



**Verified Carbon
Standard**

WIND POWER PROJECT BY RAJSTHAN GUM PRIVATE LIMITED (EKIESL- CDM.SEPTEMBER-12-02)



Document Prepared by EKI Energy Services Limited

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|----------------------|---|
| Project Title | Wind Power Project by Rajasthan Gum Private Limited (EKIESL-CDM.September-12-02) |
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1 PROJECT DETAILS

1.1 Summary Description of the Project

The project activity has installed 7 WTGs having a total installed capacity of 14.7 MW. The project is generating energy through renewable source i.e wind which is a clean energy generating technology, replaces anthropogenic emissions of greenhouse gases (GHG's), which is estimated to be approximately 24,213 tCO_{2e} per year, thereon displaces 26,008 MWh amount of electricity from the generation-mix of power plants connected to INDIAN Grid, which is dominated by thermal/fossil fuel-based power plant,

Among these 7 WTGs 6 are connected to the INDIAN grid and one is used for captive purpose.

The detailed list of WTG and the state of installation is mentioned in the table below:

| Project Promoters' Name | WTG No. | Site | Capacity in MW | State | Purpose |
|-------------------------------|---------|------------|----------------|-------------|---------------|
| Rajasthan Gum Private Limited | WTG 1 | Jath | 1*2.1 MW | Maharashtra | Sale to grid |
| | WTG 2 | Jath | 1*2.1 MW | Maharashtra | Sale to grid |
| | WTG 3 | Jath | 1*2.1 MW | Maharashtra | Sale to grid |
| | WTG 4 | Jath | 1*2.1 MW | Maharashtra | Sale to grid |
| | WTG 5 | Kaladunger | 1*2.1 MW | Rajasthan | Sale to grid |
| | WTG 6 | Kaladunger | 1*2.1 MW | Rajasthan | Sale to grid |
| | WTG 7 | Kaladunger | 1*2.1 MW | Rajasthan | Captive Usage |

| Audit Type | Period | Program | VVB Name | Number of years |
|--------------|--------------------------------------|---------|--------------------------------|-------------------------|
| Validation | 28-September-2012 | VCS | LGAI Technological Centre S.A, | 10 |
| Verification | 28-September-2012 to 04-January-2015 | VCS | LGAI Technological Centre S.A, | 2 Years 3 Months 7 days |

| | | | | |
|--------------|--|-----|------------------------------------|--------------------------|
| Verification | 05-January-2015 to 04-January-2021 | VCS | Earthhood Services Private Limited | 6 |
| Verification | 28-September-2022 to 27-September-2032 | VCS | - | 10 |
| Total | | | | 28 years 3 months 7 days |

1.2 Sectoral Scope and Project Type

According to the categorisation system of the Clean Development Mechanism, which is a part of Green House Gas (GHG) program that has been approved by the VCS board, the project is categorised as;

- Sectoral scope: 1 : Energy industries (renewable - / non-renewable sources)
- Type of project activity: Type 1:Renewable Energy Project
- *Category: Grid connected renewable electricity generation – AMS I.D., version 18.PP* herby confirms that the project activity is an individual project not a grouped project.

1.3 Project Eligibility

The project activity has installed and generating electricity using wind turbines i.e by using the renewable sources replacing electricity supply from a fossil-fuel dominated electricity, thus leads to reduction of anthropogenic GHG emissions from atmosphere. Hence the project activity is eligible under Sectoral Scope 1: Energy industries (renewable/non-renewable sources) under the scope of VCS program.

1.4 Project Design

The project design is such that the project owner has installed the WTGs at multiple locations but the Project activity is not a grouped project activity.

Eligibility Criteria

This section is not applicable as the project activity is not a grouped project activity.

1.5 Project Proponent

.

| | |
|--------------------------|--|
| Organization name | Rajasthan Gum Private Limited |
| Contact person | Mr. Bheru Jain |
| Title | CEO |
| Address | S-272/342005 M.I.A II Phase, Jodhpur Rajasthan |
| Telephone | +91 291-2746192 / 291-2746992 |
| Email | bherujain@rahasthangum.com |

1.6 Other Entities Involved in the Project

| | |
|----------------------------|--|
| Organization name | EKI Energy Services Limited |
| Role in the project | Project Consultant |
| Contact person | Mr. Manish Dabkara |
| Title | MD & CEO |
| Address | Office No. 201, EnKing Embassy Plot No. 48, Scheme No. 78 Part II, Vijay Nagar INDORE – 452001 |
| Telephone | +91-731-4289086 |
| Email | manish@enkingint.org |

1.7 Ownership

For the ownership details of the project any of the following documents of Rajasthan Gum Private Limited (Project proponent/project promoter) may be referred:

1. Power Purchase Agreement between the project promoters and State Utility.
2. Commissioning certificates.
3. Purchase order of WTGs

1.8 Project Start Date

The start date for this project is said to be 28-September-2012. This is the day on which the first WTG was commissioned under the project activity.

1.9 Project Crediting Period

The project crediting period shall be a maximum of ten years which will be renewed at most twice. Project commissioned on 28-september-2012. The start date of Renewed crediting period is 28-September-2022 and 27-September-2032 will be the end date of the renewed crediting period.

1.10 Project Scale and Estimated GHG Emission Reductions or Removals

The project does not fall under large scale category since the emission reductions are less than 300,000 tCO₂ e per annum.

| Project Scale | |
|---------------|---|
| Project | √ |
| Large project | |

| Year | Estimated GHG emission reductions or removals (tCO ₂ e) |
|--|--|
| Year 1(28-Sept-2022 to 27-Sept-2023) | 24,213 |
| Year 2 (28-Sept-2023 to 27-Sept-2024) | 24,213 |
| Year 3 (28-Sept-2024 to 27-Sept-2025) | 24,213 |
| Year 4 (28-Sept-2025 to 27-Sept-2026) | 24,213 |
| Year 5 (28-Sept-2026 to 27-Sept-2027) | 24,213 |
| Year 6 (28-Sept-2027 to 27-Sept-2028) | 24,213 |
| Year 7 (28-Sept-2028 to 27-Sept-2029) | 24,213 |
| Year 8 (28-Sept-2029 to 27-Sept-2030) | 24,213 |
| Year 9 (28-Sept_2030 to 27-Sept-2031) | 24,213 |
| Year 10 (28-Sept-2031 to 27-Sept-2032) | 24,213 |

| | |
|--|---------|
| Total estimated ERs | 242,130 |
| Total number of crediting years | 10 |
| Average annual ERs | 24,213 |

1.11 Description of the Project Activity

The project activity has installed 7 WTGs having a total installed capacity of 14.7 MW. The project is generating energy through renewable source i.e wind which is a clean energy generating technology, replaces anthropogenic emissions of greenhouse gases (GHG's), which is estimated to be approximately 24,213 tCO_{2e} per year, thereon displaces 26,008 MWh amount of electricity from the generation-mix of power plants connected to INDIAN Grid, which is dominated by thermal/fossil fuel-based power plant,

The detailed list of WTF and the state of installation is mentioned in the table below:

| Project Promoters' Name | WTG No. | Site | Capacity in MW | State | Purpose |
|-------------------------------|---------|------------|----------------|-------------|---------------|
| Rajasthan Gum Private Limited | WTG 1 | Jath | 1*2.1 MW | Maharashtra | Sale to grid |
| | WTG 2 | Jath | 1*2.1 MW | Maharashtra | Sale to grid |
| | WTG 3 | Jath | 1*2.1 MW | Maharashtra | Sale to grid |
| | WTG 4 | Jath | 1*2.1 MW | Maharashtra | Sale to grid |
| | WTG 5 | Kaladunger | 1*2.1 MW | Rajasthan | Sale to grid |
| | WTG 6 | Kaladunger | 1*2.1 MW | Rajasthan | Sale to grid |
| | WTG 7 | Kaladunger | 1*2.1 MW | Rajasthan | Captive Usage |

Scenario existing prior to the implementation of the project activity:

The scenario existing prior to the implementation of the project activity, is electricity delivered to the grid by the project activity that 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".

Technology Used:A S-88, 2100 kW (WTG) Machine manufactured by Suzlon Energy Limited the details of same is as such in table below:

| S No. | Particulars | Details |
|-------|-------------|---------|
|-------|-------------|---------|

| | | |
|----|----------------------------|--|
| 1 | Rated Power | 2.1 MW |
| 2 | Cut-in wind speed | 4 m/s |
| 3 | Rated wind speed | 14 m/s |
| 4 | Cut-out wind speed | 25 m/s |
| 5 | Survival wind speed | 59.5 m/s |
| 6 | Hub height | 80 m |
| 7 | Rotational speed | 15 to 17.6 rpm |
| 8 | Pitch type | Electrical |
| 9 | Diameter | 88 m |
| 10 | Swept area | 6082 m ² |
| 11 | Blade material type | Epoxy bounded fibre glass |
| 12 | Aerodynamic brake | 3 independent systems with blade pitching mechanism |
| 13 | Mechanical brake type | Hydraulic disc brake, activated by hydraulic pressure + mechanical rotor lock, activity by hydraulic pressure. |
| 14 | Estimated design life time | 20 years |

