The GHG emission avoidance calculation in practice

Renewable energy

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Renewable energy | Scope

Previously named : electricity, heat and cooling.

Clarification of the scope:
This section applies to innovative renewable energy projects for the purpose of generating electricity and heating/cooling, including:

- electricity and/or heat produced from biomass*
- fuels derived from biomass*,
- heat pumps,

- And the use of renewable energy outside the activities falling within Annex I of the ETS.

* See next slide

Renewable energy | Biomass

* Note that while **projects producing renewable energy from biomass should apply using the calculation rules in this Chapter**, they should be classified under the category/sector EII/other with the product dispatchable electricity and/or bio-heat.

- Projects involving CCS at existing renewable power facilities : apply under the category/sector/product EII/Other/Storage and follow the EII methodology, using Case 7 (BECCS) or Case 3 (any projects other than BECCS) for reference emissions.

Renewable energy | Consumption

Projects for the use of renewable energy outside Annex I must consume solely energy that is wholly renewable.

In the case of electricity, this must be through procurement of additional renewable electricity.

For example:

- electricity supplied by a direct connection to a dedicated renewable source;
- wind electricity delivered by the grid, that would otherwise be curtailed;
- hydroelectricity that has insufficient demand in the region and will probably be insufficiently connected to the rest of the grid even in 2030 to allow all of it to be used;
- renewable electricity supplied under a PPA with additional renewable power plants.

Renewable energy | Manufacturing

Manufacturing of components for renewable energy installations (e.g., production of innovative heat pumps, photovoltaic modules and wind turbines).

In that case, applicants shall demonstrate the existence of one or several buyers (i.e., companies that will use the innovative technology to generate renewable electrical or thermal energy) through provisional contract agreements to ensure accountability over the intended GHG emission avoidance,

For information on how GHG emission avoidance will be calculated for such projects, please refer to section 4.2.3: In brief, GHG emissions assessed proportionally to the economic value of the component.

Renewable energy | Project and Reference Scenarios

System boundary: intend to simplify while capturing the main emissions sources.

Project scenarios include leakage for LSC and operation emission (e.g., geothermal).

For the sake of simplification, and to enable a fair competition between projects, the reference scenario has been **pre-defined for all projects** producing the same output (principal products), despite the regional differences that will invariably be observed in real life:

- non-dispatchable grid electricity : 48.81 g CO_2e/MJ (175 gCO2eq/kWh)
- dispatchable grid electricity: 140 g CO2e/MJ (504 gCO2eq/kWh)
- renewable heating, a natural: 62.3 g CO_2e/MJ.

Sum over 10 years to calculate absolute and relative GHG emission avoidances.

Renewable energy | With storage

For projects that include physical or virtual storage of renewable electricity at times **when there is an excess of it in the grid**, e.g., smart grid applications, should be considered as **hybrid projects**.

They should split their feed-in of renewable electricity generated by the project into a storage component and the residual uncontrolled feed-in. In order to claim such a credit the applicant must **provide details of their plan to manage power consumption to coincide with times when the emissions of the electricity supply are below average** (i.e., consume electricity when its emissions are low"). The emission avoidance of the storage component shall be calculated as in section on emissions accounting for energy storage (see section 5).

Renewable energy | Example (1/2)

Potential manifest error: unrealistic, too simplistic and/or non evidenced approach to estimate on-site emissions.

Potential clerical error: omission of Projelect,y (given that EFelectricty,proj = zero).

1. Description: The project foresees the innovative conversion of biogenic residues into heat, which will be sold to a nearby cement industry currently purchasing heat from a coal-fired CHP plant, and to the city where the project is based as district heating
2. Classification: EII → Other → Heat
3. Methodology section: RES, Section 4 of Annex C
4. Reference: Heating is supplied by natural gas boilers

$$\Delta GHG_{abs} = \sum_{y=1}^{10} (Ref_y - Proj_y) = \sum_{y=1}^{10} \left(Ref_{heat} - Proj_{onsite} \right) = \sum_{y=1}^{10} Ref_{heat} - \left(Proj_{FF,stat,y} + Proj_{FF,mob,y} + Proj_{elect,y} \right)$$

$Q_{FF\_stat,y} * EF_{FF}$

$Q_{FF\_mob,y} * EF_{FF}$

$EC_y * EF_{electricity,proj}$

5. Data:
   - QFF_stat/mob,y= Quantity of fossil fuel type FF combusted in stationary or mobile sources at the project site in year y, in litres or m^3.
   - ECy = Amount of electricity imported from the grid and consumed at the project site in year y, in MWh.

