we are ICF

GHG emissions avoidance methodologies

First stage of application for proposals under the Innovation Fund

Prepared by Laura Pereira (ICF Associate) & Jakob Wachsmuth (Fraunhofer ISI)

Fraunhofer ISI

milieu Law & Policy Consulting

TURQUOISE Finance | Energy, Environment, Efficiency

15 September 2020

Content of the presentation

Intro	11:00h – 11:10h
Application of First Stage Methodologies | Recap of the GHG avoidance methodologies and examples	11:10h – 11:20h
Q&A | Frequently Asked Questions + Slido	11:20h

Intro

Recap of the application process

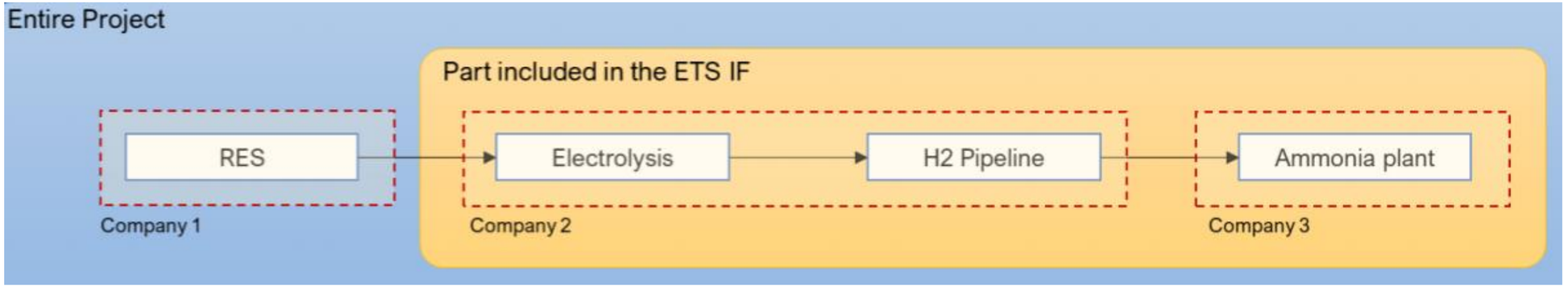
Submitting an application

Step by step

1. Define project and organisational boundaries
2. Classify your project
3. Identify the appropriate methodology and tools, if any
4. Identify the reference scenario for your project type and sector
5. Apply your projected operational data to adequate(s) methodology(ies)
6. Upload estimated GHG emissions avoidance to submission portal alongside supporting calculation tool

Source: Adapted from INEA, 2020. *Innovation Fund First stage of the large scale call. Application procedure*

1. Define project and organisational boundaries
2. Classify your project
3. Identify the appropriate methodology and tools, if any
4. Identify the reference scenario for your project type and sector
5. Apply your projected operational data to adequate(s) methodology(ies)
6. Upload estimated GHG emissions avoidance to submission portal alongside supporting calculation tool



Source: Adapted from INEA, 2020. *Innovation Fund First stage of the large scale call. Application procedure*

1. Define project and organisational boundaries
2. Classify your project
3. Identify the appropriate methodology and tools, if any
4. Identify the reference scenario for your project type and sector
5. Apply your projected operational data to adequate(s) methodology(ies)
6. Upload estimated GHG emissions avoidance to submission portal alongside supporting calculation tool

Category of the project (drop down list) *Annex C, Methodology for calculation of GHG emission avoidance, Appendix C1 Classification of projects into sectors*	[category name from list: (Energy storage, Renewable energy, Energy Intensive Industries, Energy intensive industries, CCS]
Sector of the project (drop down lists)	[sector name from list: (Intra-storage, Other energy storage, Solar energy, Hydro/Oce Geothermal energy, Bio-electrici Heating/Cooling, Refineries, Bic refineries, Iron & steel, Non-f Cement & lime, Glass, construction material, Pulp Chemicals, Hydrogen, Other, C and Storage)]
Products within sector	[product name from list: (if subs indicate the product substituted)