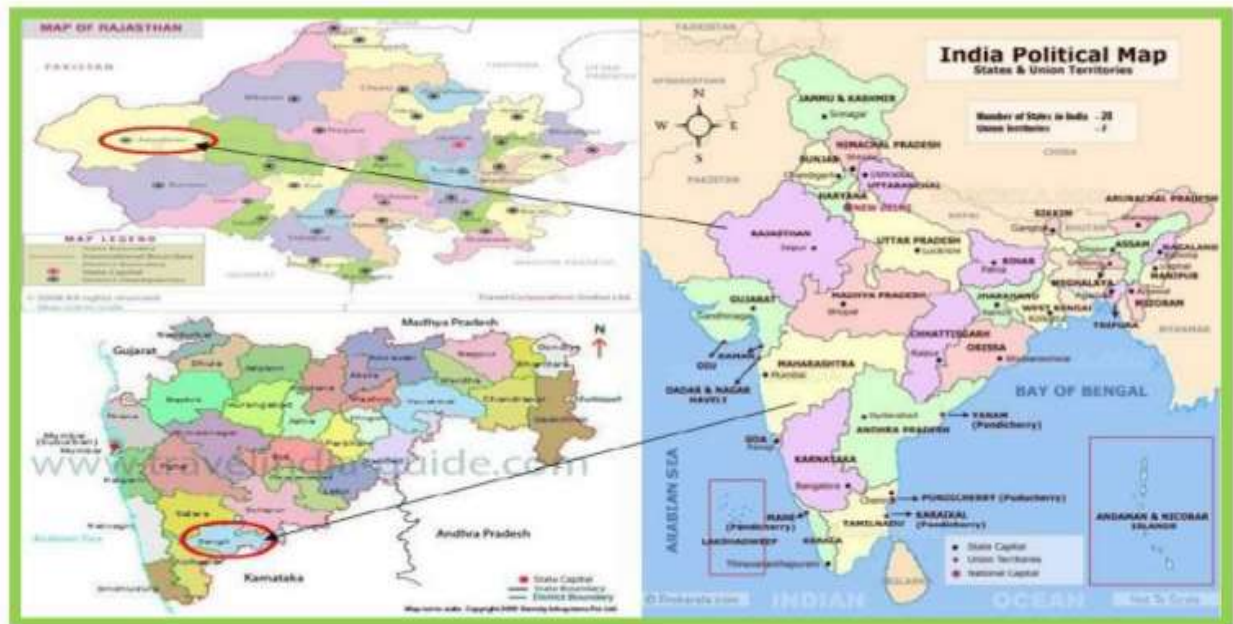
All the WTGs are based on indigenous technology and the project activity doesn't involve any kind of knowhow, measures or technology transfer.

1.12 Project Location

Taluka : Jath and Mohangarh
 Village : Yeldhari and Kanod
 District : Sangli and Jaisalmer
 State : Maharashtra and Rajasthan
 Region : Western
 Country: India

The Project is located at Maharashtra and Rajasthan state of India and the project location is depicted in the table below:

| Project Promoter's Name | WTG No. | Village | Tehsil | District | State | Latitude | Longitude |
|-------------------------------|---------|-----------|--------------|-----------|-------------|----------------|----------------|
| Rajasthan Gum Private Limited | JTH-67 | Yeldhari | Jath | Sangli | Maharashtra | 16 59' 28.4" N | 75 12' 03.8" E |
| | JTH-152 | Mendhgiri | Jath | Sangli | Maharashtra | 16 58' 26.7" N | 75 14' 17.8" E |
| | JTH-158 | Mendhgiri | Jath | Sangli | Maharashtra | 16 58' 50.7" N | 75 13' 35.5" E |
| | JTH-183 | Jath | Jath | Sangli | Maharashtra | 17 03' 09.4" N | 75 15' 15.0" E |
| | KD- 89 | Kanod | Mohan garh-1 | Jaisalmer | Rajasthan | 27 09' 38.2" N | 71 07' 31.7" E |
| | KD- 86 | Kanod | Mohan garh-1 | Jaisalmer | Rajasthan | 27 09' 17.4" N | 71 07' 00.1" E |
| | KD- 84 | Kanod | Mohang arh-1 | Jaisalmer | Rajasthan | 27 08' 29.2" N | 71 05' 54.3" E |



Location of Project activity

1.13 Conditions Prior to Project Initiation

This is a Greenfield project. The project activity replaces the carbon intensive grid electricity. The project activity effectively utilises renewable wind energy to generate electricity which is feeded into the coal intensive INDIAN Grid. Thereby the project activity reduces the dependence on fossil fuel-based generation units and as there are no associated emissions with this project it contributes to the reduction of greenhouse gases (GHG) emissions.

1.14 Compliance with Laws, Statutes and Other Regulatory Frameworks

The relevant national laws and regulation pertaining to generation of energy are:

1. Electricity Act 2003
2. National Electricity Policy 2005
3. Tariff Policy 2006

The project activity conforms to all the applicable laws and regulations in India.

1.15 Participation under Other GHG Programs

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

Project has been registered with UNFCCC under Clean Development Mechanism program, Registration reference number is 10026¹. PP also submitted undertaking for Project neither has not intends to generate any form of GHG related environmental credit for GHG emission reductions or removals claimed under the VCS program.

1.15.2 Projects Rejected by Other GHG Programs

Project Participant hereby declares that the Project activity is not rejected by any other GHG programs.

1.16 Other Forms of Credit

1.16.1 Emissions Trading Programs and Other Binding Limits

The project is registered under CDM and UNFCCC² (Registration ID -10026). The project is also approved by the DNA and a copy of the approval is also submitted to the DOE. Project Proponent has submitted undertaking that they do not claim same GHG emission reductions of the project

¹ <https://cdm.unfccc.int/Projects/DB/LRQA%20Ltd1408957529.49/view>

² <http://cdm.unfccc.int/Projects/DB/LRQA%20Ltd1408957529.49/view>

from CDM and VCS. PP does not use net GHG emission reductions by the projects for compliance with emission trading program to meet binding limits on GHG emissions.

1.16.2 Other Forms of Environmental Credit

Project has been registration with UNFCCC under Clean Development Mechanism program. Registration reference number is 10026. Project Proponent has submitted undertaking for not availing other forms of environmental credit for the same crediting period under consideration.

Supply Chain (Scope 3) Emissions

Not Applicable.

1.17 Sustainable Development Contributions

The National CDM Authority (NCDMA), which is the Designated National Authority (DNA) for the Government of India (GOI) under the Ministry of Environment Forests and Climate Change (MoEFCC), has mentioned four indicators for the sustainable development in the interim approval guidelines for Clean Development Mechanism (CDM) projects from India³. Thus, the project's contribution towards sustainable development has been addressed based on the following sustainable development aspects:

Social Well being

The project activity provided / provides job opportunity to local people during erection, commissioning and maintenance of the wind machines. Frequency of visiting villages and nearby areas by skilled, technicians and industrialist, increase due to installation /site visit/operation and maintenance work related to WTGs. This directly and indirectly positively effects the economy of villages and nearby area.

Environmental well being

The Wind power is one of the cleanest renewable energy powers and does not involve any fossil fuel. There are no GHG emissions. The impact on land, water, air and soil is negligible. Thus, the project activity contributes to environmental well-being without causing any negative impact on the surrounding environment.

Economic Well being

The CDM project activity generates permanent and temporary employment opportunity within the vicinity of the project. The electricity supply in the nearby area improves which directly and indirectly improves the economy and life style of the area.

Technological Well being

³ http://www.cdmindia.in/approval_process.php

The project activity is step forward in harnessing the untapped wind potential and further diffusion of the wind technology in the region. The project activity leads to the promotion of WTGs and demonstrates the success of wind turbines in the region which further motivate more investors to invest in wind power projects. Hence, the project activity leads to technological well-being.

1.18 Additional Information Relevant to the Project

Leakage Management

Project does not involve any leakage emissions as this is wind power project, Hence Leakage Management Plan and risk mitigation measures are not required.

Commercially Sensitive Information

There is no any commercially sensitive information that has been excluded from the public version of the project description.

Further Information

There are no information or incidents that have bearing on the eligibility of the project, the net GHG emission reductions or removals, or the quantification of the project's net GHG emission reductions or removals.

2 SAFEGUARDS

2.1 No Net Harm

The project does not involve any potential negative environmental and socio-economic impacts and hence this criteria is not applicable to the project activity.

2.2 Local Stakeholder Consultation

The following are the local stakeholders for the project activity:

- Local community
- Local village administration
- Technology suppliers
- Local vendors

All the stakeholders were invited through submission of the invitation letter (delivered in hand) to attend the stakeholder meeting.

In the introductory speech, Mr. Binu C. Verghese, (email: benbinuvarghese@gmail.com), along with other representatives of EKI Energy Services Limited welcomed the gathering and informed the stakeholders about the project activity; project's associated benefits with respect to CO₂ emission reductions and explained the purpose of conducting the stakeholders on the project activity. Subsequently to the introductory speech, comments were received from the stakeholders.

The meeting dates and location is mentioned in table below;

| Name of Project Investor | Invitation Date | Meeting Date | Location of the LSM | |
|-------------------------------|-----------------|-------------------|---------------------|-------------|
| | | | Site | State |
| Rajasthan Gum Private Limited | 24-August-2012 | 15-September-2012 | Jath | Maharashtra |
| | 24-August-2012 | 12-September-2012 | Kaladunger | Rajasthan |

2.3 Environmental Impact

The project activity is using renewable energy generation technology which is free from any kind of anthropogenic emission. The project activity is not having any negative environmental impact, only a very small amount of oily and solid wastes was associated with the installation of the WTG which can be ignored when compared with the emission reductions. The project activity results in GHGs emission reduction equivalent to 24,200 tCO₂/Year.

As per the schedule 1 of the Ministry of Environment Forests and Climate Change (MoEFCC – Government of India) notification dated September 14, 2006, - 39 activities are required to undertake environmental impact assessment studies⁴. As the wind power generation projects are listed in any of the categories of the schedule, it does not require Environmental Impact Assessment.

