icf.com

we are ICF

Technical Workshop on Draft Methodology for Calculation of GHG emission avoidance

First Call for proposals under the Innovation Fund

Presented by Laura Pereira (ICF), Jakob Wachsmuth (Fraunhofer ISI) and Sascha Lehmann (Fraunhofer ISI)

5 February 2020

Context

Scope
- Low-carbon projects in energy-intensive industries, including substitute products and Carbon capture and utilisation (CCU);
- Carbon capture and geological storage (CCS);
- Renewable energy (RES) projects;
- Energy storage projects
- Production of components for innovative RES and energy storage technologies.

Main Principle

Emissions savings from projects applying for funding under the Innovation Fund will be the difference between:

- the **emissions from the project activity**, and
- the **emissions that would occur in the absence of the project**.

Use
- Support IF applicants estimate GHG emission avoidance over the first 10 years of operation.
- Form the basis of the scoring of the selection criterion "effectiveness of GHG emission avoidance"
- Serve as KPI for project monitoring
- Serves as the basis of disbursements of grants, as projects that reach >75% of the projected emissions avoided over the first 3-10 years of operation will receive 100% of the grant

Workshop Objectives

Get consensus on how the methodologies shall be shaped so that they are:
- **sufficiently robust** to reflect the emissions occurring in both reference and projects scenarios,
- **not disproportionate complicated** to discourage applicants or generate administrative burden for MRV and evaluation purposes.
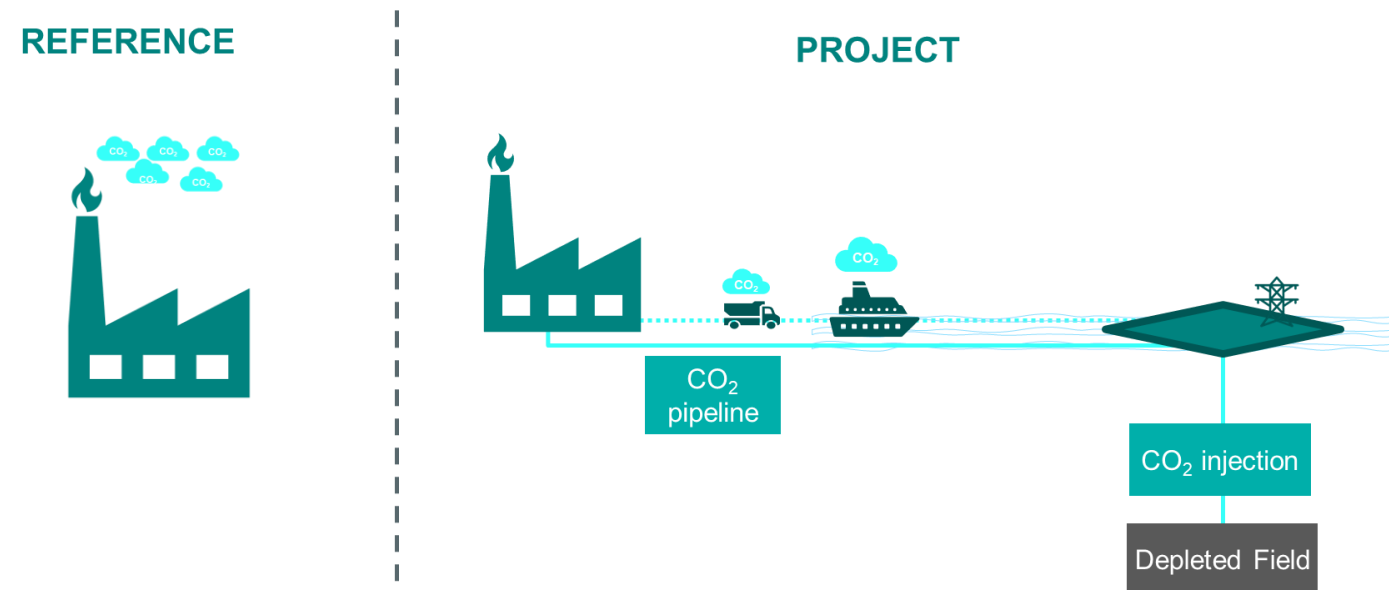
Potential approaches for quantification of GHG emissions savings

CCS, Renewable energy, Energy storage

Potential approaches for quantification
Carbon Capture and Storage (CCS)

REFERENCE

PROJECT

CO_2 pipeline

CO_2 injection

Depleted Field

Potential approaches for quantification

NER300: GHG savings equals to the CO_2 stored plus knowledge-sharing requirements for the other emissions

Sensible simplifications: GHG savings equals to the CO_2 stored, minus emissions for CO_2 capture, transport by pipeline and injection

Detailed: GHG savings equals to the CO_2 stored, minus emissions for CO_2 capture, transport by pipeline, road tanker or ship and injection

Key issues:

1. **How boundaries should be defined for project and reference scenarios?**

    *   shall emissions due to capture, transportation and injection be excluded for simplification or included to allow for a more consistent comparison with other IF projects?

2. **Which simplifications are possible for emissions and conversion factors?**

    *   Would it possible to adopt standard ratios of emissions per tonnes CO_2 stored for the potential new sources (e.g. injection)?

3. **What should be required from participants at the application phases and during monitoring**

    *   Consider the MRV challenges if the scope of the quantification is expanded

    *   Are emissions or capture efficiency expected to change over time?