Annex C, Methodology for calculation of GHG emission avoidance, Appendix C1 Classification of projects into sectors

Category	Sector	Product
Energy storage, incl. manufacturing plants for components	Intra-day electricity storage	electricity
	Other energy storage	electricity, heating/cooling, e-fuels, hydrogen
Renewable energy, incl. manufacturing plants for components	Wind energy	electricity
	Solar energy	electricity
	Hydro/Ocean energy	electricity
	Geothermal energy	electricity, CHP
	Bio-electricity	electricity, CHP
	Renewable Heating/Cooling	heating/cooling
Energy Intensive Industries, incl. CCU, incl. substitute products, incl. CCS (CO2 capture and full scale)	Refineries	fuels (incl. e-fuels)
	Biofuels and bio-refineries	biofuel, bio-based products
	Iron & steel	coke, iron ore, iron, steel, cast ferrous metals products, other
	Non-ferrous metals	aluminium, precious metals, copper, cast non-ferrous metal products, other
	Cement & lime	cement, lime, dolime, sintered dolime, other
	Glass, ceramics & construction material	flat & container glass, glass fibres, tiles, plates, refractory products, bricks, houseware, sanitary ware, mineral wool, gypsum, other
	Pulp & paper	chemical pulp, mechanical pulp, paper and paperboard, sanitary and tissue paper, other
	Chemicals	organic basic chemicals, inorganic basic chemicals, nitrogen compounds, plastics in primary forms, synthetic rubber, other
	Hydrogen	hydrogen
	Other	electricity, heat, other
CCS (CO2 transport and/or storage)	CO2 transport and/or storage	CO2 transport and/or storage

1. Define project and organisational boundaries
2. Classify your project
3. Identify the appropriate methodology and tools, if any
4. Identify the reference scenario for your project type and sector
5. Apply your projected operational data to adequate(s) methodology(ies)
6. Upload estimated GHG emissions avoidance to submission portal alongside supporting calculation tool

Production and use of **renewable energy**, including manufacturing plants for components

Carbon capture and use or storage

Fostering low-carbon transition by supporting the insertion of innovative low-carbon technologies into the market

Low carbon products from **energy-intensive industries**, including substitute products

Energy storage including manufacturing for components

Absolute GHG emissions avoidance

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

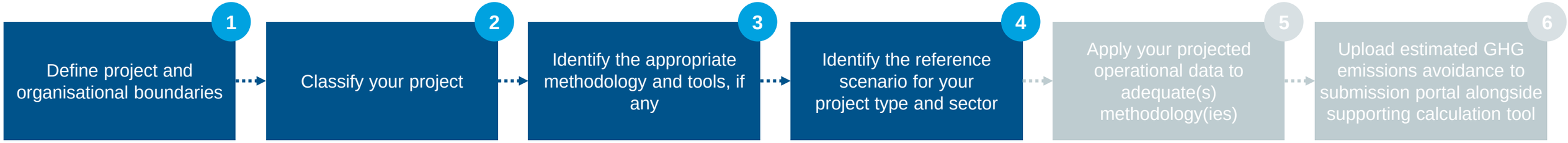
in t CO_2e

Relative GHG emissions avoidance

$$\Delta GHG_{rel} = \frac{\Delta GHG_{abs}}{\sum_{y=1}^{10} (Ref_y)}$$

in %

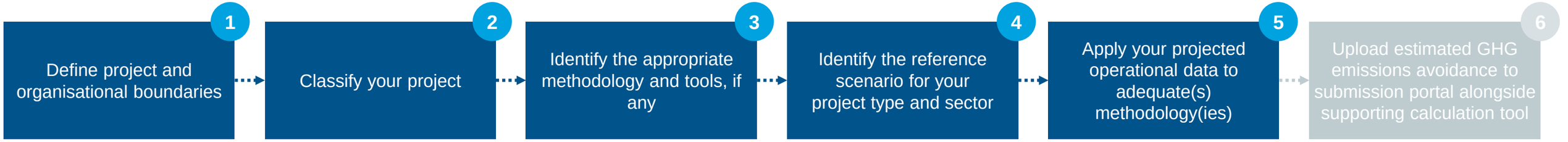
Source: Adapted from INEA, 2020. *Innovation Fund First stage of the large scale call. Application procedure*