2.4 Public Comments

Stakeholders had no objections from installation of the WTGs; Instead they had openly said that wind power project helped them by:

⁴ <http://envfor.nic.in/legis/eia/so1533.pdf>

- Additional revenue generated through land/lease to outsiders like contractors & their Employees.
- Job opportunity for day to day maintenance and security of WTGs.
- Development of roads.
- No any adverse impact on rains, agriculture.

The stakeholders had given positive feedback and thus no measures were required to be taken.

2.5 AFOLU-Specific Safeguards

Not Applicable as this project activity is not an AFOLU project activity.

3 APPLICATION OF METHODOLOGY

3.1 Title and Reference of Methodology

Title: Grid Connected Renewable Electricity Generation⁵

References: AMS I.D. (Version 18, EB 81)

This methodology also refers the latest approved tool - TOOL 07, the details of which is as such-

Title: Tool to calculate the emission factor for an electricity system⁶ (Version 07.0)

3.2 Applicability of Methodology

As per AMS I.D. - “Grid Connected Renewable Electricity Generation (Version 18.0)” following are the criteria and the justification for the same is illustrated as follows;

| Para No. | Applicability Criteria | Justification for project case |
|----------|---|--|
| 4 | <p>This methodology is applicable to project activities that:</p> <ul style="list-style-type: none"> a) Install a Greenfield plant; b) Involve a capacity addition in (an) existing plant(s); | <p>This methodology is applicable to the project activity as, it’s an Greenfield project where Option (a) i.e. install a new power plant at a site where there was no renewable energy power plant operating</p> |

⁵ <https://cdm.unfccc.int/UserManagement/FileStorage/2P7FS6ZQAR84LG3NMKYUH50WI9ODBC>

⁶ <https://cdm.unfccc.int/methodologies/PAMethodologies/tools/am-tool-07-v7.0.pdf>

| | | |
|---|---|--|
| | <ul style="list-style-type: none"> c) Involve a retrofit of (an) existing plant(s); d) Involve a rehabilitation of (an) existing plant(s)/units(s); or e) Involve a replacement of (an) existing plant(s). | <p>prior to the implementation of the project activity (Greenfield plant).</p> <p>Hence the project activity fulfils the applicable criterion.</p> |
| 5 | <p>Hydro power plants with reservoirs that satisfy at least one of the following conditions are eligible to apply this methodology:</p> <ul style="list-style-type: none"> 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. | <p>The Project activity is power generation from wind energy source and is not a Hydro Power Project, therefore this eligibility criterion is not applicable to the Project activity.</p> |
| 6 | <p>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</p> | <p>The project activity is a 14.7 MW electric power generation project using wind as the source of energy. Unit does not co-fires fossil fuels since wind is the only source of power. Thus, the project activity has only renewable component and any non-renewable component is not applied.</p> |

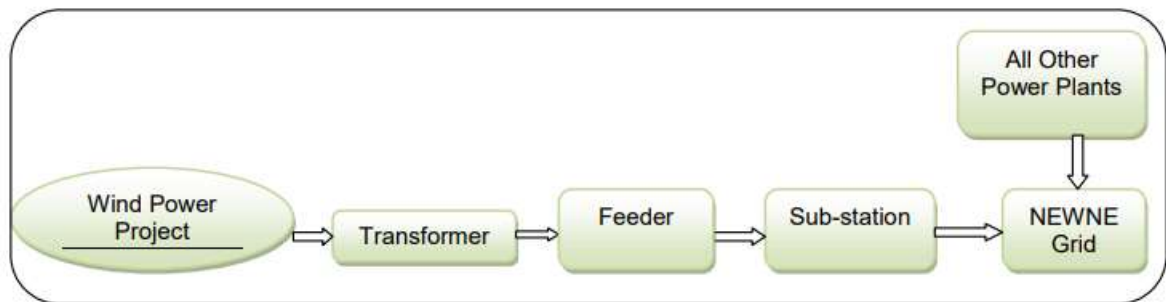
| | | |
|----|---|--|
| | unit shall not exceed the limit of 15 MW. | Hence the applicability criteria is not applicable to the project. |
| 7 | Combined heat and power (co-generation) systems are not eligible under this category. | The project activity is a 14.7 MW electricity generation project wherein the generation is solely based on Wind energy. There are no combined heat and power (co-generation) systems involved in the project. Hence the criteria is not applicable to the project. |
| 8 | In the case of project activities that involve the 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. | The project activity is the installation of small scale bundled wind power project and doesn't involve the addition of new unit to any of existing renewable power generation facility therefore the given criterion is not applicable to the project activity. |
| 9 | In the case of retrofit, rehabilitation or replacement, to qualify as a small-scale project, the total output of the retrofitted, rehabilitated or replacement power plant/unit shall not exceed the limit of 15 MW. | Not applicable, the entire wind project is a green field project activity and this project is not the enhancement or up gradation project. |
| 10 | In the case of landfill gas, waste gas, wastewater treatment and agro-industries projects, recovered methane emissions are eligible under a relevant Type III category. If the recovered methane is used for electricity generation for supply to a grid then the baseline for the electricity component shall be in accordance with procedure prescribed under this methodology. If the recovered methane is used for heat generation or cogeneration other applicable Type-I methodologies such as "AMS-I.C.: Thermal energy production with or without electricity" shall be explored. | This project activity involves wind power only. Landfill gas, waste gas, waste water treatment and agro-industries projects, recovered methane emission are not involved in this project activity. Hence this criteria is not applicable to this project. |

| | | |
|----|--|--|
| 11 | In case biomass is sourced from dedicated plantations, the applicability criteria in the tool “Project emissions from cultivation of biomass” shall apply. | This is a sole wind power project, biomass is not used here. So the criteria is not applicable to the project. |
|----|--|--|

3.3 Project Boundary

Project boundary have been ascertained using para 18 of AMS I.D. – “The spatial extent of the project boundary includes the project power plant and all power plants connected physically to the electricity system that the CDM project power plant is connected to”

Hence the project boundary includes the wind turbine generator, sub-stations, grid and all other power plants connected to grid. The project activity evacuate power to the INDIAN grid and also for captive utility.



Project Boundary

| Source | | Gas | Included? | Justification/Explanation |
|----------|---------------------------------------|------------------|-----------|--|
| Baseline | Electricity generation of INDIAN grid | CO ₂ | Yes | Major emission sources. |
| | | CH ₄ | No | Excluded for simplification. This is conservative. |
| | | N ₂ O | No | Excluded for simplification. This is conservative. |
| | | Other | No | Not Applicable |
| Project | Wind electricity generation | CO ₂ | No | As renewable wind power project, hence not applicable. |
| | | CH ₄ | No | The project is wind power project, hence not applicable. |
| | | N ₂ O | No | The project is wind power project, hence not applicable. |

| Source | Gas | Included? | Justification/Explanation |
|--------|-------|-----------|---------------------------|
| | Other | No | - |

3.4 Baseline Scenario

As per the approved methodology AMS – I.D., Version 18.0, para 19, If the project activity is the installation of a Greenfield power plant, the baseline scenario is the following:

“The baseline scenario is that the electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources into the grid.” As reflected in the combined margin (CM) calculations described in the “Tool to calculate the mission factor for an electricity system”.

Thus, the project activity evacuate power to the INDIAN grid and also for captive purpose complying with the stated guideline.

3.5 Additionality

As per of EB 22, Annex 3, baseline scenario should be established taking into account relevant national and/or sectoral policies and circumstances, such as sectoral reform initiatives, local fuel availability, power sector expansion plans, and the economic situation in the project sector.

Para 7 (a) of same states that, only those national and/or sectoral policies or regulations under para 6(a) i.e. type E+ policy that increase GHG emissions, that have been implemented before adoption of the Kyoto Protocol by the COP (decision 1/CP.3, 11 December 1997), shall be taken into account when developing a baseline scenario. For more emitting power sector, there was no policy with comparative advantage existed before 11 December 1997. Hence it is not applicable for baseline determination.

Para7(b) of the same state that those National and/or sectoral policies or regulations under paragraph 6(b), i.e. type E-Policy that decrease GHG emissions, that have been implemented since the adoption by the COP of the CDM M&P (decision 17/CP.7, 11-November-2001) need not be taken into account in developing a baseline scenario. As per Electricity Act 2003, Section 86(1), SERC shall Promote cogeneration and generation of electricity from renewable sources of energy by providing suitable measures for connectivity with the grid and sale of electricity to any person”. The Ministry of Power has published the implementation plan⁷ of various sections (of Electricity Act 2003) including the provision of incentivizing renewable energy projects through State Electricity Regulatory Commissions. Hence, it can be concluded that the provincial and sectoral policies are E-, policies that decrease GHG emissions. Also, these policies have been implemented since the adoption by the COP of the CDM M & P (decision 17/CP.7, 11 November 2001).

⁷ http://powermin.gov.in/acts_notification/electricityact2003/%20status.htm

Hence the project investor has not considered them in developing the baseline scenario for the project activity. Instead, the baseline scenario is based on hypothetical situation without the provincial and sectoral policies being in place. Hence the selection of baseline scenario confirms to Annex 3 of EB 22. Moreover, the project under consideration is a wind power project and the methodology itself specifies the baseline of the project activity

As per Guidelines on the Demonstration of Additionality of small-scale project activities (Version 9 EB 68 Annex 27)⁸, to establish the project additionality, it has to be shown that the project activity would not have occurred anyway due to at least one of the following barriers:

- **Investment barrier:** A financially more viable alternative to the project activity would have led to higher emissions;
- **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;
- **Barrier due to prevailing practice:** Prevailing practice or existing regulatory or policy requirement would have led to implementation of a technology with higher emissions;
- **Other barriers:** Without the project activity, for another specific reason identified by the project participant, such as institutional barrier or limited information, managerial resources, or capacity to absorb new technologies, emissions would have been higher.

