0.25 \end{aligned}$$

= 0.9817 t CO₂/MWh

The emission factor for NEWNE grid is applicable for project activity instances connected to NEWNE grid and emission factor for Southern grid is applicable for project activity instances connected to southern grid. Accordingly, for the initial five project activity instances the emission factor is as follows:

- For project activity instance – 1 at Bhadla – the EF for NEWNE grid is considered
- For project activity instances - Instance – 2: Achampet, Instance – 3: Kalwakurthy, Instance – 4: Salakpur and Instance – 5: Alladurg – the EF for Southern grid is considered

PLF as per loan application submitted to Bank for initial five instances are as follows. This is as per CDM EB 48, Annex 11.

Name	PLF
VCS Project instance for Solar Power Plant at Bhadla, Rajasthan	17.1%
VCS Project instance for Solar Power Plant at Achampet, Telangana	16.68%
VCS Project instance for Solar Power Plant at Kalwakurthy, Dist. Mehabubnagar, Telangana	16.89%
VCS Project instance for Solar Power Plant at Salakpur, Telangana	16.56%
VCS Project instance for Solar Power Plant at Alladurg, Telangana	17.07%

The baseline emissions are as follows:

Project activity instances	Estimated Annual Average Baseline emissions over crediting period (tCO ₂ e)
Instance – 1: Bhadla	29,271
Instance – 2: Achampet	6,942
Instance – 3: Kalwakurthy	14,086
Instance – 4: Salakpur	13,504
Instance – 5: Alladurg	13,875
Total	77,678

3.2 Project Emissions

Since the project activity instances to be included into the grouped project activity are renewable energy projects based on solar PV technology, there will be no project emissions involved as per paragraph 39 of the small scale methodology AMS.I.D (version 18.0) and paragraph 35 of the large scale methodology ACM0002 (version 16.0). Hence,

$$PE_y = 0$$

3.3 Leakage

Since the project activity instances to be included into the grouped project activity are renewable energy projects based on solar PV technology, no leakage emissions are considered - in line with paragraph 42 of the small scale methodology AMS.I.D (version 18.0) and paragraph 60 of the large scale methodology ACM0002 (version 16.0).

3.4 Net GHG Emission Reductions and Removals

Based on paragraph 43 of methodology AMS.I.D (version 18.0) and paragraph 61 of methodology ACM0002 (version 16.0), net GHG emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y$$

ER_y = Emission reductions in year y (tCO₂e/yr)

BE_y = Baseline emissions in year y (tCO₂e/yr)

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

Ex-ante calculation (estimate) of net GHG emission reductions:

Ex-ante emission reduction calculations are calculated based on current five project activity instances to be included in the grouped project activity under consideration. Summary of ex-ante emission reduction calculations is as follows:

Years	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	57,794	0	0	57,794
Year 2	79,887	0	0	79,887
Year 3	79,887	0	0	79,887
Year 4	79,887	0	0	79,887
Year 5	79,887	0	0	79,887
Year 6	79,887	0	0	79,887
Year 7	79,887	0	0	79,887
Year 8	79,887	0	0	79,887

Year 9	79,887	0	0	79,887
Year 10	79,887	0	0	79,887
Total	776,777	0	0	776,777

The ex-ante emission reductions for individual project activity instances are as follows:

Instance – 1: Bhadla:

Years	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	29,271	0	0	29,271
Year 2	29,271	0	0	29,271
Year 3	29,271	0	0	29,271
Year 4	29,271	0	0	29,271
Year 5	29,271	0	0	29,271
Year 6	29,271	0	0	29,271
Year 7	29,271	0	0	29,271
Year 8	29,271	0	0	29,271
Year 9	29,271	0	0	29,271
Year 10	29,271	0	0	29,271
Total	292,710	0	0	292,710

Instance – 2: Achampet:

Years	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	4,872	0	0	4,872
Year 2	7,171	0	0	7,171
Year 3	7,171	0	0	7,171
Year 4	7,171	0	0	7,171
Year 5	7,171	0	0	7,171
Year 6	7,171	0	0	7,171
Year 7	7,171	0	0	7,171
Year 8	7,171	0	0	7,171
Year 9	7,171	0	0	7,171
Year 10	7,171	0	0	7,171
Total	69,411	0	0	69,411

