

IFI Approach to GHG Accounting for Renewable Energy Projects

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Overview:

This note sets out a harmonized approach for assessing the mitigation benefits, or net greenhouse gas (GHG) emissions, of renewable energy (RE) projects in accordance with the International Financial Institution (IFI) Framework for a Harmonized Approach to Greenhouse Gas Accounting.¹ A Technical Working Group (TWG)² of IFIs has agreed to use a common set of emission factors for GHG accounting of electricity production from Renewable Energy (RE) projects.³ The purpose is to harmonize GHG accounting through the application of common emission factors to RE GHG calculations. Further iterations of this approach note will include the treatment of off-grid RE activities.

Renewable Energy (RE) Definition:

The RE definition follows the RE project typology defined by the Common Principles for Climate Mitigation Finance Tracking:⁴

- Wind power
- Geothermal power
- Solar power (concentrated solar power, photovoltaic power)
- Biomass or biogas power
- Ocean power (wave, tidal, ocean currents, salt gradient, etc.)
- Hydropower⁵

If the pre-investment facility has not reached the end of its technical life, the approach set out in the “IFI Approach to GHG Accounting for Energy Efficiency Projects” shall be followed.

Scope for calculations:

- Construction emissions for RE projects may be excluded
- Include Large Hydro reservoir emissions to balance the estimated savings
- Include biomass feedstock-related leakage emissions
- Include geothermal fugitive emissions

Project Power Output:

Assumptions for power generation capacity (MW) and project energy output (MWh) should be based on project appraisal documentation and the due diligence documentation of IFIs. Project emission calculations will also take into account adjustments for reservoir and fugitive emissions as well as leakage.

¹http://www.worldbank.org/content/dam/Worldbank/document/IFI_Framework_for_Harmonized_Approach_to_Greenhouse_Gas_Accounting.pdf

²The TWG for this methodology includes technical specialists from ADB, AfDB, AFD, EBRD, EIB, GEF, GIB, NIB, NEFCO, IDB, IFC, and WB, with support from the UNFCCC secretariat; to be widened to include more IFIs as work progresses. This note will be reviewed and updated periodically by the TWG.

³ This approach is generally consistent with similar approaches to account for GHG emissions from a broader set of power generation projects.

⁴ <http://www.worldbank.org/content/dam/Worldbank/document/Climate/common-principles-for-climate-mitigation-finance-tracking.pdf> ; <https://www.idfc.org/Press-And-Publications/other-publications.aspx>

⁵ Pumped storage hydropower plants are not considered renewable energy in this version of the note

Baseline Emissions Factors:

The main principles and assumptions for baseline emissions factors include:

- Energy generated from renewable sources will avoid emissions that would otherwise be generated wholly or partly from more carbon-intensive sources.
- For the purpose of promoting greater harmonization, the IFI GHG Accounting TWG maintains a common dataset containing Baseline Emission Factors (BEFs) for countries and for sub-national and interconnected grids where applicable. The common dataset of BEFs will be updated annually under responsibility of the TWG. Where an IFI has conducted its own country or project-related baseline study, the results of this study should be submitted to the TWG for consideration of inclusion in the common dataset during future annual updates.
- In those cases where a project is replacing specific planned generation capacity, each IFI is free to conduct its own assessment, which should be shared with the TWG. In all other cases, the BEF approach and the common dataset described will apply.

Available Data Sources for the Common Data Set:

The common dataset containing BEFs will be constructed using a *Combined Margin* (CM) for the grid that is comprised of an *Operating Margin* (OM) and a *Build Margin* (BM). The OM represents the marginal generating capacity in the existing dispatch hierarchy that will most likely be displaced by the project. The BM is the cohort of the prospective power plants whose construction and operation would be affected by the project, based on an assessment of planned and expected new generation capacity.

The common dataset will be comprised, where available, of UNFCCC standardized baselines (SBLs), which are based on the CDM Grid Tool⁶ or other approaches approved by the CDM Executive Board; and/or drawn from official country emission data sources developed by designated national authorities.

For other countries with certified and registered CDM projects, a dataset is derived from a *List of Grid Emission Factors* dataset managed and regularly updated by the Institute for Global Environmental Strategies. For each country, the following approach is used to derive the OM and BM data.

1. **Select the most recent years in which the CDM projects have been registered:** this data vintage range can be updated when IFIs review the common dataset.
2. **Calculate OM:** from the selected pool of CDM projects, identify OMs calculated by Simple OM, Simple Adjusted OM or, and Dispatch Data Analysis OM. Then average out the identified OMs.
3. **Calculate BM:** average out BMs from the selected project pool of CDM projects.
4. **Calculate CM:** add average OMs and BMs using appropriate weighting as defined below. Alternative weights may be agreed by IFIs in the future.