The project investor has selected Investment barrier to demonstrate in a conservative and transparent manner that the proposed CDM project activity is financially unattractive. In line with the guidelines stipulated under Annex 34 of EB 35 (“Non-binding best practice examples to demonstrate additionality for SSC project activities”), a benchmark analysis is used in the project case under investment barrier.

Appropriateness of using benchmark analysis for additionality demonstration and its conformity to guidance 19 of Annex 5, EB 62⁹ -

Considering the fact that the alternative to the project is the supply of electricity from the grid & the choice of the developer is to invest or not to invest, benchmark analysis has been considered appropriate for demonstration of additionality, which is in conformity with guidance 19 Annex 5 EB 62.

Selection of Financial Indicator:

As the project is 100% equity financed, the decision to invest or not to invest is based on the returns generated by the equity investment; hence post tax Equity IRR has been identified as the relevant financial indicator for investment analysis at the time of decision making.

⁸ http://cdm.unfccc.int/Reference/Guidclarif/meth/methSSC_guid05.pdf

⁹ http://cdm.unfccc.int/Reference/Guidclarif/reg/reg_guid03.pdf

Selection of Benchmark:

The benchmark has been considered in accordance with Guidance 15 of EB 62 Annex 05, “The values in the table in Appendix A may also be used, as a simple default option”.

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

- As the proposed project activity generates power utilizing wind energy, Group 1 as per para 5 of Appendix of EB 62, Annex 5 has been identified as a suitable category.
- The investment analysis has been carried out in nominal terms. Accordingly, Default values as given in Para 8, Appendix, Annex 5, EB 62 has been adjusted by adding suitable forecasted inflation rate taken from RBI (Central Bank, India).
- Project investor has calculated Benchmark based on WPI median inflation rate. As per Para 7 of Appendix of EB 62, Annex 5, the inflation forecast should be for the duration of the crediting period. However, since RBI provides forecast inflation only for 5 & 10 years, the project investor has calculated benchmark using both the durations and the most conservative value is considered as Benchmark for the project activity.

The benchmark has been computed in the following manner:

$$\text{Nominal Benchmark}^{10} = \{(1 + \text{Real Benchmark}) * (1 + \text{Inflation rate})\} - 1$$

Where,

Real Benchmark = Default Value, i.e., 11.75% (as per Appendix of Annex 5, EB 62)

Inflation rate = Projected Inflation rate for India in next 5 and 10 years (RBI Forecast)

Key Assumptions supporting financial projections:

Input values are based on publicly available data sources which can be clearly validated by the DOE, thus it complies with guidance 13 of EB 62, Annex 5.

| Parameters | WTG 1,2,3&4 | Source |
|---------------|-------------|----------------------------------|
| State | Maharashtra | Offer letter dated 12-April-2012 |
| Capacity (MW) | 2.1 | Offer letter dated 12-April-2012 |
| No. of WTGs | 4 | Offer letter dated 12-April-2012 |

¹⁰ As per Pg. 320 of Corporate Finance, Second Edition of Aswath Damodaran

| | | |
|---------------------------------------|-------------------|---|
| Total Capacity (MW) | 8.4 | |
| Expected Date of commissioning | 30-September-2012 | Offer letter dated 12-April-2012 |
| Life of the plant (years) | 20 | Technical specification |
| PLF (%) | 19.85 % | As per third party report in accordance to EB 48 Annex 11 |
| De-ration | NA | |
| Tariff (INR) | 4.86 | MERC Tariff order dated 30-march-2012 |
| O&M Expenses (INR MN) | 10.34 | Offer Letter date 12-April-2012 |
| Escalation in O&M Expenses (%) | 5 % | Offer Letter date 12-April-2012 |
| O&M free for years | 1 | Offer letter dated 12-April-2012 |
| Insurance (INR MN) | 0.72 | TAC Order |
| Total Project Cost (INR MN) | 480 | Offer Letter date 12-April-2012 |
| Loan Amount (INR MN) | NA | |
| Land Cost (INR MN) | 14.40 | As per management decision |
| Salvage Value in % | 10 % | As per CERC order dated 03-December-2009 |
| Book Depreciation Rate (%) | 15.33 % | Companies Act |
| Residual Value | 60.96 | Calculated |
| IT Depreciation (%) | 15 % | Income Tax Act |
| Additional Depreciation in Year-1 (%) | 20 % | Finance Act |
| Corporate Tax (%) | 32.45 % | Finance Act |
| MAT (%) | 20.01 % | Finance Act |

| | | |
|-----------------|---------|-------------|
| Service Tax (%) | 12.36 % | Finance Act |
|-----------------|---------|-------------|

| Parameters | WTG 5 & 6 | Source |
|--------------------------------|-------------------|---|
| State | Rajasthan | Offer Letter dated 30-June-2012 |
| Capacity (MW) | 2.1 | Offer Letter dated 30-June-2012 |
| No. of WTGs | 2 | Offer Letter dated 30-June-2012 |
| Total Capacity (MW) | 4.2 | |
| Expected Date of commissioning | 30-September-2012 | Offer Letter dated 30-June-2012 |
| Life of the plant (years) | 20 | Technical Specifications |
| PLF (%) | 20.66% | As per Third Party Report in accordance to EB 48 Annex 11 |
| Tariff (INR) | 4.46 | RERC Tariff Order date 14-December-2011 |
| O&M Expenses (INR MN) | 5.17 | Offer Letter dated 30-June-2012 |
| Escalation in O&M Expenses (%) | 5% | Offer Letter dated 30-June-2012 |
| O&M free for years | 1 | Offer Letter dated 30-June-2012 |
| Insurance (INR MN) | 0.36 | TAC |
| Total Project Cost (INR MN) | 240 | Offer Letter dated 30-June-2012 |
| Loan Amount (INR MN) | NA | |
| Land Cost (INR MN) | 7.20 | As per management decision |
| Salvage Value in % | 10% | As per RERC notification dated 23-March-2009 |

| | | |
|---------------------------------------|--------|----------------|
| Book Depreciation Rate (%) | 15.33% | Companies Act |
| Residual Value | 30.48 | Calculated |
| IT Depreciation (%) | 15% | Income Tax Act |
| Additional Depreciation in Year-1 (%) | 20% | Finance Act |
| Corporate Tax (%) | 32.45% | Finance Act |
| MAT (%) | 20.01% | Finance Act |
| Service Tax (%) | 12.36% | Finance Act |

| | | |
|------------------------------------|-------------------|--|
| Parameter ¹¹ | WTG 7 | Source |
| State | Rajasthan | Offer Letter dated 06-August-2012 |
| Capacity (MW) | 2.1 | Offer Letter dated 06-August-2012 |
| No. of WTGs | 1 | Offer Letter dated 06-August-2012 |
| Total Capacity (MW) | 2.1 | |
| Expected Date of Commissioning | 30-September-2012 | Offer Letter dated 06-August-2012 |
| Life of the Plant (Years) | 20 | Technical Specifications |
| PLF (%) | 20.66% | As per Third Part Report in accordance to EB 48 Annex 11. |
| Transmission & Wheeling Losses (%) | 8.00% | As per policy for promoting Generation of Electricity from Wind,2011 |
| Tariff (INR) | 5.50 | As per Electricity Bill |

¹¹ Separate financial analysis has been done for this WTG 7 as it is used for captive purpose, while the other two WTGs (WTG 5 & 6) are selling the electricity generated to the state electricity board.

| | | |
|---------------------------------------|--------|--|
| Wheeling Charges (INR/kWh) | 0.055 | As per policy for promoting Generation of Electricity from Wind,2011 |
| Transmission Charges (INR/kW/Month) | 76.00 | As per policy for promoting Generation of Electricity from Wind,2011 |
| O&M Expenses (INR MN) | 2.58 | Offer letter dated 6-August-2012 |
| Escalation in O&M Expenses (%) | 5% | Offer letter dated 6-August-2012 |
| O&M free for years | 1 | Offer letter dated 6-August-2012 |
| Insurance (INR MN) | 0.18 | TAC Order |
| Total Project Cost (INR MN) | 120 | Offer letter dated 6-August-2012 |
| Loan Amount (INR MN) | NA | |
| Land Cost (INR MN) | 3.60 | As per management decision |
| Salvage Value in % | 10% | As per RERC notification dated 23-march-2009 |
| Book Deprecation Rate (%) | 15.33% | Companies Act |
| Residual Value | 15.24 | Calculated |
| IT Depreciation (%) | 15% | Income Tax Act |
| Additional Depreciation in Year-1 (%) | 20% | Finance Act |
| Corporate Tax (%) | 32.45% | Finance Act |
| MAT (%) | 20.01% | Finance Act |
| Service Tax (%) | 12.36% | Finance Act |

| Sr. No. | WTG Owner | Inflation Forecast | | Benchmark | |
|---------|-----------|--------------------|---------|-----------|---------|
| | | 5-Year | 10-Year | 5-Year | 10-Year |
| | | | | | |

| | | | | | |
|---------------|-------------------------------|-------|-------|--------|--------|
| WTG 1,2,3 & 4 | Rajasthan Gum Private Limited | 6.10% | 5.80% | 18.57% | 18.23% |
| WTG 5 & 6 | | 6.10% | 5.80% | 18.57% | 18.23% |
| WTG 7 | | 6.20% | 6.00% | 18.68% | 18.46% |

The result analysis is as follows:

| WTG No. | Equity IRR without CDM | Benchmark |
|-----------------|------------------------|-----------|
| WTG 1, 2, 3 & 4 | 9.29% | 18.23% |
| WTG 5 & 6 | 8.58% | 18.23% |
| WTG 7 | 8.73% | 18.46% |

This substantiates that the investment is not financially attractive (equity IRR for the project activity is less than the Benchmark) for all WTGs. Thus, it can be easily concluded that project activity is additional & is not business as usual scenario.