Instance – 3: Kalwakurthy:

Years	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	10,146	0	0	10,147
Year 2	14,523	0	0	14,524
Year 3	14,523	0	0	14,524
Year 4	14,523	0	0	14,524
Year 5	14,523	0	0	14,524
Year 6	14,523	0	0	14,524
Year 7	14,523	0	0	14,524
Year 8	14,523	0	0	14,524
Year 9	14,523	0	0	14,524
Year 10	14,523	0	0	14,524
Total	140,853	0	0	140,863

Instance – 4: Salakpur:

Years	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	6,866	0	0	6,867
Year 2	14,239	0	0	14,241
Year 3	14,239	0	0	14,241
Year 4	14,239	0	0	14,241
Year 5	14,239	0	0	14,241
Year 6	14,239	0	0	14,241
Year 7	14,239	0	0	14,241
Year 8	14,239	0	0	14,241
Year 9	14,239	0	0	14,241
Year 10	14,239	0	0	14,241
Total	135,017	0	0	135,036

Instance – 5: Alladurg:

Years	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	6,635	0	0	6,636

Year 2	14,678	0	0	14,679
Year 3	14,678	0	0	14,679
Year 4	14,678	0	0	14,679
Year 5	14,678	0	0	14,679
Year 6	14,678	0	0	14,679
Year 7	14,678	0	0	14,679
Year 8	14,678	0	0	14,679
Year 9	14,678	0	0	14,679
Year 10	14,678	0	0	14,679
Total	138,737	0	0	138,747

4 MONITORING

4.1 Data and Parameters Available at Validation

Data / Parameter	The percentage share of total installed capacity of the specific technology
Data unit	%
Description	The percentage share of total installed capacity of the specific technology in the total installed grid connected power generation capacity in the host country.
Source of data	Data published by Central Electricity Authority, Ministry of Power, Government of India.
Value applied:	1.44%
Comments	-

Data / Parameter	W_{OM}
Data unit	Fraction
Description	Weight of operating margin emission factor for calculating the emission factor
Source of data	Tool to calculate the emission factor for an electricity system (version 05.0)
Value applied:	0.75
Justification of choice of data or description of measurement methods and procedures applied	This is in accordance with applicable methodology AMS.I.D (version 18.0) and ACM0002 (version 16.0)
Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	W_{BM}
Data unit	Fraction
Description	Weight of build margin emission factor for calculating the emission factor
Source of data	Tool to calculate the emission factor for an electricity system

	(version 05.0)
Value applied:	0.25
Justification of choice of data or description of measurement methods and procedures applied	This is in accordance with applicable methodology AMS.I.D (version 18.0) and ACM0002 (version 16.0)
Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	EF _{BM,y}
Data unit	tCO ₂ /MWh
Description	Build margin emission factor for respective Grid in year y
Source of data	CO ₂ baseline database for Indian Power Sector, Version 10.0. Released by Central Electricity Authority, Ministry of Power, Government of India
Value applied:	0.9495 for NEWNE grid and 0.9609 for Southern grid
Justification of choice of data or description of measurement methods and procedures applied	The “CO ₂ Baseline Database for the Indian Power Sector”, User Guide, Version 10.0 dated December 2014, released by the Central Electricity Authority, Ministry of Power, Government of India, is the official database for statistics on the power sector in India in the various grids. It has been specially created to meet the data requirements for emission factors for the CDM project activities in the country. The database is used in accordance with the requirements in the applicable methodology stated as, “Calculations must be based on data from an official source and made publicly available”
Purpose of Data	Calculation of baseline emissions
Comments	The build margin emission factor for respective projects are applied depending on which grid they operate in. Instance – 1 being included in the grouped project activity falls under NEWNE grid and instance – 2, instance -3, instance -4 and instance -5 fall under Southern grid.

