Methodology for Grid Connected Renewable Energy Generation Projects

GCCM001
v1.0 - 2020
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1. **Baseline and monitoring methodologies of GCC**

1. Global Carbon Council (GCC) is MENA region’s first and only voluntary carbon offsetting program that aims to contribute to a vision of sustainable and low carbon economy of the region and help to catalyse climate actions on the ground. Refer www.globalcarboncouncil.com for details.

2. GCC methodologies facilitate the project owners of eligible greenhouse gas (GHG) reduction projects to calculate emission reduction of their projects, monitor the emission reductions and develop the project submission in accordance with the methodologies.

3. This methodology for renewable power generation projects (here onwards referred as “the project activity”) facilitates the projects that displace the electricity which would be provided to the grid by more emission-intensive mix of power sources, than that established under project activity.

2. **Source/s of this baseline and monitoring methodology**

4. For the development of GCC methodologies, the requirements of the ‘GCC Program Manual’ (paragraphs 43-46) and ‘Standard on Key Project Requirements and Methodology Development’ are applied. The determination of baseline scenario and baseline emissions are consistent with UNFCCC’s Clean Development Mechanism (CDM) guideline “Guideline for determining baseline for measure/s” (Baseline Guideline) referred in the above standard.

5. This methodology is based on following baseline and monitoring methodologies of CDM.
   - ACM0002: Grid-connected electricity generation from renewable sources; and
   - AMS-I-D: Grid connected renewable electricity generation.

6. This methodology also refers to the latest approved versions of the following tools and guidelines of CDM:
   - (a) “Tool to calculate the emission factor for an electricity system”;
   - (b) “Tool to calculate baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation”; 
   - (c) “Tool for Demonstration and Assessment of Additionality”

7. This methodology is developed by GCC in collaboration with Qatar General Electricity & Water Corporation (KAHRAMAA).

3. **Description of key terms**

8. Following description of key terms apply to the projects using this methodology:
<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Key Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Utility scale power plant (USPP)</td>
<td>USPPs are those power plants which are implemented only for the purpose of producing electricity (using renewable energy types applicable in this methodology) and supplying it to regional or national electricity grid for distribution to various end users, without any domestic use of electricity. The power plant can be comprised of multiple power units based on single site or multiple sites with a minimum total installed capacity exceeding 15 MW. The example of USPP is a large-scale solar PV plant connected to grid.</td>
</tr>
<tr>
<td>2</td>
<td>Distributed Power Plants (DPPs)</td>
<td>DPPs are those distributed type of power plants which are implemented only for the purpose of producing electricity (using renewable energy types applicable in this methodology) and supplying it to regional or national electricity grid for distribution to various end users, with or without any domestic use of electricity. The DPPs may be comprised of multiple power units, at one or single site or distributed in multiple sites with a maximum total installed capacity of 15 MW and individual unit of 100 kW(^1). The example of DPPs is residential rooftop solar PVs, which supply electricity to grid in addition to meeting the domestic electricity demand.</td>
</tr>
<tr>
<td>3</td>
<td>Installed capacity or nameplate capacity</td>
<td>The installed or nameplate capacity of a power unit is the capacity of power generation, expressed in Kilowatts or one of its multiples, for which the power unit has been designed to operate at nominal conditions. The installed capacity of USPP or DPPs is the sum of the installed capacities of its power units.</td>
</tr>
</tbody>
</table>

4. **Applicable project activities and their eligibility conditions**

9. The project activities eligible under this methodology aim to build and operate a new USPP or new DPPs, which are subject to following eligibility conditions.

(a) The project activities shall employ following renewable energy generation technologies and supply generated electricity to a national or a regional grid:

   (i) Solar Photovoltaic;

   (ii) On-shore or Off-shore Wind;

   (iii) Tidal;

\(^1\) Refer section 3.6.1 of “Standard for Key Project Requirements and Methodological Development” at https://globalcarboncouncil.com/resources/Standard-on-Key-Project-requirements-and-Methodological-Development.pdf
(iv) Wave.

(b) The project activities shall not involve combined heat and power (co-generation) systems.

(c) The project activities shall not involve co-firing of fossil fuel of any kind.

(d) The project activities may have consumption of electricity (grid on on-site generation) for site offices.

