# CERT

Certified Emissions Reduction Technologies Foundation

# GRID-CONNECTED ELECTRICITY GENERATION FROM RENEWABLE SOURCES

*CERT Methodology · Sectoral Scope: Renewable Energy · Version 1.0*

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## Document Control

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## Version History

| Version | Date | Author | Description |
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| 1.0 | 2026-07-02 | CERT Founding Secretariat | Initial draft for founding Board review and public consultation. |

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# 1. Summary Description

This methodology applies to grid-connected electricity generation from renewable sources — wind (onshore and offshore), geothermal, terrestrial and floating solar photovoltaic, wave, tidal, and small hydroelectric plants — including greenfield plants, capacity additions, retrofits, rehabilitations, and replacements, and plants integrated with battery energy storage systems (BESS). Emission reductions arise from the displacement of grid electricity that would otherwise have been generated by grid-connected power plants, predominantly fossil-fuelled. Baseline emissions equal net electricity supplied to the grid multiplied by the grid emission factor determined under CERT-TOOL-004.

Sectoral scope: Renewable Energy (Energy Supply). Activity type: emission reduction. Project family: non-nature-based — no Buffer Pool contribution applies (Rulebook 10.1A).

# 2. Sources

This methodology draws on internationally recognised methodological practice for grid-connected renewable electricity under the UNFCCC Clean Development Mechanism, including concepts from consolidated methodology ACM0002 and related methodological tools, adapted to and superseded by the requirements of the CERT Registry Rulebook (CERT-REG-001). It must be used with the following CERT tools (current versions):

- CERT-TOOL-001 Additionality Assessment (Investment Analysis).
- CERT-TOOL-002 Combined Baseline and Additionality Assessment (retrofit, rehabilitation and replacement projects only).
- CERT-TOOL-003 Emissions from Electricity Consumption and Generation.
- CERT-TOOL-004 Electricity System Emission Factors.

# 3. Definitions

| Term | Definition |
|---|---|
| Grid / electricity system | The regional or national electricity system to which the project plant is connected, comprising generating units that can be dispatched without significant transmission constraint, as delineated under CERT-TOOL-004. |
| BESS | Battery energy storage system: an electrochemical storage installation charging from and discharging to the grid and/or the project plant. |
| Greenfield plant | A new renewable energy power plant constructed and operated at a site where no power plant operated before the implementation of the project. |
| Capacity addition | An increase in installed capacity of an existing plant through new units, operating alongside the existing units. |
| Retrofit / rehabilitation / replacement | Investment to restore or improve an existing plant (or replace it) without/with change of installed capacity, as applicable. |
| Purpose-built wheeling arrangement (PBWA) | A contractual arrangement wheeling electricity from a specified generation facility to a specified consumer through the grid, as defined in CERT-TOOL-003. |

Definitions of the CERT Registry Rulebook otherwise apply.

# 4. Applicability Conditions

**4.1** The project activity corresponds to one or more rows of Table 1.

| Technology | Capacity | Eligible geographies |
|---|---|---|
| Wind (onshore and offshore); geothermal; terrestrial solar PV; floating solar PV | Any | Low-, lower-middle- and upper-middle-income countries (per the World Bank Country and Lending Groups classification current at the time of listing) |
| Wave; tidal | Any | Globally applicable |
| Hydroelectric | 15 MW or less (the higher of rated capacity or authorised capacity in the regulatory approval) | Least Developed Countries (per the UN list) only |

**4.2** Temporal eligibility — project cutoff. The project start date (Rulebook / CERT-TMP-001 §1.8) is on or after 1 January 2007. Projects with a start date before 1 January 2007 are not eligible under this methodology.

**4.3** Retrospective issuance cutoff. Notwithstanding the crediting period, CRUs shall not be issued for emission reductions achieved before 1 January 2021. Monitoring periods may span this date only where monitored data permit unambiguous separation of pre- and post-cutoff generation; reductions achieved before 1 January 2021 shall be reported but flagged non-creditable.

**4.4** Where the project integrates a BESS: the BESS and the renewable plant are located on the same site, directly connected to each other, share a single grid interconnection/metering point, are owned and operated by the same entity, and form part of the same investment decision.

**4.5** Hydroelectric projects must not involve new reservoirs, or increases of existing reservoir area, with power density below the thresholds set out in Section 8.2; projects creating significant new reservoirs must additionally satisfy the safeguards requirements of Rulebook 4.2 for affected communities and ecosystems.

**4.6** The applicability conditions of the CERT tools listed in Section 2 also apply. Regulatory surplus is an eligibility condition (Rulebook 5.2A): capacity that is mandated by enforced law, regulation or binding obligation is not eligible for crediting.

# 5. Project Boundary

The spatial extent of the project boundary encompasses the project power plant(s), the BESS where applicable, and all power plants connected physically to the electricity system to which the project plant is connected. GHG sources included: CO2 emissions from grid electricity generation displaced (baseline); project emissions per Section 8.2 (CO2, CH4, and fire-suppression agents as CO2e). Excluded, with justification of conservativeness: N2O from combustion in grid plants (minor, conservative to exclude from baseline).