Data / Parameter	EF _{OM,y}
Data unit	tCO ₂ /MWh
Description	Operating margin emission factor for respective Grid in year y
Source of data	CO ₂ baseline database for Indian Power Sector, Version 10.0. Released by Central Electricity Authority, Ministry of Power,

	Government of India
Value applied:	0.9862 for NEWNE grid and 0.9887 for Southern grid
Justification of choice of data or description of measurement methods and procedures applied	The "CO2 Baseline Database for the Indian Power Sector", User Guide, Version 10.0 dated December 2014, released by the Central Electricity Authority, Ministry of Power, Government of India, is the official database for statistics on the power sector in India in the various grids. It has been specially created to meet the data requirements for emission factors for the CDM project activities in the country. The database is used in accordance with the requirements in the applicable methodology stated as, "Calculations must be based on data from an official source and made publicly available"
Purpose of Data	Calculation of baseline emissions
Comments	The operating margin emission factor for respective projects are applied depending on which grid they operate in. Instance – 1 being included in the grouped project activity falls under NEWNE grid and instance – 2, instance -3, instance -4 and instance -5 fall under Southern grid.

Data / Parameter	$EF_{CO2,grid,y}$
Data unit	tCO ₂ /MWh
Description	Combined margin emission factor for National Grid in year y for the proposed grouped project activity
Source of data	The combined margin emission factor is calculated using following formula: $EF_{grid,CM,y} = EF_{grid,OM,y} * W_{OM} + EF_{grid,BM,y} * W_{BM}$
Value applied:	0.9770 for NEWNE grid and 0.9817 for southern grid
Justification of choice of data or description of measurement methods and procedures applied	This is in accordance with applicable methodologies – AMS.I.D (version 18.0) and ACM0002 (version 16.0) and Tool to calculate the emission factor for an electricity system (version 05.0).
Purpose of Data	Calculation of baseline emissions
Comments	The combined margin emission factor for respective projects are applied depending on which grid they operate in. Instance – 1 being included in the grouped project activity falls under NEWNE grid and instance – 2, instance -3, instance -4 and instance -5 fall under Southern grid.

4.2 Data and Parameters Monitored

Data / Parameter	EG _{PJ, facility, y}										
Data unit	MWh										
Description	Net electricity supplied to the grid by the project activity instance during the year y										
Source of data	The quantity of net electricity supplied by the project activity to the grid (i.e. Net export in kWh) will be taken from monthly “Joint Meter Reading” report which contains monthly energy meter reading										
Description of measurement methods and procedures to be applied	Net electricity supplied to grid will be calculated based on the measured values of “export” and “import” on the meter at the delivery point, where monthly joint meter reading is taken.										
Frequency of monitoring/recording	Continuous monitoring and monthly recording										
Value applied:	81,521 MWh/year The above value is for estimation purpose only. It includes five project activity instances to be included in the grouped project activity at present. There will be more project activity instances be added into the proposed grouped project activity. Actual values of net electricity supplied to grid will be monitored for each of the project activity instance separately. Following are values for five project activity instances: <table border="1"> <tr> <td>Project Activity Instance – 1</td><td>29,959 MWh/year</td></tr> <tr> <td>Project Activity Instance – 2</td><td>7,306 MWh/year</td></tr> <tr> <td>Project Activity Instance – 3</td><td>14,796 MWh/year</td></tr> <tr> <td>Project Activity Instance – 4</td><td>14,507 MWh/year</td></tr> <tr> <td>Project Activity Instance – 5</td><td>14,953 MWh/year</td></tr> </table>	Project Activity Instance – 1	29,959 MWh/year	Project Activity Instance – 2	7,306 MWh/year	Project Activity Instance – 3	14,796 MWh/year	Project Activity Instance – 4	14,507 MWh/year	Project Activity Instance – 5	14,953 MWh/year
Project Activity Instance – 1	29,959 MWh/year										
Project Activity Instance – 2	7,306 MWh/year										
Project Activity Instance – 3	14,796 MWh/year										
Project Activity Instance – 4	14,507 MWh/year										
Project Activity Instance – 5	14,953 MWh/year										
Monitoring equipment	Monitoring equipment will be energy meter installed at each of the project activity instance site. Readings will be cross checked with back up meter.										
QA/QC procedures to be applied	The measurement of the electricity generated will be jointly recorded by respective power distribution company and project participants. This value is treated as the accurate and final measurement of the energy supplied to Grid by the power producer.										

