Renewable energy sources Overview and calculation

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Scope

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

Generation of renewable energy	Dispatchable or non-dispatchable electricity and/or heat produced from wind, solar, geothermal, ocean power plants
	Dispatchable or non-dispatchable electricity and/or heat produced from biomass. **Note**: fuels derived from biomass fall under EII.
	Heat pumps
Use of renewable energy outside the ETS Annex I activities	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
Manufacturing of components for RES installations	e.g., production of innovative heat pumps, photovoltaic modules and wind turbines. 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.

Credit for carbon removals: Projects involving capture of CO_2 at existing RES facilities shall 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.

Boundaries

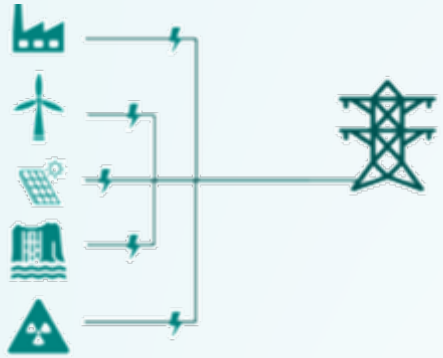
Scenario	Emission source	Large and medium scale projects	Small scale projects
Reference	GHG emissions for the generation of electricity, heating or cooling in fossil fuel power plants, which will be replaced due to the project activity	Yes	Yes
Project	GHG emissions due to consumed electricity and fossil fuel in stationary machinery and on-site vehicles at the project site(s)	Yes	No
	GHG emissions due to leakage during the operation of geothermal power plants, and from the production and supply of biomass-based fuels	Yes	Yes

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.

Absolute GHG emissions avoidance

Generation or use of renewable energy

$$\Delta GHG_{abs} = \sum_{y=1}^{10} (Ref_y - Proj_y) = \sum_{y=1}^{10} \Big(\quad - \quad \Big)$$



$$= \sum_{y=1}^{10} \Big(Ref_{grid\ /\ heat\ /\ cool} - \big(Proj_{onsite} + Proj_{bio} + Proj_{geo} \big) \Big)$$

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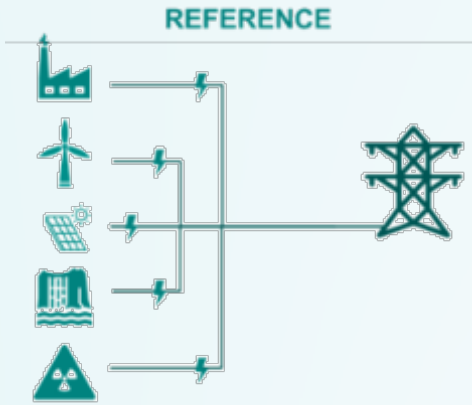
Absolute GHG emissions avoidance

Manufacturing of components for RES installations

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



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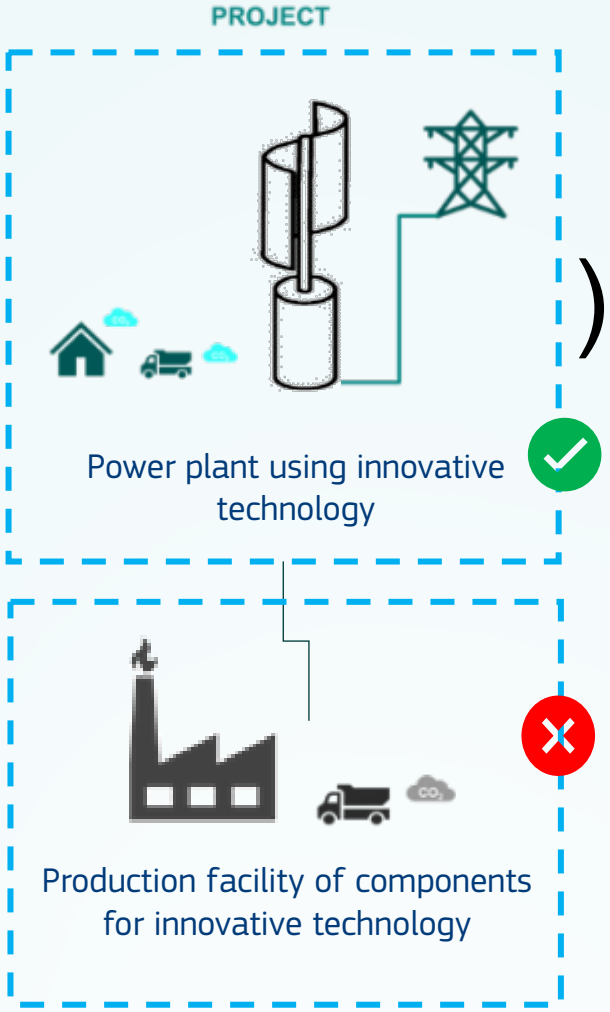

$$\left. \right)$$

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

The applicant has to:

- Demonstrate the **existence of a buyer of the technology** (i.e. a company that will run the wind power plant) in the EU + NO + IS market to ensure the accountability over the promised GHG avoidance, and
- 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.

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

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Example RES
Renewable heating

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

1. Description: The project foresees the 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 / Methodology: RES, Section 4
3. Reference: Heating is supplied by natural gas boilers

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

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

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

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

$$EC_y * EF_{grid,proj}$$

Where:

- 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 m3.
- ECy = Amount of electricity imported from the grid and consumed at the project site in year y, in MWh.
- Pheat = Installed capacity, i.e. maximum thermal power output, in Watts.
- PLF = Plant Load Factor, i.e. plant's capacity utilisation, in %
- Ty = operating hours in year y, in hours

Example RES

Production of blades for floating wind turbines for RES electricity

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: RES → Manufacturing of components for renewable energy → wind plants and their components / Methodology section: RES, Section 4
3. Reference: Electricity is supplied by the EU grid mix (reference year 2030)

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

$$CS * N_y * P_{elec} * PLF * T_y * EF_{elec,ref} - CS * N_y * (Proj_{FF,stat} + Proj_{FF,mob} + Proj_{elect})$$

Example:

$$0.6 * (100\ MW + 300\ MW + 400\ MW + \ldots + 400\ MW) * 45\% * 8400\ hours/year * EF_{elec,ref}$$

- 0.6: Cost of the innovative component as a fraction of the total capital cost
- (100 MW + 300 MW + 400 MW + ... + 400 MW): Evidenced assumption of the cumulated capacity installed until Years 1 – 10
- 45%: Average capacity factor achieved
- 8400 hours/year: Assumption of operating hours

Potential SIW: unrealistic and non-evidenced number of blades sold

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