Sensitivity Analysis

As per Guidance 20 and 21 of Annex 5 of EB 62 Annex 5, only variables, including the initial investment cost, that constitute more than 20% of either total project costs or total project revenues should be subjected to reasonable variation and the results of this variation should be presented in the PDD and be reproducible in the associated spreadsheets. Guidance also states, "All parameters varied need not necessarily be subjected to both negative and positive variations of the same magnitude". The Annex also states, as a general point of departure, variations in the sensitivity analysis should at least cover a range of +10% and -10%, unless this is not deemed appropriate in the context of the specific project circumstances.

Since the project cost is already firmed up, the cost is not variable. The tariff is determined by PPA which is fixed for years mentioned as per the respective State Electricity Board's tariff order and hence it need not be subjected to variation. All other expenses are much less than 20% of the total cost. Hence, only PLF needs to be subjected to reasonable variation. Nevertheless, following factors have been subjected to sensitivity analysis:

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

The results of sensitivity analysis are as follows:

| Equity IRR | WTG 1, 2, 3 & 4 | | | |
|--------------|-----------------|--------|--------|-----------------|
| Variation % | -10% | Normal | 10% | Breaching Value |
| PLF | 7.56% | 9.29% | 10.98% | 57.48% |
| O&M | 9.62% | 9.29% | 8.99% | -366.10% |
| Project Cost | 10.83% | 9.29% | 8.04% | -40.95% |
| Tariff Rate | 7.56% | 9.29% | 10.98% | 57.48% |

| Equity IRR | WTG 5 & 6 | | | |
|--------------|-----------|--------|--------|-----------------|
| Variation % | -10% | Normal | 10% | Breaching Value |
| PLF | 6.85% | 8.58% | 10.20% | 64.85% |
| O&M | 8.88% | 8.58% | 8.24% | -393.39% |
| Project Cost | 10.04% | 8.58% | 7.32% | -44.15% |
| Tariff Rate | 6.85% | 8.58% | 10.20% | 64.85\$ |

| Equity IRR | WTG 7 | | | |
|--------------|--------|--------|--------|-----------------|
| Variation % | -10% | Normal | 10% | Breaching Value |
| PLF | 6.82% | 8.73% | 10.56% | 58.41% |
| O&M | 9.04% | 8.73% | 8.42% | -399.40% |
| Project Cost | 10.23% | 8.73% | 7.47% | -44.12% |
| Tariff Rate | 6.82% | 8.73% | 10.56% | 58.41% |

Addressing Guidance 20 & 21 of EB 62. Annex 5, Sensitivity Analysis has been carried out.

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

| Variable | Probability to breach the benchmark |
|----------|--|
| PLF | PLF considered in financials for all WTGs is the maximum envisaged as per the offer letter. Therefore, variation in PLF of more than 10% is highly |

| | |
|--------------|--|
| | unlikely. However, if we refer the breaching values for all Project Investors Breaching value of PLF for all WTGs is above 10%. Hence probability of PLF breaching is unlikely to happen. |
| O&M Cost | Breaching value of O&M Cost for all WTGs is below (-100%). Hence, even, if the O & M cost is reduced to zero IRR will not cross the benchmark. However, reduction of O & M to zero is the most unlikely scenario. |
| Project Cost | Since the Purchase Order cost is firm, there is no possibility of project cost going below this level. Even then, sensitivity analysis is carried out for project cost being 10% less than that considered during decision making for all WTGs, though for none of the WTGs, the actual project cost has varied by 10%. Even at this level, the IRR does not breach the Benchmark for any of the WTGs. Hence, there is no any probability of the Benchmark being breached. |
| Tariff Rate | The tariff is determined by PPA which is fixed for years mentioned as per the respective State Electricity Board's tariff order. Hence, there is no probability of any variation for the same. |

The results of sensitivity analysis show that even with a variation of +10% & -10% in Project Cost, O&M cost, PLF and Tariff Rate Equity IRR is significantly lower than the benchmark. And it is evident from the results given above; the project remains additional even under the most favourable conditions.

Demonstration of Parallel and continuing actions as per the 'Guidelines on the demonstration and assessment of prior consideration of the CDM' annex 13 to EB 62¹².

| Client Name | Letter of Intent | Prior CDM Intimation |
|------------------|------------------|----------------------|
| WTG 1, 2, 3, & 4 | 15-May-2012 | 02-November-2012 |
| WTG 5 & 6 | 13-July-2012 | 02-November-2012 |
| WTG 7 | 11-August-2012 | 02-November-2012 |

The project activity is in compliance with Para 2 of Annex 13, EB 62.

3.6 Methodology Deviations

There no methodology deviation from the registered PD.

¹² http://cdm.unfccc.int/Reference/Guidclarif/reg/reg_guid04.pdf

4 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

4.1 Baseline Emissions

According to the approved baseline methodology AMS-I.D. Version 18.0, EB 81, Annex 24

Baseline Emission:

As per para 22 of AMS-I.D. Version 18.0, Baseline emissions include only CO₂ emissions from electricity generation in power plants that are displaced due to the project activity. The methodology assumes that all project electricity generation above baseline levels would have been generated by existing grid-connected power plants and the addition of new grid-connected power plants. The Baseline emissions are to be calculated as follows:

$$BE_y = EG_{p,y} * EF_{grid,CM,y}$$

Where:

| | | |
|-------------------------|---|--|
| BE _y | = | Baseline emissions in year y (t CO ₂) |
| EG _{p,y} | = | Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the project activity in year y (MWh) |
| EF _{grid,CM,y} | = | Combined margin CO ₂ emission factor for the grid connected power generation in year y calculated using the latest version of the “Tool to calculate the emission factor for an electricity system” (tCO ₂ /MWh) |

As per Para 23 of AMS-I.D, Version 18.0 The emission factor shall be calculated in a transparent and conservative manner as follows:

- (a) A Combined Margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the “Tool to calculate the emission factor for an electricity system”; or
- (b) The weighted average emissions (in tCO₂/ MWh) of the current generation mix. The data of the year in which project generation occurs must be used.

Option (a) of the two methods has been chosen to calculate the grid emission factor. Also as per “Tool to calculate the emission factor for an electricity system” (Version 07.0, EB 100, Annex 4), following six steps have been followed:

- (a) Step 1: Identify the relevant electricity systems:

- (b) Step 2: Choose whether to include off-grid power plants in the project electricity system (optional);
- (c) Step 3: Select a method to determine the operating margin (OM);
- (d) Step 4: Calculate the operating margin emission factor according to the selected method;
- (e) Step 5: Calculate the build margin (BM) emission factor;
- (f) Step 6: Calculate the combined margin (CM) emission factor.

Step 1: Identify the relevant electricity systems

Central Electricity Authority of India (CEA), Ministry of Power, Government of India (Host Country) has given the delineations of the project electricity system and the connected electricity system in India.

As per CEA, Power generation and supply within the regional grid is managed by Regional Load Dispatch Centre (RLDC). The Regional Power Committees (RPCs) provide a common platform for discussion and solution to the problems relating to the regional grid. Each state in a regional grid meets its demand with its own generation facilities and with allocation of power plants owned by the central agencies such as NTPC and NHPC etc. Depending on the regional grid. There are also electricity transfers between regional grids.

Geographical Scope of Indian Electricity Grid

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

| | | | | |
|---------------|--|--|--|--|
| Uttar Pradesh | | | | |
| Uttarakhand | | | | |

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

Project owner may choose between the following two options to calculate the operating margin and build margin emission factor:

Option 1: Only grid power plants are included in the calculation.

Option 2: Both grid power plants and off grid power plants are included in the calculation.

Project Investor has chosen option 1 to calculate operating margin and build margin emission factor.

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

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

CO₂ Baseline Database Version 18, published by Central Electricity Authority (hereafter CEA Database) has been referred for the values of OM. As per the “Tool to calculate the emission factor for an electricity system” (Version 07.0, Annex 04, EB 100), any of the four methods can be used.

However, the data required to calculate simple adjusted OM or Dispatch data analysis is not possible due to lack of availability of this activity data to the project developers. The choice of the other two options for calculating the operating margin emission factor depends on the generation of electricity from low cost/must run sources.

In the context of the methodology the simple OM method can be used only if the low-cost/ must run resources constitute less than 50% of the total grid generation in:

1. Average of the five most recent years, or
2. Based on long term averages for hydroelectricity production. A low-cost/must run resource typically includes hydro, geothermal, wind, low cost biomass, nuclear and solar generation.

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

| | 2019-20 | 2020-21 | 2021-22 |
|-------------|---------|---------|---------|
| INDIAN Grid | 17.0% | 16..5% | 15.8% |

Data Source: Central Electricity Authority (CEA) database Version18, September 2022¹³

The above table clearly states that operating margin can be calculated using the Simple OM method as the low-cost/must run resources constitute less than 50% (Only% - Average of three years, as shown in table below) of the total grid generation of INDIAN Grid in average of the three most recent years, and the average emission rate method cannot be applied, as low cost/must run resources constitute less than 50% of the total grid generation.

For the simple OM method, emission factors can be calculated using either of the two following data vintages:

Ex ante option – If the ex ante option is chosen, the emission factor is determined once at the validation stage, thus no monitoring and recalculation of the emission factor during the crediting period required.

Ex post option – If the ex post ante option is chosen, the emission factor is determined for the year in which the project activity displaces grid electricity, requiring the emission factor to be updated annually during monitoring.

Project Investor has chosen ex ante option and emission factor determined at validation stage, will be the same throughout the crediting period.