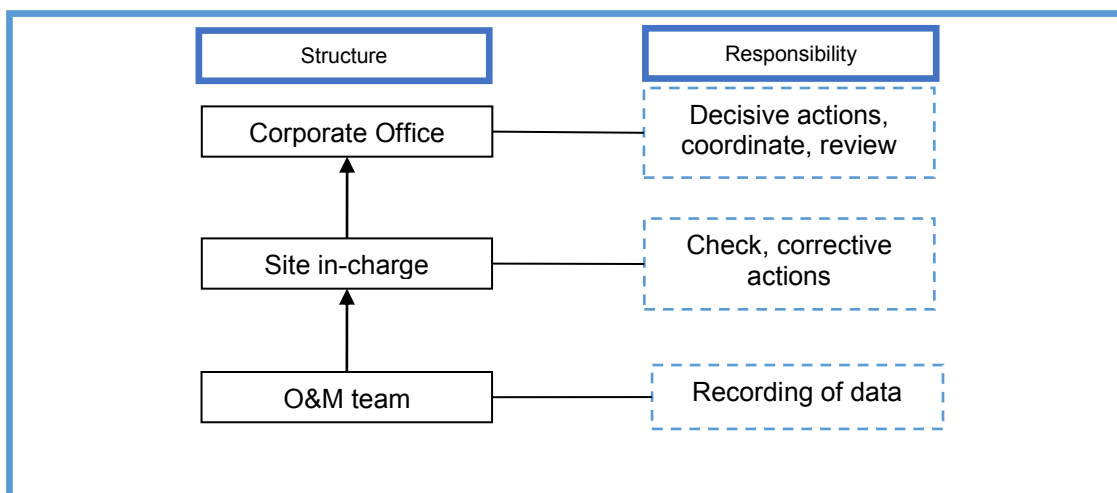
	The meters (main and check meters for exported electricity and imported electricity) are installed at the delivery point to grid. All main and check meters shall be calibrated as described in the Central Electricity Authority (Installation and Operation of Meters) Regulations, 2006 ¹⁰ . These regulations describe of calibration of meters to be done at least once in five years.
Purpose of data	Calculation of baseline emissions
Calculation method	-
Comments	The monitored data will be archived electronically by the project proponent for the period that covers crediting period + 2 years.

4.3 Monitoring Plan

The monitoring plan for the grouped project activity has been developed in accordance with procedures described in methodologies – AMS.I.D (version 18.0) and ACM0002 (version 16.0). Both these methodologies requires monitoring of the quantity of net electricity supplied from the project activity power plant to the grid. The monitoring plan is described as follows:

Roles and Responsibility:

Essel Mining and Industries Limited (EMIL) is the coordinating and managing entity for the grouped project activity. EMIL is also the coordinating and managing entity and the implementation entity for each of the project activity instance to be included in the grouped project activity. The management structure implemented for the purpose of monitoring of proposed project activity is explained as follows:



Corporate Office

Officers in corporate office of project proponent would be responsible for overall co-ordination towards the project activity instances development under VCS, including communication with VCS Consultants and Validation/Verification agencies etc. They would also ensure that the relevant monitoring and data up-keep is carried out for the project activity properly and regularly.

¹⁰ http://powermin.nic.in/whats_new/pdf/Metering_Regulations.pdf

Thus, corporate office of Project Proponent would be solely responsible for timely execution of all the related activities in VCS project development as well as operation of the proposed grouped project activity and would take decisive actions in this regard.

Site In-charge

Site In-charge for each of the project activity instance are the EMIL staff who would be responsible for trouble free day to day operation of Solar PV project in support with O&M Team at respective sites. The site in-charge would ensure that the monitoring plan is adhered and operations are carried out as per standard procedures. He/she will collect all the relevant monitored data from O&M Team, and submit them to the corporate office for perusal. For the VCS aspects, he/she would co-ordinate for the site visits under validation/verification process of the project activity.