The GHG emissions that would occur in the absence of the project are calculated based on the assumption that, in the reference scenario, the **product** would be delivered under the following circumstances:

Sector	Reference scenario
Energy intensive industry	EU ETS benchmark(s) for the product or fossil fuel comparator in some cases
Bio fuels	Fossil fuel comparators from REDII
Renewable electricity	Expected 2030 electricity mix
Renewable heat	Natural gas boiler
Energy storage	Single-cycle natural gas turbine (peaking power)

Source: Adapted from INEA, 2020. *Innovation Fund First stage of the large scale call. Application procedure*



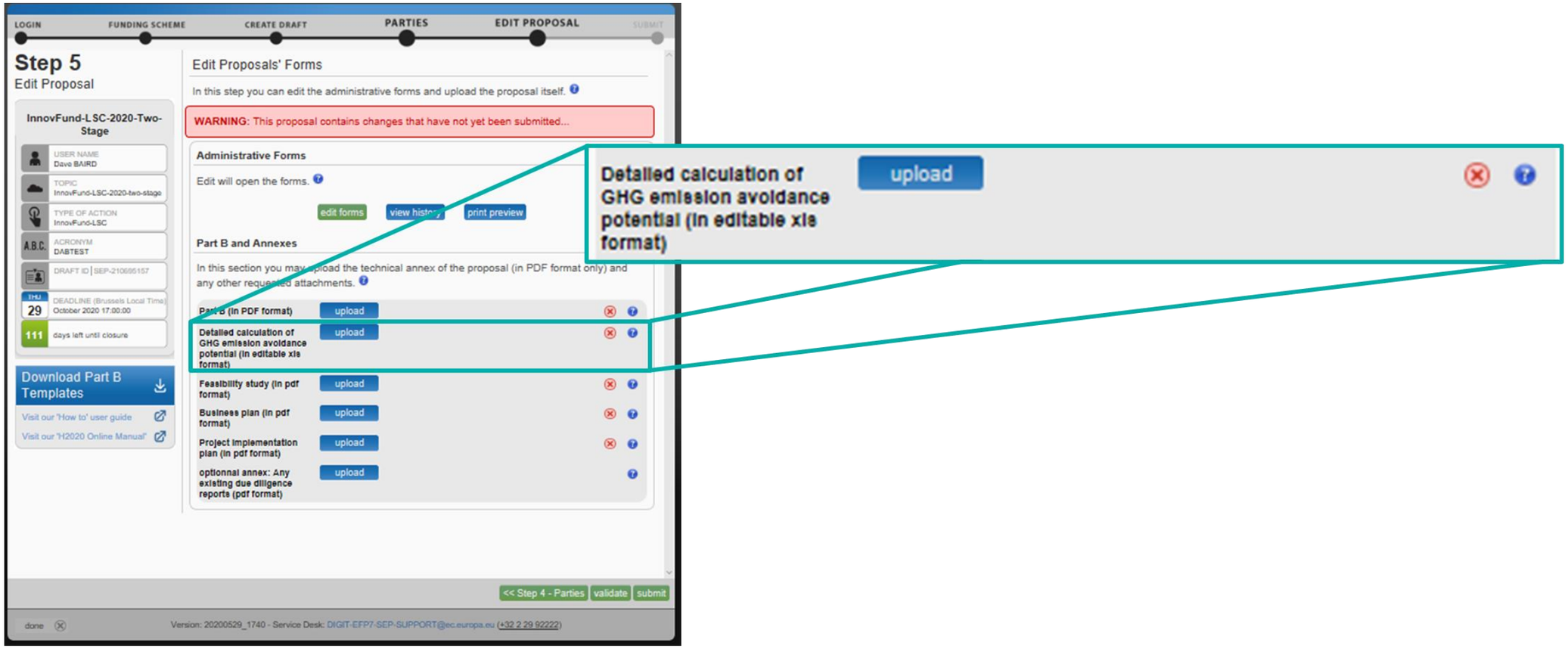
Projected operational data													GHG Emissions	
Source	**Parameter monitored**	**Description**	Unit	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	t CO2e / [unit]	t CO2e
Ref_{grid}	EG_{grid}	Net amount of electricity to be generated by the renewable technology and fed into the grid	MWh											0.150	0
Ref_{heat}	EG_{heat}	Net amount of thermal energy to be delivered by the renewable technology	MWh											0.202	0