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

Simple OM has been calculated using “Tool to calculate the emission factor for an electricity system” (version 07.0, Annex 4, EB 100). Project Investor has opted for option (A) “ Based on the net electricity generation and CO₂ emission factor of each power unit” and used data provided by CEA, Version18. Net electricity generation and absolute CO₂ emission of all generating power plants serving the system, not including low-cost/must-run power plants, calculated from CEA database and CO₂ emission per unit net electricity generation (tCO₂/MWh) estimated for year 2019-20, 2020-21, 2021-22. The simple OM emission factor is calculated as the generation-weighted average CO₂ emissions per unit net electricity generation (tCO₂/MWh) of all generating power plants serving the system.

Net Generation in Operating Margin (MWh) (Incl. Imports)

¹³ https://cea.nic.in/wp-content/uploads/baseline/2023/01/Approved_report_emission_2021_22.pdf

| | 2019-20 | 2020-21 | 2021-22 |
|-------------|---------|---------|-----------|
| INDIAN Grid | 965,009 | 958,218 | 1,035,672 |

Simple Operating Margin (tCO₂/ MWh) (Incl. Imports)

| | 2019-20 | 2020-21 | 2021-22 |
|-------------|---------|---------|---------|
| INDIAN Grid | 0.9541 | 0.9402 | 0.9605 |

Simple Operating Margin (INDIAN) = Generation weighted average of the simple operating margin

Simple OM = 0.9518 (tCO₂/MWh)

In the project activity, the full generation-weighted average (ex-ante) for the most recent 3 years for which data are available at the time of PD submission has been considered. Hence operating margin value will remain fixed and need not be monitored during the crediting period.

Step 5: Calculate the build margin (BM) emission factor

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

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

- a) Option 1 - for the first crediting period, calculate the build margin emission factor ex ante based on the most recent information available on units already built for sample group m at the time of PD submission. For the second crediting period, the build margin emission factor should be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period. This option does not require monitoring the emission factor during the crediting period.
- b) Option 2 - For the first crediting period, the build margin emission factor shall be updated annually, ex post, including those units built up to the year of registration of the project activity or, if information up to the year of registration is not yet available, including those units built up to the latest year for which information is available. For the second crediting period, the build margin emissions factor shall be calculated ex ante, as described in Option 1 above.

Option 1 has been chosen in the project activity by Project investor. BM is calculated ex-ante based on the most recent information available at the time of PF submission.

Build Margin (tCO₂/MWh) (not adjusted for imports)

| |
|---------|
| 2021-22 |
|---------|

| | |
|-------------|--------|
| INDIAN Grid | 0.8687 |
|-------------|--------|

BM values have been taken from CO₂ Baseline database for the Indian Power Sector, Version 18. CO₂ Baseline database for the Indian Power Sector is published by Central Electricity Authority, Ministry of Power, Govt. of India.

Step 6: Calculate the Combined Margin (CM) emission factor

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

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

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

The emission factor for grid electricity or Grid Emission Coefficient (also referred as CO₂ Emission factor) is calculated as the weighted average of the operating margin emission factor ($EF_{grid,OM,y}$) and the build margin emission factor ($EF_{grid,BM,y}$), where the weights W_{OM} and W_{BM} for wind projects, by default, are $W_{OM} = 0.75$ & $W_{BM} = 0.25$. $EF_{grid,CM,y}$ is calculated as below and are expressed in tCO₂/MWh.

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times W_{OM} + EF_{grid,BM,y} \times W_{BM}$$

Where,

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

$EF_{grid,BM,y}$ = 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)

Therefore,

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

4.2 Project Emissions

As per section 39 (Project emissions) of the methodology AMS I.D ‘Grid connected renewable electricity generation’ version 18.0 For most renewable energy project activities, $PE_y = 0$.

Therefore the project emission $PE_y = 0$.

4.3 Leakage

According to para 42 of AMS-I.D. Version 18.0, Leakage emissions are considered only for biomass projects to quantify leakages pertaining to the use of biomass residues. As this project activity is a wind power project, no leakage emissions are considered.

Therefore, $LE_y = 0$.

4.4 Net GHG Emission Reductions and Removals

The Baseline emission factor i.e combined margin emission factor is calculated as below:

$$EF_{\text{grid,CM},y} = EF_{\text{grid,OM},y} \times W_{\text{OM}} + EF_{\text{grid,BM},y} \times W_{\text{BM}}$$

Where,

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

$EF_{\text{grid,BM},y}$ = 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)

Now as per para 86 of TOOL 07 Version 07.0 the value of $W_{\text{OM}} = 0.75$ and $W_{\text{BM}} = 0.25$, and As per CEA CO₂ Baseline data version 18, $EF_{\text{grid,BM},y} = 0.8653$ and $EF_{\text{grid,OM},y} = 0.9518$.

Therefore,

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

Now, the emission reduction is calculated as follows:

$$ER_y = BE_y - PE_y - LE_y$$

Where:

ER_y = Emission reduction in year y (tCO₂)

BE_y = Baseline emission in year y (tCO₂)

PE_y = Project emission in year y (tCO₂)

LE_y = Leakage emission in year y (t CO₂)

Also,

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

Where,

$EG_{P,y}$ = Total quantity of net electricity delivered to the INDIAN Grid.

| Project Investors name | Capacity MW | PLF (%) | Grid | Generated Power (MWh) | Baseline Emission Factor | Baseline Emissions (tCO ₂ /Year) |
|-------------------------------|------------------------|---------|--------|-----------------------|--------------------------|---|
| Rajasthan Gum Private Limited | 2.1*4 (Maharashtra) | 19.85 | INDIAN | 14,606 | 0.9310 | 13,598 |
| | 2.1*3 (Rajasthan) | 20.66 | INDIAN | 11,402 | 0.9310 | 10,615 |

$$BE_y = 26,008 * 0.9310$$

$$= 24,213$$

Now, as per section 4.2 $PE_y = 0$ and as per section 4.3 $LE_y = 0$.

Therefore,

$$ER_y = 24,213 - 0 - 0$$

$$ER_y = 24,213 \text{ tCO}_2\text{e.}$$

| Year | Estimated baseline emissions or removals (tCO ₂ e) | Estimated project emissions or removals (tCO ₂ e) | Estimated leakage emissions (tCO ₂ e) | Estimated net GHG emission reductions or removals (tCO ₂ e) |
|---|---|--|--|--|
| 2022 (28-September-2022 to 27-September-2023) | 24,213 | 0 | 0 | 24,213 |
| 2023 (28-September-2023 to 27-September-2024) | 24,213 | 0 | 0 | 24,213 |
| 2024 (28-September-2024 to 27- | 24,213 | 0 | 0 | 24,213 |

| | | | | |
|---|----------------|----------|----------|----------------|
| September-2025) | | | | |
| 2025 (28-September-2025 to 27-September-2026) | 24,213 | 0 | 0 | 24,213 |
| 2026 (28-September-2026 to 27-September-2027) | 24,213 | 0 | 0 | 24,213 |
| 2027 (28-September-2027 to 27-September-2028) | 24,213 | 0 | 0 | 24,213 |
| 2028 (28-September-2028 to 27-September-2029) | 24,213 | 0 | 0 | 24,213 |
| 2029 (28-September-2029 to 27-September-2030) | 24,213 | 0 | 0 | 24,213 |
| 2030 (28-September-2030 to 27-September-2031) | 24,213 | 0 | 0 | 24,213 |
| 2031(28-September-2031 to 27-September-2032) | 24,213 | 0 | 0 | 24,213 |
| Total | 242,130 | 0 | 0 | 242,130 |

5 MONITORING

5.1 Data and Parameters Available at Validation

| | |
|---|--|
| Data / Parameter | $EF_{grid,OM,y}$ |
| Data unit | tCO ₂ /MWh |
| Description | Operating margin CO ₂ emission factor in year y |
| Source of data | Calculated from CEA database, Version18, 19-September-2022 ¹⁴ |
| Value applied | 0.9518 |
| Justification of choice of data or description of measurement methods and procedures applied | Calculated as per “Tool to calculate the emission factor for an electricity system, version 07.0” as 3-year generation weighted average using data for the years 2019-20, 2020-21, & 2021-22. The data are obtained from “CO ₂ Baseline Database for Indian Power Sector” version 18, published by the Central Electricity Authority, Ministry of Power, Government of India. |
| Purpose of Data | For the calculation of baseline emission |
| Comments | This parameter is fixed ex-ante for the entire crediting period. |

| | |
|---|---|
| Data / Parameter | $EF_{grid,BM,y}$ |
| Data unit | tCO ₂ /MWh |
| Description | Build Margin CO ₂ emission factor in year y |
| Source of data | Calculated from CEA database, Version 18, 19-September-2022 ¹⁵ |
| Value applied | 0.8687 |
| Justification of choice of data or description of measurement methods and procedures applied | Calculated as per “Tool to calculate the emission factor for an electricity system, version 07.0” for the year 2021-22. The data is obtained from “CO ₂ Baseline Database for Indian Power Sector” version 18, published by the Central Electricity Authority, Ministry of Power, Government of India. |

¹⁴https://cea.nic.in/wp-content/uploads/baseline/2023/01/Approved_report_emission_2021_22.pdf