O&M Team

The monitoring data related to the project activity would be collected, reported, maintained and archived by O&M team at the respective project sites. The corrective actions (if required) would be taken by O&M Team to maintain the quality of data. The team would further submit the monitoring data to site in-charge for perusal.

Monitoring Procedures:

For each of the project activity instance to be included in the grouped project activity, the main and check meters are installed. Details of the metering point and meters installed for five project activity instances being included in the grouped project activity are provided in the table as follows:

Project activity instances	Meter Details	Metering Point
Instance – 1: Bhadla	3 phase 4 wire, bidirectional meters with accuracy class of 0.2S	Meters are installed within plant premises
Instance – 2: Achampet	3 phase 4 wire, bidirectional meters with accuracy class of 0.2S	Meters are installed at 132/33 kV grid substation at Achampet, Dist. Mehaboobnagar, Telangana
Instance – 3: Kalwakurthy	3 phase 4 wire, bidirectional meters with accuracy class of 0.2S	Meters are installed at 132/33 kV grid substation at Kalwakurthy, Dist. Mehaboobnagar, Telangana
Instance – 4: Salakpur	3 phase 4 wire, bidirectional meters with accuracy class of 0.2S	Meters are installed at 132/33 kV Grid Sub-station (GSS) of located at Mustyal, Telangana
Instance – 5: Alladurg	3 phase 4 wire, bidirectional meters with accuracy class of 0.2S	Meters are installed at 132/33 kV Grid Sub-station (GSS) of located at Peddashankarampet in Telengana

Net electricity supplied to grid will be calculated as the difference of the measured values of “export” and “import” at the metering point. The energy import and export readings are recorded on monthly basis in the form of Joint Meter Readings (JMR). The readings are taken in presence of representative from project proponent, representative from GSS and representative from the power purchaser. The JMR document is signed by all these representatives.

This net electricity supplied is utilized for the purpose of GHG emission reductions by the proposed project activity. Same monitoring plan is followed at each project activity instance.

QA/QC Procedures:

All main and back up meters installed at each of the project activity instance sites shall be calibrated as described in Central Electricity Authority (Installation and Operation of Meters) Regulations, 2006. Currently the regulations describe of calibration of meters to be done at least once in five years.

Further, the net electricity exported to the grid can be cross verified with sales invoices raised in the name of power purchaser.

Completeness:

Data Management and Data Archiving (Central GHG information system):

Copies of, monitored data sheet and monthly energy meter reading reports will be maintained for the entire crediting period plus two years by the project proponent.

Central GHG information system and controls will be maintained by Essel Mining and Industries Limited. Data for all the project activity instances will be maintained by coordinating and managing entity i.e. Essel Mining and Industries Limited. This data will be maintained in electronic format for entire crediting period plus two years.

Procedures for Data Adjustments/Uncertainties:

Reading and Corrections of Meters:

1. Project proponent, representative from GSS and representative from the power purchaser shall jointly read the metering system on every month at the delivery point.
2. In the event that the main metering system is not in service as a result of maintenance, repairs or testing, then the back-up metering system shall be used during the period the main metering system is not in service.
3. Meter reading taken jointly at the appointed date and time will be signed by the representative of project proponent, representative from GSS and representative from the power purchaser. If representative from project proponent is not present, then the power purchaser shall provide the project participant with a signed copy of the meter reading of the Main Metering System or Back-up metering system as the case may be. Such meter readings shall be treated as the accurate and final measurement of the energy supplied to grid by the power producer.

Sealing and Maintenance of Meters:

1. The main metering system and back-up metering system shall be sealed in the presence of representative of project proponent, representative from GSS and representative from the power purchaser.
2. When the main metering system and/or back-up metering system and/or any component thereof is found to be outside the acceptable limits of accuracy or otherwise not functioning properly, it shall be repaired, re-calibrated or replaced as soon as possible.