Tools available to support the calculation for CCS, RES and energy storage projects. Due to the variety of possible cases in the sectors, it **wasn't possible to develop an Excel workbook to support the calculations** for energy intensive industries' projects. EII applicants shall develop their own calculations using an Excel template and are encouraged to:

- Split calculation of reference and projects emissions, for the ease of verification
- Maintain projected input data separated by year
- Not hardcode conversion factors into the formulas, so that these are easily traceable and updatable
- Create a colour code for input and linked/calculated data
- Provide a full description of the data traceability and responsibility

Source: Adapted from INEA, 2020. *Innovation Fund First stage of the large scale call. Application procedure*

1. Define project and organisational boundaries
2. Classify your project
3. Identify the appropriate methodology and tools, if any
4. Identify the reference scenario for your project type and sector
5. Apply your projected operational data to adequate(s) methodology(ies)
6. Upload estimated GHG emissions avoidance to submission portal alongside supporting calculation tool



Source: Adapted from INEA, 2020. *Innovation Fund First stage of the large scale call. Application procedure*

Application of First Stage Methodologies

Recap of the GHG avoidance methodologies and examples

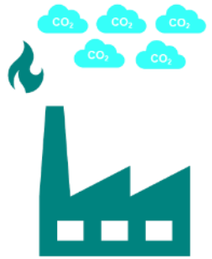
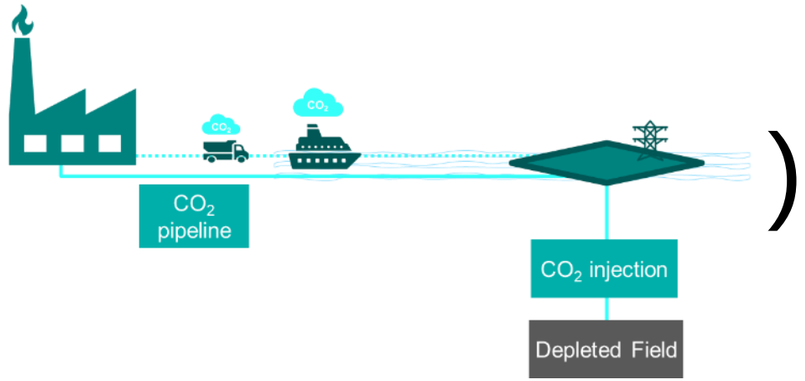
Carbon Capture and Storage (CCS)

First stage methodology

GHG avoided equals to the CO2 stored, minus emissions for CO2 capture, transport and injection

REFERENCE

PROJECT

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

$$= \sum_{y=1}^{10} \left(Ref_{release,y} - (Proj_{capture,y} + Proj_{transport\ pipeline,y} + Proj_{injection,y} + Proj_{transport\ road,y} + Proj_{transport\ maritime,y}) \right)$$

$Ref_{release,y}$ = $CO2_{transferred\ to\ the\ capture\ installation,y}$

As defined in Commission Implementing Regulation (EU) 2018/2066 of 19 December 2018