¹⁵ https://cea.nic.in/wp-content/uploads/baseline/2023/01/Approved_report_emission_2021_22.pdf

| | |
|---|---|
| Purpose of Data | For the calculation of baseline emission |
| Comments | This parameter is fixed ex-ante for the entire crediting period. |
| Data / Parameter | $EF_{grid,CM,y}$ |
| Data unit | tCO ₂ /MWh |
| Description | Combined margin CO ₂ emission factor in year y |
| Source of data | “Calculated as per “Tool to calculate the emission factor for an electricity system, version 07.0” as 3-year generation weighted average using data for the years 2019-2020, 2020-2021, & 2021-22. The data are obtained from “CO ₂ Baseline Database for Indian Power Sector” version 18, published by the Central Electricity Authority, Ministry of Power, Government of India. |
| Value applied | 0.9310 |
| Justification of choice of data or description of measurement methods and procedures applied | Calculated using the CM approach as per “Tool to calculate the emission factor for an electricity system ¹⁶ , Version 07.0”. The data reflects the combined margin emission factor of the INDIAN grid for the year 2021-22. |
| Purpose of Data | For the calculation of baseline emission |
| Comments | This parameter is fixed ex-ante for the entire crediting period. |

5.2 Data and Parameters Monitored

| | |
|-------------------------|---|
| Data / Parameter | $EG_{PJ,y,RJ}$ |
| Data unit | MWh/Yr |
| Description | Quantity of net electricity supplied to the grid as a result of the implementation of the project activity in year y (MWh) at Rajasthan site. |
| Source of data | 1) Breakup of Net Export as per Monthly Generation Report and Joint Meter Reading authorized by R.R.V.P.N.L. 2) The quantity of net electricity supplied to the grid (i.e. Net Export in kWh) by the project activity to be taken from the break-up sheet prepared by Suzlon India Limited on the basis of monthly Joint |

¹⁶ <https://cdm.unfccc.int/methodologies/PAMethodologies/tools/am-tool-07-v7.0.pdf>

| | |
|---|---|
| | <p>Meter Reading (JMR) certificate certified by Rajasthan Rajya Vidyut Prasaran Nigam Limited (RRVPNL).</p> <p>3) The value for net electricity supplied to the grid to be cross verified from the monthly invoice raised by the project participant.</p> |
| <p>Description of measurement methods and procedures to be applied</p> | <p>Metering at 33 kV/220 kV level:</p> <p>The electricity generated by the project activity WTG/s is evacuated to the pooling station at 33 kV/220 kV level. The project activity WTG/s along with other WTGs, are connected to the feeder-wise metering point/s, where each metering point consists of both main & check meters. These energy meters (type: tri-vector) are having accuracy class of 0.2s.</p> <p>The joint meter reading is taken on monthly basis at these metering point/s by the representatives of PP & State Utility, which records parameters like export, import.</p> <p>The electricity (export and import) for the connected WTG/s is apportioned on monthly basis by the State Utility at 33 kV/220 kV level on the basis of generation ratio at the applicable metering point (ratio of controller reading of connected WTG to the controller reading for all WTGs connected to the applicable metering point) and the electricity (export, import etc) recorded by the energy meters at 33 kV/220 kV GSS on monthly basis. It give export kWh & import kWh for connected WTG. The net export obtained at 33 kV/220 kV level for any given month for the connected WTG is then obtained by:</p> <p>Net Export = Export kWh – Import kWh</p> <p>All these metering points are further connected to the common delivery point at the 220 kV level.</p> <p>Metering at 220 kV level:</p> <p>The common metering point at 220 kV GSS concurrently records total electricity (total export and total import) receiving from all connected metering points. The common metering point consists of both main & check meters. These energy meters (type: tri-vector) are having accuracy class of 0.2s. The monthly JMR is taken by the representative of PP & State Utility.</p> <p>Billing of the energy is done based on the energy break up available at the metering at 220 kV level.</p> <p>Transmission loss:</p> <p>The total transmission loss occurred during export of the electricity between the 33/220 kV level pooling station & 220 kV level common delivery point is calculated as the difference between total aggregated reading of exports for all metering points at 33/220 kV level and the total reading of exports for same metering points recorded at the 220 kV level. Similarly,</p> |

| | |
|-----------------------------------|---|
| | <p>transmission loss occurred during import of the electricity is also calculated.</p> <p>The PP/WTG wise transmission loss during export & import is calculated by multiplying the values of arrived transmission loss for export & import for wind farm with the Generation Ratio at common delivery point (ratio of electricity generated by installed WTG to the total generation by all the connected WTGs/ or connected metering points under common delivery point).</p> <p>The values of transmission loss during export & import for the given WTG are subtracting from EGExport, metering point & EGImport, metering point respectively to get the values of export and import respectively for the given month.</p> <p>Net electricity delivered to the Grid:</p> <p>The net electricity delivered to the Grid by the given WTG for the given month (net export kWh) is then obtained by subtracting import from export.</p> <p>The values of the net electricity delivered to the Grid are aggregated annually to get $EG_{BL,y}$.</p> <p>The value of net electricity delivered to the Grid ($EG_{BL,y}$) by the project activity per annum is converted to MWh before the calculation of emission reductions.</p> |
| Frequency of monitoring/recording | Monthly recording |
| Value applied | 11,402 |
| Monitoring equipment | Energy Meters |
| QA/QC procedures to be applied | <ul style="list-style-type: none"> • Annual Testing of all the meters is to be undertaken and faulty meters be duly replaced immediately. • However the meters are calibrated at-least once in 3 years. • The Net Units generated to be cross checked against the invoice raised by the Project Investor towards the Discom. • The energy meter is of 0.2 accuracy class. |
| Purpose of data | The Data/Parameter is required to calculate the baseline emission. |
| Calculation method | - |
| Comments | Data will be achieved electronically for a period of 2 years beyond the end of crediting period. |

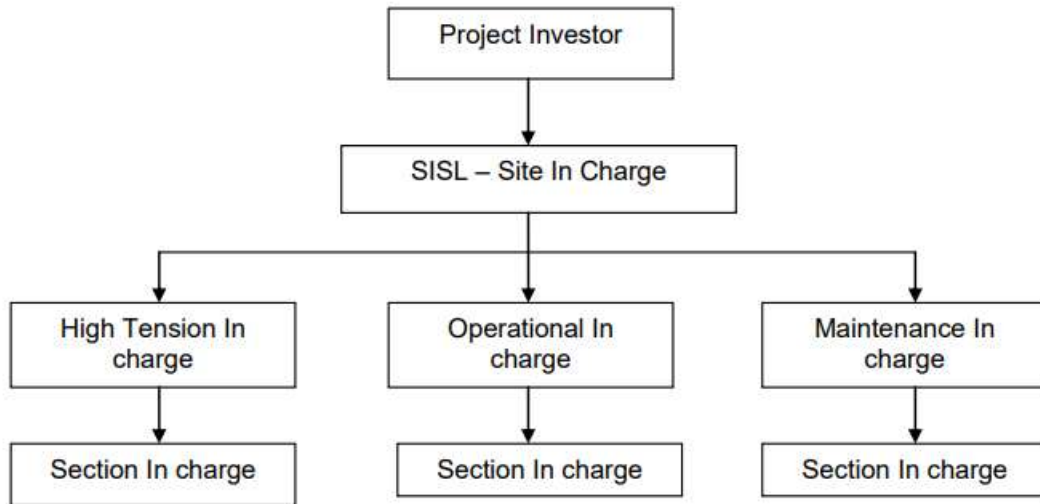
| | |
|--|--|
| Data / Parameter | EG _{PJ,y,MH} |
| Data unit | MWh/yr |
| Description | Quantity of net electricity supplied to the grid as a result of the implementation of the project activity in year y (MWh) at Maharashtra site. |
| Source of data | Credit report as per monthly generation report |
| Description of measurement methods and procedures to be applied | Data Type: Measured Monitoring equipment: Main and check Meters with accuracy class of 0.2 are used for monitoring Recording Frequency: Continuous monitoring and Monthly recording from Energy Meters, Summarized Annually Archiving Policy: Paper & Electronic Calibration frequency: Annually Electricity exported to the grid is in kWh. However, for the calculation purpose electricity exported is converted in MWh. |
| Frequency of monitoring/recording | Monthly recording |
| Value applied | 14,606 |
| Monitoring equipment | Energy meters |
| QA/QC procedures to be applied | Annual calibration of all the meters to be undertaken at required intervals and faulty meters will be duly replaced immediately. The meters are of accuracy class 0.2. |
| Purpose of data | The data/parameter is required to calculate the baseline emission. |
| Calculation method | - |
| Comments | Data will be achieved electronically for a period of 2 years beyond the end of crediting period. |

5.3 Monitoring Plan

Monitoring Plan at Rajasthan State

A detailed description of metering measurements methods procedures to be applied to the project activity has been well incorporated in section 5.2.

The organizational hierarchy of the project proponent and Suzlon Infrastructure Services Ltd. (SISL) project management is as follows:



QA/QC Procedure:

The main and backup meter installed at connected substations for monitoring of the project activity are electronic tri-vector energy meters of 0.2 accuracy class. Each meter is jointly inspected and sealed on behalf of project proponent and RRVPNL, in the presence of its authorised representatives. All main and backup meter are calibrated annually by RRVPNL or its representatives.

Description of calibration of WTG Controller

The controller used for the WTGs which is an SCS Controller is a micro-processor based intelligent controller which has been specially designed for control of wind turbines. It uses a Woodward Multi function Relay that has three current inputs from CT and three direct voltage inputs (690 Volts). The analog values of current / voltage is converted into digital signal internally using A/D Converters at very high sampling rate. A software program reads these values and displays instantaneous parameters such as voltage, current, power factor, kVAh, kVArh and kWh. These instantaneous values are then time integrated and displayed / stored. Woodward relay is having no display and needs special protocol to view energy readings as this relay is communicating digital signal through special communication protocol. Moreover, turbine cannot run without this relay hence it cannot be removed for calibration, hence, it is not possible to calibrate.

Data Management and Data Archiving:

Copies of the break-up sheet, invoices raised on Discom and sales receipts will be retained and archived for the entire crediting period plus two years by the project proponent.