# 6. Baseline Scenario

**6.1** Greenfield plants, capacity additions and BESS integration: the baseline scenario is that the electricity delivered to the grid by the project would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources to the grid, as reflected in the combined margin calculated under CERT-TOOL-004.

**6.2** Retrofit, rehabilitation or replacement projects: identify the baseline scenario using CERT-TOOL-002, where the alternatives assessed must include: (a) P1 — the project undertaken without registration under any GHG programme; (b) P2 — continuation of the current situation, with business-as-usual maintenance, the additional power being generated by existing and new grid-connected plants; and (c) P3 — all other plausible, technically feasible alternatives available to the proponent providing an increase in power generated at the site, including different levels of replacement, retrofit or rehabilitation. Where more than one alternative remains after the legal-compliance screen: apply the investment comparison analysis of CERT-TOOL-002 Step 2 where the remaining alternatives include P1 and P3, or the benchmark analysis of CERT-TOOL-001 Step 2 (Option 2) where they include P1 and P2.

# 7. Additionality

**7.1** Additionality shall be demonstrated and assessed using CERT-TOOL-001, applying exactly two elements: (a) the regulatory surplus eligibility condition of Rulebook 5.2A; and (b) the investment analysis of CERT-TOOL-001 Step 2, with mandatory sensitivity analysis. For projects applying benchmark analysis, the project documents must record the results of each demonstration element of CERT-TOOL-001 Step 2 (Option 2).

**7.2** No other demonstration is required or accepted. In particular, barrier analysis and common practice analysis are not applicable under this methodology and shall not appear in project documents (Rulebook 5.1; CERT-TMP-001 §3.5). Simplified or automatic additionality procedures are not available under this methodology.

# 8. Quantification of Emission Reductions

## 8.1 Baseline Emissions

$$BEy = EGPJ,y \times EFgrid,CM,y \qquad (1)$$

**Where:**

***BEy*** = Baseline emissions in year y (t CO2/yr)

***EGPJ,y*** = Quantity of net electricity generation supplied to the grid as a result of the project activity in year y (MWh/yr); for greenfield plants, total net generation; for capacity additions, retrofits, rehabilitations and replacements, determined per Equations (2)–(3)

***EFgrid,CM,y*** = Combined margin CO2 emission factor of the grid in year y, calculated under CERT-TOOL-004 (t CO2/MWh)

**8.1.1** For capacity additions: EGPJ,y = EGtotal,y − EGhistorical, where EGhistorical is the average annual net generation of the existing units over the three most recent years prior to implementation.

$$EGPJ,y = EGtotal,y - EGhistorical \qquad (2)$$

**8.1.2** For retrofits, rehabilitations and replacements: EGPJ,y = EGtotal,y − max(EGhistorical, EGbaseline,estimated), applied conservatively per the baseline scenario determined in Section 6.2.

$$EGPJ,y = EGtotal,y - max(EGhistorical, EGbaseline) \qquad (3)$$

**8.1.3** Retrospective issuance cutoff. In applying Equation (1), EGPJ,y shall include only electricity generated on or after 1 January 2021 (Section 4.3).

## 8.2 Project Emissions

For most renewable generation projects PEy = 0. Where applicable, project emissions are:

$$PEy = PEFF,y + PEGP,y + PEHP,y + PEBESS,y + PEPSP,y + PEFSS,y \qquad (4)$$

**Where:**

***PEFF,y*** = Project emissions from on-site fossil fuel consumption in year y (t CO2/yr), calculated from fuel quantities and IPCC default emission factors

***PEGP,y*** = Project emissions from operation of dry, flash-steam or binary geothermal plants in year y (t CO2e/yr), from measured steam non-condensable gas fractions (CO2 and CH4)

***PEHP,y*** = Project emissions from water reservoirs of hydropower and pumped-storage plants in year y (t CO2e/yr), per Clause 8.2.1

***PEBESS,y*** = Project emissions from charging the BESS with grid or fossil-generated electricity (t CO2e/yr), calculated per Scenario A (Grid Electricity System) of CERT-TOOL-003

***PEPSP,y*** = Project emissions from grid electricity used for pumping in pumped-storage operation in excess of the coordinated renewable plant's production (t CO2e/yr), calculated per Scenario A of CERT-TOOL-003

***PEFSS,y*** = Project emissions from release of BESS fire-suppression agents (t CO2e/yr), per Clause 8.2.2

**8.2.1** Hydropower reservoir emissions. Where power density (installed capacity divided by reservoir surface area at full level) exceeds 10 W/m², PEHP,y = 0. Where power density is between 4 and 10 W/m²:

$$PEHP,y = (EFRes \times EGfacility,y) / 1000 \quad (5)$$

Projects with power density at or below 4 W/m² are not eligible. EFRes takes the default value in Section 9.