Carbon Capture and Storage (CCS)

Example

1. **Description:** Project intends to build a special transport system to transport large volumes of CO2 by pipeline to the storage site
2. **Classification:** CCS → CO2 transport/storage → CO2 transport/storage
3. **Methodology:** CCS, Section 3 of Annex C
4. **Reference:** CO2 is released in the atmosphere up to EU ETS benchmark emissions

$$\Delta GHG_{abs} = \sum_{y=1}^{10} \left(CO2_{transf,y} - Proj_{capt,y} - Proj_{pipe,y} - Proj_{inject,y} - Proj_{tranport,y} \right)$$

- $Proj_{capt,y}$ = Fossil fuel (FF) combustion at capture installation and material use + fugitives
- $Proj_{pipe,y}$ = Combustion at support installations + fugitives + venting + leakage
- $Proj_{inject,y}$ = Combustion at booster station + venting + leakage
- $Proj_{tranport,y}$ = Combustion at each transportation modal

5. **Data**: CO2 transferred to capture facility; quantity of fossil fuel consumed; for fugitives (unintentional), leakage events and venting (planned) it will depend on the monitoring plan to be proposed by the applicant, and method of quantification selected.

Note that…

- The applicant shall secure a buyer of their technology and cover the whole cycle from capture to storage in their submission, which shall be part of the boundaries of GHG emission avoidance calculation. Companies will be required to monitor and report on emission across all stages.
- Applications can be submitted with or without a Consortia. It is up to the applicants and players to organise themselves and split the revenues and liabilities

Carbon Capture and Storage (CCS)

Example: Hybrid biogenic CO2 capture and storage

1. **Description:** Project intends to capture and store biogenic CO2
2. **Classification:** EII, CCS → bio-fuel/bio-refineries, CO2 transport/storage → bio-fuel/bio-based products, CO2 transport/storage
3. **Methodology:** CCS, Section 3 of Annex C
4. **Reference:** EU ETS benchmark emissions

$$\Delta GHG_{abs} = \underbrace{\sum_{y=1}^{10}(Ref_y - Proj_y)}_{\text{EII}} + \underbrace{\sum_{y=1}^{10}(Ref_y - Proj_y)}_{\text{CCS}}$$

$$= \sum_{y=1}^{10}\left(\Delta E_{inputs} + \Delta E_{processes} + \Delta E_{products} + \Delta E_{use} + \Delta E_{EoL}\right) + \sum_{y=1}^{10}\left(CO2_{transf,y} - Proj_{capt,y} - Proj_{pipe,y} - Proj_{inject,y} - Proj_{tranport,y}\right)$$

If any of these components are identical for the project and reference scenarios, then their change in emissions can be set to zero

Note that…

- If the CO2 comes from a biofuel factory it is likely that it is already claiming a reduction under RED II. However, **rewards received under any other legislations shall not influence the GHG emissions avoidance calculation.**

Remove any double-counting from the calculations, i.e. the benefits of burning bio-CO2 will be counted only once.

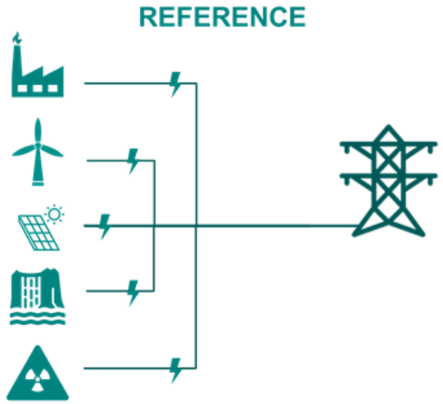
- Relative GHG emission avoidance capped at 100%
- Net carbon removal projects will be seen favourable under the Degree of Innovation criterion in second stage