(e) DPPs that supply electricity also for domestic purposes in addition to supply to grid, shall demonstrate that grid connection was available on the site before the installation of project activity.

5. Sectoral scope applicable to GCC verifier

10. The sectoral scopes eligible under GCC have been defined in section 3.2 of ‘Standard on Key Project Requirements and Methodology Development’.

11. Only a third-party verifier approved under GCC for the sectoral scope 1: Energy Industries (renewable/non-renewable sources) can conduct Project Verification or Emission Reduction Verification of GCC project that applies this methodology.

6. Project boundary

12. The spatial extent of the project boundary includes the project power plant and all power plants connected physically to the electricity system that the GCC project power plant or distributed type power generation devices are connected to.

The GHGs included in or excluded from the project boundary are listed in Table 1

<table>
<thead>
<tr>
<th>Source</th>
<th>GHG</th>
<th>Included</th>
<th>Justification/explanation</th>
<th>Determination of Emissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>CO₂ emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity</td>
<td>CO₂</td>
<td>Yes</td>
<td>The major source of emissions in the baseline</td>
</tr>
<tr>
<td></td>
<td>CH₄</td>
<td>No</td>
<td>Excluded for simplification. This emission source is assumed to be very small</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>N₂O</td>
<td>No</td>
<td>Excluded for simplification. This emission source is assumed to be very small</td>
<td>-</td>
</tr>
</tbody>
</table>
### 7. Baseline scenario

13. The rationale as per Baseline Guideline for determination of baseline scenario is that the electricity delivered to the grid by the project activity would be generated by the operation of grid-connected power plants and by the addition of new generation sources into the grid.

14. Hypothetically it means that a power plant with emission factor equivalent to grid mix would have supplied electricity in absence of new project plant or added capacity. A grid emission factor is a reasonable benchmark that provides the proxy performance of the baseline power plant.

### 8. Additionality

#### 8.1 Project specific additionality

15. Under project-specific additionality approach, the additionality of GCC projects shall be determined by Project Owner using the CDM Tool: “Tool for Demonstration and Assessment of Additionality”.

16. If the Project Owner demonstrates that the penetration of renewable energy technologies mentioned in paragraph 9(a) above justifies that the share of installed capacity of the USPP under project activity at the time of preparation of project submission to GCC is equal to or less than $2\%^2$ of the total installed capacity of power generation in grid-connected power plant, the project is considered as “automatically additional”.

17. There is no project-specific approach to be followed for project activities installing DPPs as these project activities are automatically additional as per “Standard for Key Project

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2 In line with positive list criterion of penetration of technology in CDM methodology ACM0002: Grid-connected electricity generation from renewable sources.
Requirements and Methodological Development” (Refer section 3.6.1) in all host
countries of the world.

8.2 Standardized additionality approach using positive lists of
various countries

18. For the use of the “standardized approach” by project owner, the renewable energy
technology used by GCC project activity must be defined in positive list of technologies of
the region. The project activities implementing the technologies that are listed in “positive
list” are automatically additional. The low/no penetration of Utility-scale power plants
employing renewable energy technologies mentioned in paragraph 9(a)4 above in three
countries of Middle-East region namely; Qatar, Kuwait and Oman owes to the fact that
grid electricity tariffs are low that reduces the attractiveness of such technologies.
Therefore, these renewable power generation technologies irrespective of their scale are
included in GCC’s “positive list of technologies” and considered “additional” if implemented
as GHG reduction projects in Qatar, Oman and Kuwait.

19. Although the positive list of renewable energy technologies for Qatar, Kuwait and Oman
include those referred in paragraph 9(a), the project owners from other regions may
provide justification to GCC for inclusion of technology in the positive list that is specific to
their region/countries.

20. The validity of the positive list of these technologies will remain for three years from the
date of approval of this methodology, which means the project owner may claim automatic
additionality if they implement the technologies listed in this positive list. After three years
analysis will be made whether the economic attractiveness of the implementation of these
technologies have improved substantially in Qatar, Kuwait and Oman resulting into their
sizeable share in the total grid-connected power generation. If so, the selected
technologies will be removed from the list and the list will be updated.

21. In addition to above, the project activities installing DPPs are automatically additional as
per “Standard for Key Project Requirements and Methodological Development”5 (Refer
section 3.6.1) in all host countries of the world.