If new or additional CDM project data becomes available then these data will be assessed by the TWG for the annual update of the common dataset. If there is a validated project (in the current or most recent previous year) under CDM providing specific emission factor data

⁶ Methodological tool: Tool to calculate the emission factor for an electricity system, http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v4.0.pdf/history_view

then the IFI may consider to use these data instead of the CM on the common dataset, with the requirement that the IFI will share these data with the TWG for consideration for the next annual update of the EF common dataset of emission factors.

Constructing proxy BEF where data is not readily available:

For the remaining countries where neither relevant official UNFCCC nor applicable CDM/JI data (as defined above) is available, the alternative approach (defined below) to estimating the OM-BM will be used to populate the common dataset, based on International Energy Agency (IEA) emissions data⁷.

As better data becomes available that will feed into the process, e.g. through developing additional SBLs in collaboration with UNFCCC, then these data may be considered for the next update of the TWG common dataset. Likewise, where an IFI has conducted a country or project-related emission factor study, the results of this study can be submitted to the TWG and UNFCCC for consideration of inclusion in the joint dataset in future updates.

Calculating the OM:

- The IEA database specifies the country's generation mix and related emissions for the following fuel types: gas, oil, coal and other (mainly hydro, renewables and nuclear). The common dataset uses a 3 year rolling average of the IEA data.
- It is assumed that hydropower, other renewables and nuclear are likely to be must-run⁸ resources in most countries, while gas, oil and coal are considered most likely to be on the margin.
- Oil and gas-based generation are assumed to be highest on the fossil merit order and most likely to be replaced on the margin by any incoming new renewable generation. The bottom 50% of the merit order is assumed to be unaffected by any new generation and is not considered for the OM calculation.
- In countries where RE accounts for a significant share of the energy mix (>50%), an adjustment factor (λ) is introduced as a proxy for the share of low cost and must-run generation output that is potentially not dispatched and can be displaced by new generation. This adjustment will bring the OM calculation in line with the Simple Adjusted OM method covered under the CDM Grid Tool.

Calculating the BM:

- The BM is based on the future developments of the country's' likely generation mix over a time horizon of 5-10 years. The development of some new renewable energy generation is assumed for all countries.

⁷ OECD/IEA. CO₂ Emissions from Fuel Combustion – Highlights. Retrieve from:

<http://www.iea.org/publications/freepublications/publication/name,32870,en.html>

⁸ Must-run resources are defined by the UNFCCC as "power plants with low marginal generation costs or dispatched independently of the daily or seasonal load of the grid. They include hydro, geothermal, wind, low-cost biomass, nuclear and solar generation. Methodological tool: Tool to calculate the emission factor for an electricity system, Version 4, <https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v4.0.pdf>

- Until the development of an agreed BM dataset, an interim BM will be calculated as a weighted average of the generating mix in the country based on the fuels used (IEA data). For each type of generation (gas, oil, coal, other) a GHG emission factor is applied taking into account the impact of Best Available Technology data based on a common agreed list of applicable BAT (e.g. as defined by the UNFCCC in the CDM Grid Tool).
- As better country information becomes available on expected future developments in new generation capacity, the database will be updated. The BM may be characterised by a limited set of generic emissions profiles, each corresponding to a range of generation mixes that result in similar GHG emissions⁹.
- The TWG will periodically review the initial set of country profiles on the basis of available information and cross checks as these BMs are piloted going forward.

Combining the OM and BM to construct the CM BEF:

The common dataset will initially consist of a CM arrived at by combining the OM and BM, using the following weighting:

- For variable generation (e.g. most wind and solar PV), the weighting is 75% OM: 25% BM.
- For firm generation (e.g. hydropower, geothermal and biomass), the weighting is 50% OM: 50% BM.

Over time, the TWG in coordination with the UNFCCC, will consider future modifications of the weights applied between OM and BM to account for additional factors, such as countries with high or low demand growth¹⁰.

Calculating Baseline Emissions:

In the calculation, the energy production of the project is multiplied by the CM emission factor in tCO₂e/MWh.

⁹ The first version of the BEF common database based on the existing generation mix (IEA data) within 2015. An updated version may include BMs based on mapping against generation profiles.

¹⁰ Until more definitive guidance is available, the IFI should transparently document and share with the TWG any alternative weighting proposal for a specific country.