Renewable electricity and heating

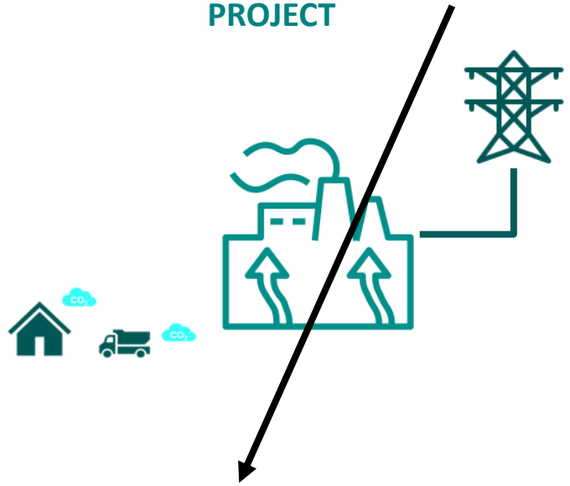
First stage methodology

GHG avoided equals to the emissions displaced by the renewable energy using the conventional technology. Project emissions are disregarded, except for bio-electricity/heating

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



$$-$$



$$\left. \right)$$

$$= \sum_{y=1}^{10} \left(Ref_{grid} \text{ or } Ref_{heat} - 0 \right)$$

= Net renewable energy generated * Emission Factor for the reference technology

Renewable electricity and heating

Example

1. **Description:** The project foresee 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:** Renewable energy → renewable heating/cooling → heating/cooling
3. **Methodology:** RES, Section 4 of Annex C
4. **Reference:** heating is supplied by natural gas boilers

$$\Delta GHG_{abs} = \sum_{y=1}^{10} (Ref_y - Proj_y) = \sum_{y=1}^{10} \left(Ref_{heat} - 0 \right) = \sum_{y=1}^{10} EG_{heat,y} * EF_{NG} / 0.90$$

$$P_{heat} * PLF * T_y$$

5. **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

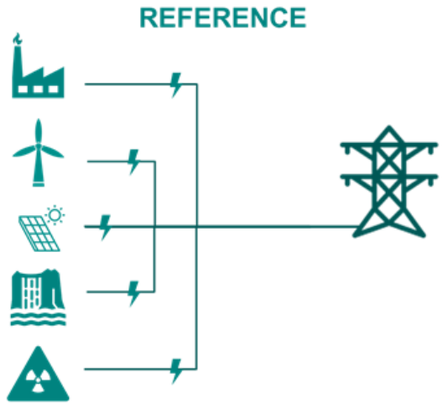
16

Energy storage

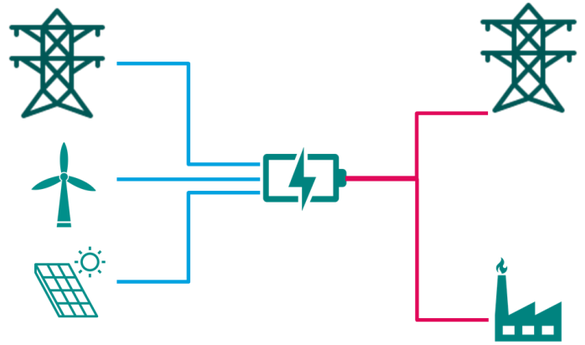
First stage methodology

GHG avoided is based on annual energy stored using emission factors depending on type of usage

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



$$-$$



$$\left. \right)$$

$$= \sum_{y=1}^{10} \left(Ref_{energy,y} + Ref_{services,y} - Proj_{energy,y} \right)$$