9. Baseline emissions

22. Baseline emissions are calculated using the guidance provided in Baseline Guidelines.

23. 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-

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3 Available at https://globalcarboncouncil.com/resources/Standard-on-Key-Project-requirements-and-
Methodological-Development.pdf

GCC-2019.

5 Available at https://globalcarboncouncil.com/resources/Standard-on-Key-Project-requirements-and-
Methodological-Development.pdf
connected power plants and the addition of new grid-connected power plants. The baseline emissions are to be calculated as follows:

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

Equation (1)

Where:

- \( BE_y \) = Baseline emissions in year \( y \) (t CO\(_2\))
- \( EG_{PJ,y} \) = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the GCC project activity in project year \( y \) (MWh)
- \( EF_{grid,y} \) = CO\(_2\) emission factor for grid connected power generation in year \( y \) (t CO\(_2\)/MWh) determined as per one of the four options below:

(i) Combined margin CO\(_2\) 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 CO\(_2\)/MWh) of the CDM;  

Or  

(ii) Latest available emission factor of the Grid in a country as approved by CDM standardized baseline  

Or  

(iii) Latest available emission factor of the Grid in a country as approved by its relevant National Authority or Designated National Authority (DNA) under CDM or UNFCCC focal point, in case DNA doesn’t exist.  

Or  

(iv) Latest published Emission factor derived by International Energy Agency (IEA)\(^6\) (This option can be used only if it is objectively demonstrated that options (i), (ii) and (iii) above are not available).

24. The grid emission factor calculations shall be based on data from an official source (where available)\(^7\) and made publicly available.


\(^7\) For determining ‘Combined margin CO\(_2\) emission factor for grid connected power generation’ using the latest version of the “Tool to calculate the emission factor for an electricity system” (t CO\(_2\)/MWh) of the CDM, the plant emission factors used for the calculation of emission factors should be obtained in the following priority:

1. Acquired directly from the dispatch center or power producers, if available;

2. Calculated, if data on fuel type, fuel Emission Factor, fuel input and power output can be obtained for each plant. If confidential data available from the relevant host-country authority are used, the calculation carried out by the project owner shall be verified by the independent verifier and the project submission document may only show the resultant carbon emission factor and the corresponding list of plants;
10. Project emissions

25. For most renewable energy project activities, project emissions are equal to zero. However, CO₂ emissions from on-site consumption of electricity by project activity shall be calculated using the latest version of the CDM methodological tool “Tool to calculate baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation”.

26. In addition to the parameters mentioned in the monitoring section of this methodology, the parameters referred in the tool above shall be monitored.

11. Leakage emissions

27. No leakage emissions are anticipated under this methodology.

12. Emission reductions

28. Emission reductions are calculated as follows:

\[ ER_y = BE_y - PE_y - LE_y \]

Equation (2)

Where:

\[ ER_y = \text{Emission reductions in project year } y \text{ (t CO}_2\text{)} \]
\[ BE_y = \text{Baseline Emissions in project year } y \text{ (t CO}_2\text{)} \]
\[ PE_y = \text{Project emissions in project year } y \text{ (t CO}_2\text{)} \]
\[ LE_y = \text{Leakage emissions in project year } y \text{ (t CO}_2\text{)} \]

13. Monitoring methodology

29. All the assumptions made related to monitoring parameters should be explained and documented transparently in the project submission to GCC.

3. Calculated, as above, but using estimates such as: default IPCC values from the 2006 IPCC Guidelines for National GHG Inventories for net calorific values and carbon emission factors for fuels instead of plant-specific values technology provider’s nameplate power plant efficiency or the anticipated energy efficiency documented in official sources (instead of calculating it from fuel consumption and power output). This is likely to be a conservative estimate, because under actual operating conditions plants usually have lower efficiencies and higher emissions than nameplate performance would imply; conservative estimates of power plant efficiencies, based on expert judgments on the basis of the plant’s technology, size and commissioning date;

4. Calculated, for the simple operating margin (OM) and the average OM, using aggregated generation and fuel consumption data, in cases where more disaggregated data is not available.
13.1 Parameters for monitoring during the crediting period

Data / Parameter table 1.