3. Any meter seal(s) shall be broken only by the GSS representative in the presence of project proponent, and representative from the power purchaser whenever the main metering system or the back-up metering system is to be inspected, tested, adjusted, repaired or replaced.

5 ENVIRONMENTAL IMPACT

Solar PV is one of the cleanest sources of renewable energy, with no associated emissions and waste products. In India, Environmental Impact Assessment (EIA) of solar power project is not an essential regulatory requirement. The Schedule-1 of Environment Impact Assessment (EIA) Notification 1994 and 2006 have covered 30 and 8 sectors respectively which are required to conduct EIA. However solar PV projects are not covered under the Schedule 1. Moreover, the project activity affects the environment in favourable manner by generating a clean energy. Therefore EIA is not required for the project activity under consideration.

6 STAKEHOLDER COMMENTS

For the VCS grouped project activity under consideration, stakeholder consultation was held at each of the project activity instance site. Relevant outcomes from respective stakeholder consultations for each of the five project activity instance are provided as follows:

Instance – 1: Bhadla:

The stakeholder meeting for the VCS project activity instance -1 at Bhadla was held at the plant site on September 12, 2015. Stakeholders were invited for the meeting by sending invitations in the form of notification in newspapers (public notice was published in Dainik Bhaskar on 28th August 2015) and by personalized invitations to key stakeholders such as government officials, panchayat representatives and other relevant organizations. Newspaper notification was published in local newspaper in local language and in English. Comments received from stakeholders during the meeting have been documented in the minutes of meeting document.

There were no negative comments received during the meeting and stakeholders appreciated proactive efforts taken by project proponent towards reducing emissions.

Instance – 2: Achampet:

The stakeholder meeting for the VCS project activity instance 2 at Achampet was held at the plant site on September 14, 2015. Stakeholders were invited for the meeting by sending invitations in the form of notification in newspapers and by personalized invitations to key stakeholders such as government officials, panchayat representatives and other relevant organizations. Newspaper notification was published in newspaper – The Hindu on 26th August 2015 in local language and in English. Comments received from stakeholders during the meeting have been documented in the minutes of meeting document.

There were no negative comments received during the meeting and stakeholders appreciated proactive efforts taken by project proponent towards reducing emissions.

Instance – 3: Kalwakurthy:

The stakeholder meeting for the VCS project activity instance -3 at Kalwakurthy was held at the plant site on September 14, 2015. Stakeholders were invited for the meeting by sending invitations in the form of notification in newspapers and by personalized invitations to key stakeholders such as government officials, panchayat representatives and other relevant organizations. Newspaper notification was published in newspaper – The Hindu on 26th August 2015 in local language and in English. Comments received from stakeholders during the meeting have been documented in the minutes of meeting document.

There were no negative comments received during the meeting and stakeholders appreciated proactive efforts taken by project proponent towards reducing emissions.

Instance – 4: Salakpur:

The stakeholder meeting for the VCS project activity instance -4 at Salakpur was held at the plant site on September 15, 2015. Stakeholders were invited for the meeting by sending invitations in

the form of notification in newspapers and by personalized invitations to key stakeholders such as government officials, panchayat representatives and other relevant organizations. Newspaper notification was published in newspaper - – The Hindu on 26th August 2015 in local language and in English. Comments received from stakeholders during the meeting have been documented in the minutes of meeting document.

There were no negative comments received during the meeting and stakeholders appreciated proactive efforts taken by project proponent towards reducing emissions.

Instance – 5: Alladurg:

The stakeholder meeting for the VCS project activity instance -5 at Alladurg was held at the plant site on September 16, 2015. Stakeholders were invited for the meeting by sending invitations in the form of notification in newspapers and by personalized invitations to key stakeholders such as government officials, panchayat representatives and other relevant organizations. Newspaper notification was published in newspaper – The Hindu on 26th August 2015 in local language and in English. Comments received from stakeholders during the meeting have been documented in the minutes of meeting document.

There were no negative comments received during the meeting and stakeholders appreciated proactive efforts taken by project proponent towards reducing emissions.