= Net energy supplied * emission factor for reference technology

= Hours of service delivery * emission factor for reference service

= Fossil-based energy stored * fossil fuel emission factor

Energy storage

Example: Hybrid RES and Storage

1. **Description:** A floating PV plant is combined with an innovative electricity storage to provide controllable RES-E generation.
2. **Classification:** RES, energy storage → solar energy, short-term electricity storage → electricity
3. **Methodology:** RES and Energy Storage, Sections 4 and 5 of Annex C
4. **Reference:** Electricity is supplied by an NG turbine (peaking power)

$$\Delta GHG_{abs} = \underbrace{\sum_{y=1}^{10}(Ref_y - Proj_y)}_{\text{RES}} + \underbrace{\sum_{y=1}^{10}(Ref_y - Proj_y)}_{\text{STORAGE}} = \sum_{y=1}^{10}\Big(\underbrace{Ref_{grid,y}}_{\text{RES}} + \underbrace{Ref_{energy,y} + Ref_{services,y} - Proj_{energy,y}}_{\text{STORAGE}}\Big)$$

Remove double-counting

$Ref_{energy,y}$ → 0

$Ref_{services,y}$ → 0

$Proj_{energy,y}$ → 0

$P_{elec} * PLF * T_y * EF_{out,ref}$

5. **Data:**
   - P_{elec} = Installed capacity for the **final power plant**, in Watts.
   - PLF = Plant Load Factor, i.e. plant's capacity utilisation, in %
   - T_y = operating hours in year y, in hours

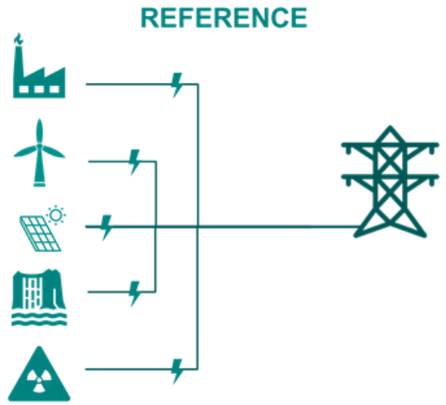
EF is not the same for Ref_{grid} and Ref_{energy}

If the storage enables a controllable feed-in, the EF should be the one from energy storage (NG turbine).

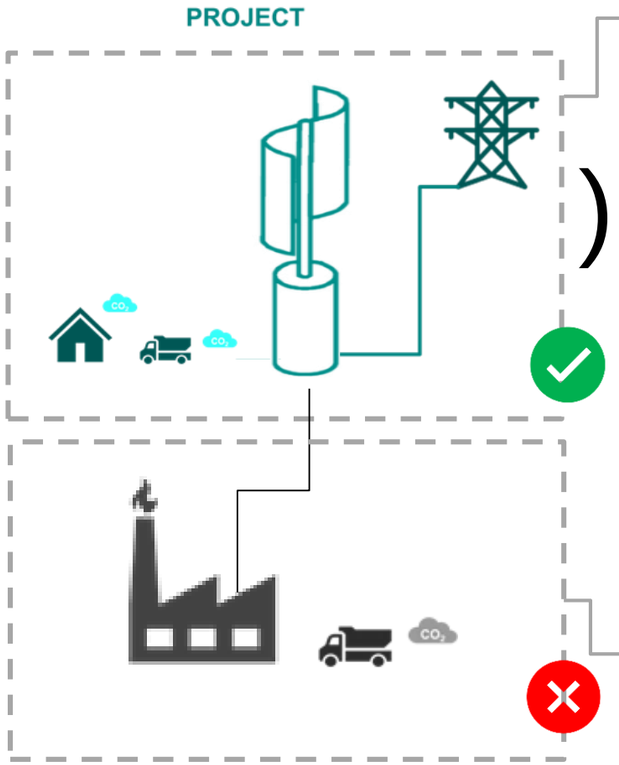
Production facilities of components for RES and Storage