<table>
<thead>
<tr>
<th>Data / Parameter:</th>
<th>( EF_{grid,y} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data unit:</td>
<td>( t , CO_2e/MWh )</td>
</tr>
<tr>
<td>Description:</td>
<td>( CO_2 ) emission factor of the grid electricity in year ( y )</td>
</tr>
<tr>
<td>Source of data</td>
<td>-</td>
</tr>
<tr>
<td>Measurement procedures (if any):</td>
<td>( CO_2 ) emission factor for grid connected power generation in year ( y ) (( t , CO_2/MWh )) determined as per one of the four options below:</td>
</tr>
<tr>
<td></td>
<td>(i) Combined margin ( CO_2 ) 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 , CO_2/MWh )) of the CDM;</td>
</tr>
<tr>
<td></td>
<td>Or</td>
</tr>
<tr>
<td></td>
<td>(ii) Latest available emission factor of the Grid in a country as approved by CDM standardized baseline</td>
</tr>
<tr>
<td></td>
<td>Or</td>
</tr>
<tr>
<td></td>
<td>(iii) Latest available emission factor of the Grid in a country as approved by its relevant National Authority or Designated National Authority (DNA) under CDM or UNFCCC focal point, in case DNA doesn’t exist.</td>
</tr>
<tr>
<td></td>
<td>Or</td>
</tr>
<tr>
<td></td>
<td>(iv) Latest published Emission factor derived by International Energy Agency (IEA) (This option can be used only if it is objectively demonstrated that options (i), (ii) and (iii) above are not available).</td>
</tr>
<tr>
<td>Monitoring frequency:</td>
<td>Once determined, the emission factor will remain fixed for the entire crediting period, unless option (i) is used and other specifications are provided in the “Tool to calculate the emission factor for an electricity system” of CDM.</td>
</tr>
<tr>
<td>Quality Procedures, if any.</td>
<td></td>
</tr>
<tr>
<td>Any comment:</td>
<td></td>
</tr>
</tbody>
</table>

Data / Parameter table 2.

<table>
<thead>
<tr>
<th>Data / Parameter:</th>
<th>( EG_{PJ,y} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data unit:</td>
<td>MWh</td>
</tr>
<tr>
<td>Description:</td>
<td>Quantity of net electricity generation supplied by the project plant/unit to the grid in year ( y )</td>
</tr>
<tr>
<td>Source of data</td>
<td>Electricity meter(s)</td>
</tr>
</tbody>
</table>
### Measurement procedures (if any):

This parameter should be either measured and monitored using bi-directional energy meter or calculated as difference between (a) the quantity of net electricity supplied by the project plant/unit to the grid; and (b) the quantity of electricity delivered to the project plant/unit from the grid.

When project involves implementation of several DPPs that require sample-based monitoring, the CDM’s “Standard: Sampling and surveys for CDM project activities and programme of activities” shall be applied by Project Owner.

In case it is calculated, then the following parameters shall be measured:

(b) The quantity of electricity supplied by the project plant/unit to the grid; and

(c) The quantity of electricity delivered to the project plant/unit from the grid

### Quality Procedures, if any.

The electricity meter measuring net electricity export to grid (and domestic consumption in case DPP also supplies for the internal use of Project Owner e.g. Rooftop PV unit supplying part electricity to house) will be subject to regular maintenance and testing in accordance with the stipulation of the meter supplier and/or as per the requirements set by the grid operators or national requirements. The calibration of meters, including the frequency of calibration, should be done in accordance with national standards or requirements set by the meter supplier or requirements set by the grid operators. The accuracy class of the meters should be in accordance with the stipulation of the meter supplier and/or as per the requirements set by the grid operators or national requirements. If these standards are not available, and meter supplier does not specify, calibrate the meters every 3 years and use the meters with at least 0.5 accuracy class (e.g. a meter with 0.2 accuracy class is more accurate and thus it is accepted).

### Monitoring frequency:

Continuous monitoring, hourly measurement and at least monthly recording.
### 14. Document History

<table>
<thead>
<tr>
<th>Version</th>
<th>Date</th>
<th>Comment</th>
</tr>
</thead>
</table>
| V 1.0   | 13/01/2020 | Initial adoption by GCC Steering Committee based on following: i. Consideration by individual steering committee member, followed by evaluation of entire steering committee  
                                      ii. 15-day global stakeholder consultation taken place between 25/11/2019 to 10/12/2019 |