Procedure for Data Adjustment/ Uncertainties:

Data uncertainty in the project activity monitoring could occur under the following circumstances:

1. During the monthly joint meter reading at connected substations, the reading of the main meter and backup meter are cross checked to insure that the meters are working within the

- permissible limit. If during the cross checking the reading is found to be outside the permissible limit of accuracy, then calibration is done to identify the meter with the error and the faulty meter is replaced immediately. The meter reading for that month is to be taken from the correct meter.
2. During the monthly joint meter reading at the connected substations, if the display defect is in the main meter than in that case the backup meter reading are considered for the purpose of preparation of the break-up sheet and billing purpose. Defective main meter will be replaced immediately.
 3. During the monthly joint meter reading at the connected substation, if the display defect is in the check meter than in that case the main meter reading are considered for the purpose of preparation of the break-up sheet and billing purpose. Defective check meter will be replaced immediately.
 4. If during the annual calibration of the meters at the connected substations, the main meter is found to be outside the permissible limit of accuracy and if the main meter reading have been used to prepare the break-up sheet, then the identified error would be applied to all the measured value since the date of last calibration. Further the main meter would be replaced immediate.
 5. If during the annual calibration of the meters the connected substations, the check meter is found to be outside the permissible limit of accuracy and if the check meter reading have been used to prepare the break-up sheet, then the identified error would be applied to all the measured value since the date of last calibration. Further the check meter would be replaced immediate.

Procedure for data apportioning:

Apportioning of net electricity generation from each WTG located at Rajasthan determined by SEB is as follows:

The apportioning of the electricity is the responsibility of the State Utility. The sample apportioning procedure adopted for any given WTG for any given month is given below:

Generation Ratio at metering point (33 kV/220 kV level GSS): The generation ratio is the ratio of electricity generated by installed WTG of PP to the total generation by all the connected WTGs to the applicable metering point.

$$G_{R, \text{metering point}} = EG_{\text{Controller, WTG}} / EG_{\text{Controller, metering point}} \quad (a)$$

Where,

$G_{R, \text{metering point}}$: Generation Ratio at metering point

$EG_{\text{Controller, WTG}}$: Electricity generated by installed WTG at PP connected to the applicable metering point

$EG_{Controller, metering\ point}$: Total generation by all the connected WTGs to the applicable metering point.

Calculation of net electricity exported at applicable metering point:

The main and check meters at the applicable metering point measure a number of parameters including export and import for all the connected WTGs.

The import, kWh by the WTG at the metering point is calculated in the following manner:

$$EG_{Import, metering\ point} = G_{R, metering\ point} * EG_{Total\ Import, metering\ point} \quad (b)$$

Where,

$EG_{Import, metering\ point}$: Export, kWh by the WTG at the metering point

$G_{R, metering\ point}$: Generation ratio at metering point

$EG_{Total\ Import, metering\ point}$: Total Import, kWh by all the WTGs at the metering point

The export, kWh by the WTG at the metering point is calculated in the following manner:

$$EG_{Export, Metering\ point} = G_{R, metering\ point} * EG_{Total\ Export, metering\ point} \quad (c)$$

Where,

$EG_{Export, Metering\ point}$ = Export, kWh by all the WTG at the metering point

$G_{R, metering\ point}$ = Generation ratio at metering point

$EG_{Total\ Export, metering\ point}$ = Total Export, kWh by all the WTGs at the metering point

The net electricity exported by the WTG at the 33kV/220kV level metering point is calculated by subtracting equation (b) from (c).

Thus, the net electricity exported at 33kV/220kV level metering point:

$$= EG_{Export, metering\ point} - EG_{Import, metering\ point} \quad (d)$$

Transmission Loss Calculation:

The total transmission loss occurred during export of the electricity between the 33/220 kV level pooling station & 220 kV level common delivery point is calculated as the difference between total aggregated reading of export for all metering points at 33/220 kV level and the total reading of export for same metering points recorded at the 220 kV level. Similarly, transmission loss occurred during import of the electricity is also calculated.

The PP/WTG wise transmission loss during export & import is calculated by multiplying the values of arrived transmission loss for export & import for wind farm with the Generation Ratio at common delivery point.

Generation Ratio at common delivery point:

It is ratio of electricity generated by installed WTG at the total generation by all the connected WTGs/ or connected metering points under common delivery point.

$$G_{R,Common\ Delivery\ Point} = \frac{EG_{Controller,WTG}}{EG_{Controller,Common\ Delivery\ Point}} \quad (e)$$

Where,

$$G_{R,Common\ Delivery\ Point} = EG\ Controller, Common\ Delivery\ Point$$

$$EG_{Controller,WTG} = Electricity\ generated\ by\ installed\ WTG$$

$$EG_{Controller,Common\ Delivery\ Point} = Total\ generation\ by\ all\ the\ connected\ WTGs/\ or\ connected\ metering\ point\ under\ common\ delivery\ point.$$

Calculation of net electricity delivered to the grid:

The Value of transmission loss during export and import for the given WTG are subtracting from $EG_{Export,metering\ point}$ and $EG_{Import,metering\ point}$ respectively to get the values of export and import respectively for the given month.

The net electricity delivered to the grid by the given WTG for the given month (net export kWh) is then obtained by subtracting import from export.

Thus,

$$= \text{Export} - \text{Import} \quad (f)$$

These apportioned values viz., import, export and net export kWh can be referred from the Monthly Breakup of net export unit report.

Monitoring Plan at Maharashtra State

Data Uncertainties and adjustments

For WTG in the project activity, the MSEDCL would report net electricity exported and imported from the grid. The net electricity supplied to the grid would be reported as the difference between the net export and import from the WTG. The electricity export and import data will be monitored via main and check meters connected to feeders at the respective sub-station. Multiple WTGs would be connected to each feeder, one of which would be part of the project activity (WTGs owned by Rajasthan Gum Private Limited) and rest of which would not be part of the project activity (WTGs owned by other entities). MSEDCL follows an apportioning procedure to account for electricity generation from individual WTGs based on data from individual WTG controllers. The electricity exported and imported from the grid is recorded on a monthly basis, jointly in the presence of Investor representatives (O&M Contractors) and MSEDCL personnel. Following the joint meter readings, the O&M Contractors provide the readings of the WTG controller to MSEDCL. Based on the monthly export and import data as per main/check meters and the WTG controller readings, MSEDCL provides a break-up of the electricity exported and imported for each WTG.

The net electricity generation from each WTG is determined by MSEDCL as follows:

$$\text{Export from WTG} = \frac{\text{Generation at WTG controller}}{\text{Total Generation at WTG controller for feeder}} * \text{Export from MSEDCL Main/} \\ \text{Check meter}$$

$$\text{Import from WTG} = \frac{\text{Generation at WTG controller}}{\text{Total Generation at WTG controller for the feeder}} * \text{Import from MSEDCL Main/} \\ \text{Check meter}$$

The above calculations would be carried out solely by MSEDCL and only the final apportioned electricity export, import, and net export for each WTG would be reported by MSEDCL in the Credit Notes. The details of the joint meter readings are not reported in the credit notes issued by MSEDCL.

A monthly joint meter reading of the energy meters would be carried out by MSEDCL officials and O&M contractors (representatives of the project promoter).

Procedure to deal with Data Uncertainty

Main and check meters for the project activity are of at least 0.2 accuracy class. Accuracy tests will be carried out at least once every year to ensure that the meters are working within their accuracy class. In addition to this, on a monthly basis main meter and check meter readings would be noted by representatives of the project promoter. To check that both meters are working within their accuracy class, the electricity export measured by the main meter and the electricity export measured by the check meter would be compared. If the difference between the two values is greater than 0.2% (sum of accuracy class of the two meters), it would be established that one or both of the meters is giving erroneous readings. In such a scenario, MSEDCL would be notified and requested to check the accuracy of both the main and check meter. The erroneous meter(s) would be identified and calibrated or replaced. The following actions would be carried out for determination of emission reductions:

- By default, main meter readings are considered in the credit notes and for emission reduction calculations. If the main meter is found to be erroneous, the check meter readings would be used in the credit notes and for emission reduction calculations. The main meter would be calibrated or replaced with a new calibrated energy meter.
- would be calibrated or replaced with a new calibrated energy meter. e considered. The check meter would be calibrated or replaced with a new calibrated energy meter.
- If both meters are found to be erroneous, and then emission reductions will be adjusted in a conservative manner to account for the error percentage reported for the respective period. Both energy meters would be calibrated or replaced with new calibrated energy meters.

Difference between Accuracy Test and Calibration

Accuracy tests will be conducted by MSEDCL personnel on the main and check energy meters at least once every year. The accuracy tests will be carried out using a standard portable meter to verify that the error percentage in the main and check meters is within the permissible limit. Calibration is conducted by MSEDCL personnel in case the error in the main or check meter is found to be beyond the permissible limit. In such a scenario, the erroneous meter may be replaced with a new calibrated energy meter.

Description of calibration of WTG Controller

The controller used for the WTGs which is an SCS Controller is a micro-processor based intelligent controller which has been specially designed for control of wind turbines. It uses a Woodward Multi-function Relay that has three current inputs from CT and three direct voltage inputs (690 Volts). The analog values of current / voltage is converted into digital signal internally using A/D Converters at very high sampling rate. A software program reads these values and displays instantaneous parameters such as voltage, current, power factor, kVAh, kVARh and kWh. These instantaneous values are then time integrated and displayed / stored. Woodward relay is having no display and needs special protocol to view energy readings as this relay is communicating digital signal through special communication protocol. Moreover, turbine cannot run without this relay hence it cannot be removed for calibration, hence, it is not possible to calibrate.