First stages methodology

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



$$) -$$



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

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

Production facilities of components for RES and Storage

Example: renewable energy

1. **Description:** Project envisage the production of an innovative blade for using in floating wind power plants, which will generate twice as much energy than a conventional blade.
2. **Classification:** Renewable energy → wind energy → electricity
3. **Methodology:** RES, Section 4 of Annex C
4. **Reference:** electricity is supplied by the EU grid mix (ref year 2030)

$$\Delta GHG_{abs} = \sum_{y=1}^{10} (Ref_y - Proj_y) = \sum_{y=1}^{10} \left(Ref_{grid} - 0 \right) = \sum_{y=1}^{10} EG_{grid,y} * EF_{grid,ref}$$

$$P_{elec} * PLF * T_y$$

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

5. **Data:**
   - P_{elec} = **Assumption** of installed capacity **for the final power plant**, in Watts.
   - PLF = **Assumption** of Plant Load Factor, i.e. plant's capacity utilisation, in %
   - T_y = **Assumption** of operating hours in year y, in hours

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

Production facilities of components for RES and Storage

Example: energy storage

1. **Description:** The project foresees the production of innovative batteries to be used in electric vehicles, which will enable to replace long-distance ICE cars.
2. **Classification:** Energy storage → Short-term electricity storage → electricity
3. **Methodology:** Energy storage, Section 5 of Annex C
4. **Reference:** cars run on diesel-fuelled ICEs

$$\Delta GHG_{abs} = \sum_{y=1}^{10} (Ref_y - Proj_y) = \sum_{y=1}^{10} \left(N_y * (Ref_{energy,y} + Ref_{services,y}) - N_y * Proj_{energy,y} \right)$$

$N_y * (EF_{transport,y} * E_{transport,y})$ $\quad N_y * 0$ $\quad N_y * 0$

5. **Data**:
   - N_y = **Assumption** of the number of batteries installed in e-vehicles
   - $E_{transport,y}$ = **Assumption** of electricity supplied for use in e-vehicles, in TJ

The applicant will have to demonstrate the existence of a buyer of the technology (i.e. a company that will install the batteries in electric vehicles) to ensure the accountability over the promised GHG avoidance

Applicants will have to present the rationale for the projected performance of the batteries. For cars, an average travel distance of 14,300 km/year should be assumed

Q&A

Frequently Asked Questions & Slido

Frequently Asked Questions

- **Can the project take place in countries other than EU? No, only projects implemented in a EU Member States, Norway and Iceland are eligible for funding**
  - **BUT** projects in the EU using feedstock produced in non-EU countries are eligible
  - **AND** the project proponent can be a non-EU legal entity, as long as the project is implemented in the EU

- **Which emission factor for electricity shall I use in the calculations? It depends on the classification of your project and the scenario.**
  - If your project falls under **EII**
    - Grid electricity substituted by net electricity export: EF = 0.150 tCO_2e/MWh
    - Net grid electricity consumed: EF = 0.00 tCO_2e/MWh
  - If your project falls under **RES**:
    - For reference emissions calculations: $EF_{grid,ref}$ = 0.150 tCO_2e/MWh
    - For project emissions calculations (second phase only): $EF_{grid,proj}$ = 0.00 tCO_2e/MWh
  - If your project falls under **Energy Storage**:
    - For discharging emissions calculations: EF_{out} = 0.504 tCO_2e/MWh
    - For charging emissions calculations: EF_{in} = 0.00 tCO_2e/MWh
  - For **CCS** projects, the methodology does not require the reporting of electricity.

Frequently Asked Questions

- **Is it possible to apply for two different applications by the same Applicant?** Yes, but you should ensure to have sufficient financial, technical and operational capacity to implement the actions if both proposals are successful.

- **Can we apply for the same technology but in different sectors and countries?** Yes, you can submit two applications, but should both applications succeed, applicants shall have sufficient financial, technical and operational capacity to implement both projects.

- **Are there templates going to be made available for the business plan, implementation plan and feasibility study?** No. There are no templates available, but the indications in the Application Form B under project maturity can guide applicants as to the scope and content of these documents.

- **Are production facilities of components that will be used in any innovative technology eligible?** It depends. Currently only production facilities for components that will be used in renewable energy plants and energy storage are directly eligible for funding. Other projects will be eligible only if they intend to use renewable energy or other low-carbon energy carrier such as hydrogen or ammonia in their production process.

Thank you