Renewable energy | Example (2/2)

And where

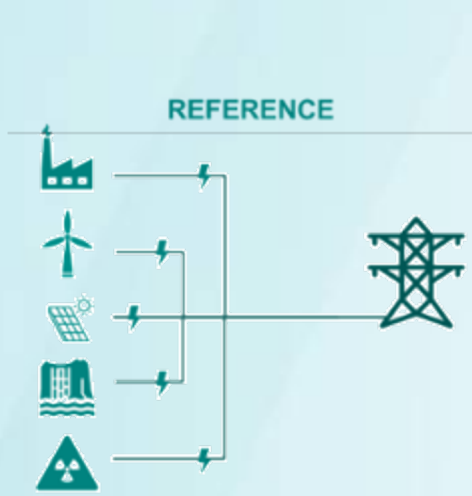
$$Ref_{heat} = P_{heat} * PLF * T_y * EF_{NG} / 0.90$$

Data:

- P_{heat} = Installed capacity, i.e. maximum thermal power output, in Watts.
- PLF = Plant Load Factor, i.e. plant's capacity utilisation, in %
- T_y = operating hours in year y, in hours

Production facilities of components for RES and energy storage

$$\Delta GHG_{abs} = \sum_{y=1}^{10} (Ref_y - Proj_y) = \sum_{y=1}^{10} \left(\right.$$



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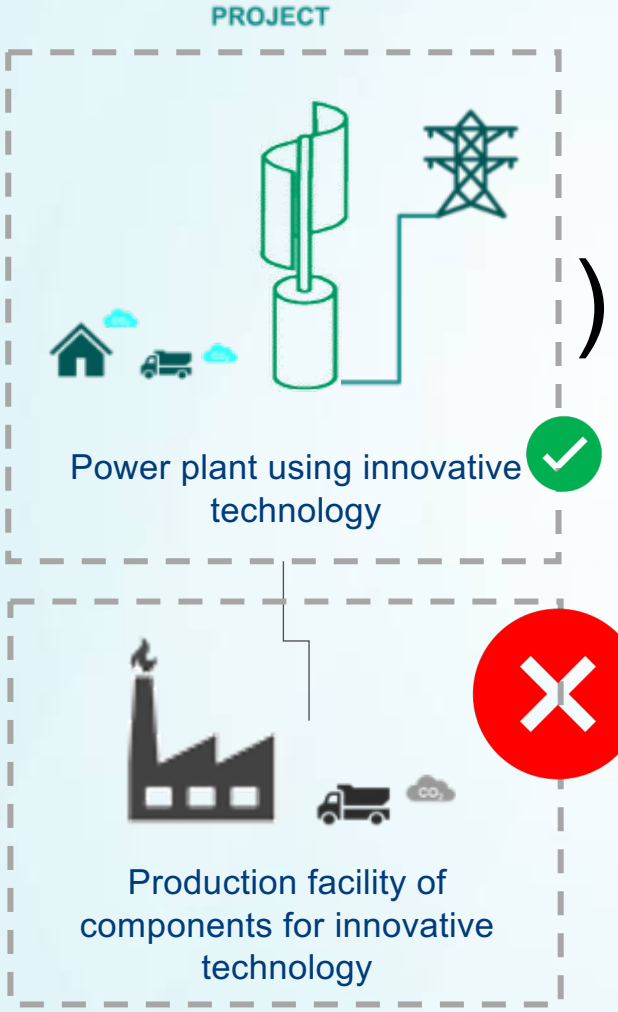

$\left. \right)$

GHG avoidance will be equal to the emissions saved by the innovative technology when operating

Emissions due to the manufacturing are **out of the scope of GHG avoidance calculations**

European Commission

Production of components for RES Example: blades for floating wind turbines for RES electricity

Potential manifest error: unrealistic and non-evidenced number of blades sold; components not sold on the EU + NO + IS market.

1. Description: Project envisages production of an innovative blade for use in floating wind power plants; the innovative blade has a higher capacity factor than a conventional blade.
2. Classification: Renewable energy → wind energy → electricity
3. Methodology section: RES, Section 4 of Annex C
4. Reference: Electricity is supplied by the EU grid mix (reference year 2030)

The applicant will have to demonstrate the existence of a buyer of the technology (i.e. a company that will run the floating wind power plant) to ensure the accountability over the promised GHG avoidance

$$\Delta GHG_{abs} = \sum_{y=1}^{10}(Ref_y - Proj_y) = \sum_{y=1}^{10} N_y * CS \left(Ref_{elect} - Proj_{onsite} \right) = \sum_{y=1}^{10} CS * EG_{elec,y} * EF_{elec,ref} - Proj_{onsite} * N_y * CS$$

$$CS * P_{elec} * PLF * T_y * EF_{electricity,ref} - Proj_{onsite,\ total}$$

Example:

$$0.6 \times (100\ MW + 300\ MW + 400\ MW + \ldots + 400\ MW) * 45\% * 8400\ hours/year * EF_{grid,ref} - Proj_{onsite,\ total}$$

Applicants will have to present the rationale for the projected performance of the component as well as of other components that will be needed at the power plant, but not necessarily manufactured at the same facility.

CS is the innovative components' cost as a fraction of the total capital cost

Evidenced assumption of the total capacity installed until Years 1 – 10

Average capacity factor achieved

Assumption of operating hours

See also the GHG calculator example: Renewable electricity and renewable heating