**8.2.2** BESS fire-suppression agents. Projects should employ zero- or low-GWP agents (GWP < 1). Where agents with GWP > 1 are used, emissions from any release event e in year y are:

$$PEFSS,y = \Sigma e \, ( Me,released,y \times GWPagent ) \quad (6)$$

**Where:**

***Me,released,y*** = Mass of fire-suppression agent released to the atmosphere in event e in year y (tonnes)

***GWPagent*** = Global warming potential of the agent, 100-year time horizon, per the IPCC assessment report specified by the Rulebook (t CO2e/tonne)

## 8.3 Leakage Emissions

Leakage comprises the embodied life-cycle emissions of the renewable plant — construction, upstream manufacturing and transport, operation, and decommissioning — parameterised against net generation output:

$$LEy = LEembodied = EGfacility,y \times EFembodied \times 10^{-3} \quad (greenfield\ plants) \quad (7)$$

$$LEy = LEembodied = EGPJ\_Add,y \times EFembodied \times 10^{-3} \quad (capacity\ additions) \quad (8)$$

**Where:**

***EGfacility,y*** = Net electricity supplied to the grid by the project plant/unit in year y (MWh/yr)

***EGPJ_Add,y*** = Net electricity supplied to the grid in year y by the plant/unit added under the project (MWh/yr)

***EFembodied*** = Emission factor for embodied emissions of the plant, by technology, per Section 9 (g CO2e/kWh)

## 8.4 Net Emission Reductions

$$ERy = BEy - PEy - LEy \quad (9)$$

ERy is the quantity of CRUs eligible for issuance for year y, subject to the retrospective issuance cutoff (Section 4.3). As a non-nature-based activity, no Buffer Pool deduction applies (Rulebook 10.1A).

# 9. Monitoring

## 9.1 Data and Parameters Available at Validation

| Field | Detail |
|---|---|
| Parameter | EFRes |
| Unit | kg CO2e/MWh |
| Description | Default emission factor for hydropower reservoir emissions |
| Equations | (5) |
| Source | International hydropower sustainability guidance on good international industry practice |
| Value applied | 100 |
| Purpose | Calculation of project emissions |
| **Field** | **Detail** |
| Parameter | EFembodied |
| Unit | g CO2e/kWh |
| Description | Embodied life-cycle emission factor of the renewable plant, by technology |
| Equations | (7), (8) |
| Source | Peer-reviewed life-cycle assessment literature or IPCC AR lifecycle medians for the technology; the value applied must be justified and conservative |
| Value applied | Per technology; fixed at validation |
| Purpose | Calculation of leakage emissions |
| **Field** | **Detail** |
| Parameter | GWPagent |
| Unit | t CO2e/tonne |
| Description | 100-year GWP of any BESS fire-suppression agent with GWP > 1 |
| Equations | (6) |
| Source | IPCC assessment report specified by the Rulebook |
| Value applied | Per agent |
| Purpose | Project emissions |

## 9.2 Data and Parameters Monitored

| Field | Detail |
|---|---|
| Parameter | EGtotal,y / EGfacility,y / EGPJ_Add,y |

| | |
|---|---|
| Unit | MWh/yr |
| Description | Net electricity supplied to the grid (total; by facility; by added unit), gross generation minus auxiliary consumption and transformation losses |
| Measurement | Revenue-grade energy meters at the grid interconnection point, read at least monthly, calibrated per national standards or manufacturer specification (at minimum every 3 years); cross-checked against grid operator settlement records |
| QA/QC | Dual metering (main and check meter) required above 15 MW; digital MRV feed to the CERT Registry where available |
| Purpose | Baseline emissions; leakage |
| **Field** | **Detail** |
| Parameter | ECBESS,charge,y (grid/fossil charging electricity) |
| Unit | MWh/yr |
| Description | Electricity used to charge the BESS from the grid or fossil generators |
| Measurement | Metered at BESS point of connection; monthly |
| QA/QC | Reconciled with plant SCADA records |
| Purpose | Project emissions (CERT-TOOL-003) |
| **Field** | **Detail** |
| Parameter | Me,released,y |
| Unit | tonnes |
| Description | Mass of fire-suppression agent released per event |
| Measurement | Agent inventory reconciliation after any discharge event; incident records |
| QA/QC | Maintenance logs; refill invoices |
| Purpose | Project emissions |

## 9.3 Monitoring Plan Requirements

The monitoring plan (CERT-TMP-001 §5.2) must specify metering architecture and calibration schedules, data flows (with digital MRV integration to the CERT Registry where available), responsibilities, QA/QC procedures, and conservative data-gap treatment (gap-filling with the lowest plausible generation for baseline purposes). Records are retained per Rulebook requirements.

# 10. References

- CERT Registry Rulebook (CERT-REG-001), in particular Sections 3–8 and 10–12.
- CERT-TOOL-001 Additionality Assessment (Investment Analysis); CERT-TOOL-002 Combined Baseline and Additionality Assessment; CERT-TOOL-003 Emissions from Electricity Consumption and Generation; CERT-TOOL-004 Electricity System Emission Factors.
- UNFCCC Clean Development Mechanism, consolidated methodology for grid-connected electricity generation from renewable sources (ACM0002) and associated methodological tools, as conceptual antecedents.
- IPCC Guidelines for National Greenhouse Gas Inventories; IPCC Assessment Report GWP values as specified by the Rulebook.
- World Bank Country and Lending Groups classification; UN list of Least Developed Countries.