Potential approaches for quantification
Renewable energy projects

Potential approaches for quantification

NER 300: Amount of renewable energy produced plus knowledge-sharing requirements for the emissions due to the project

Simplified: RE displaces the energy (and associated emissions) produced at the conventional plant

Sensible simplifications: Comparison of most significant emission sources within the project boundaries, with a pre-defined reference scenario and factors
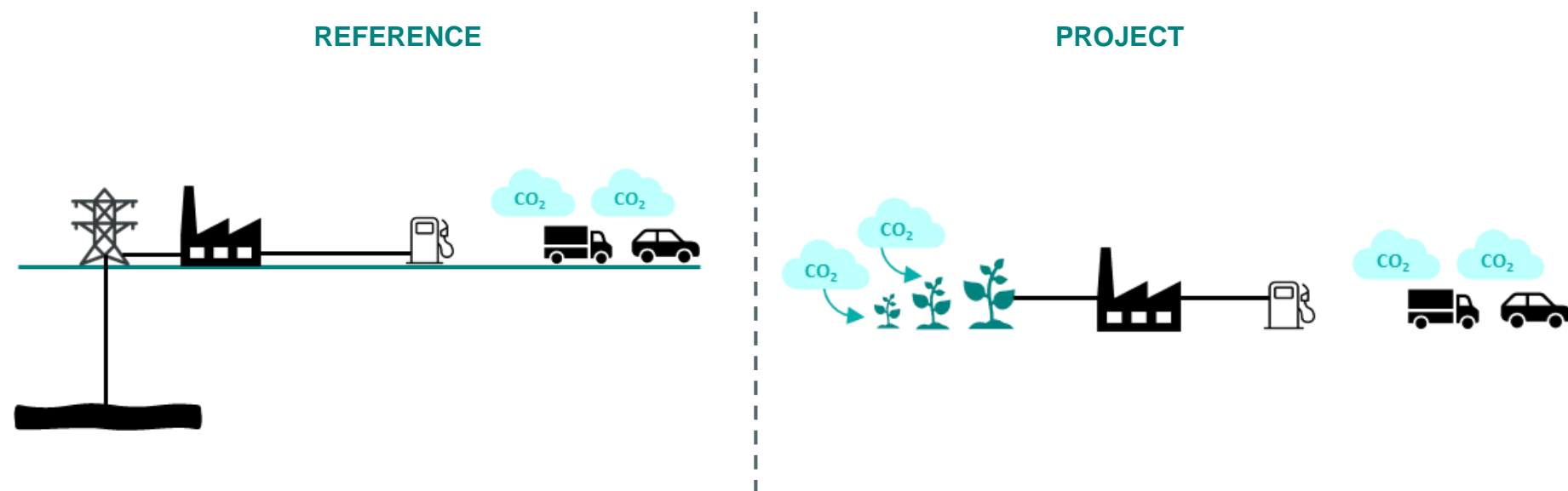
Detailed: Comparison of cradle-to-grave (or to-gate) emissions for reference and project scenarios

Key issues:

1. **How boundaries should be defined for project and reference scenarios?**

   - Which upstream (capital goods, raw material extraction/production, transport), downstream (e.g. decommissioning, use) and on-site emissions (fuel use at power plant, on-site transport, fugitives) sources should and could be included?

   - When defining reference scenario, should the most conservative emission factors be adopted (e.g. fuel oil for heating), a blend or the most likely alternative (e.g. gas for heating) or the real fuel being replaced from the reference scenario?

2. **Which simplifications are possible for emissions and conversion factors?**

   - Shall emission factors vary to match regional context (i.e. some MS are still more reliant on fossil fuels than others so reference fuel would differ)?

3. **What should be required from participants at the application phases and during monitoring**

   - Consider the MRV challenges based on the proposed boundaries

   - For project involving retrofit/capacity added to an existing plant, how should the energy generated be measured?

Potential approaches for quantification
Renewable energy projects, bioenergy projects

REFERENCE

PROJECT

Key issues:

1. **How boundaries should be defined for project and reference scenarios?**

   • Which boundaries and simplifications should be aligned to those from REDII having in mind the different use of the results?

   • For biomass carriers' projects: If emissions from waste treatment are to be included in the reference scenario, shall we assume that waste would be composted, landfilled, incinerated or treated using the most likely treatment in the Member State?

   • If biogas to energy, should we assume that CH4 would be directly released in the reference scenario or flared?

   • Combustion of fossil fuel from off-site transportation (bioenergy projects) shall be included or should be assumed that such emissions would also occur in the reference plant (e.g. leakage from gas pipeline if natural gas)?

## REDII at a Glance

Boundaries of quantification of savings:	**Emissions that can be deemed as zero :**
▪ Extraction or cultivation of raw materials;	▪ Fuel in use for biofuels and bioliquids. For biomass fuels, only CO_2 shall be deducted.
▪ Carbon stock changes caused by land-use change;	▪ Life-cycle GHG emissions up to the process of collection of wastes and residues, and residues from processing.
▪ Processing;	▪ Indirect land-use change emissions for biofuels, bioliquids and biomass fuels produced from selected feedstock categories.
▪ Transport and distribution;	
▪ Fuel in use;	
▪ Soil carbon accumulation via improved agricultural management, where applicable / CO_2 capture and geological storage / CO_2 capture and replacement.	

Potential approaches for quantification
Renewable energy projects, geothermal energy projects

**REFERENCE**   **PROJECT**
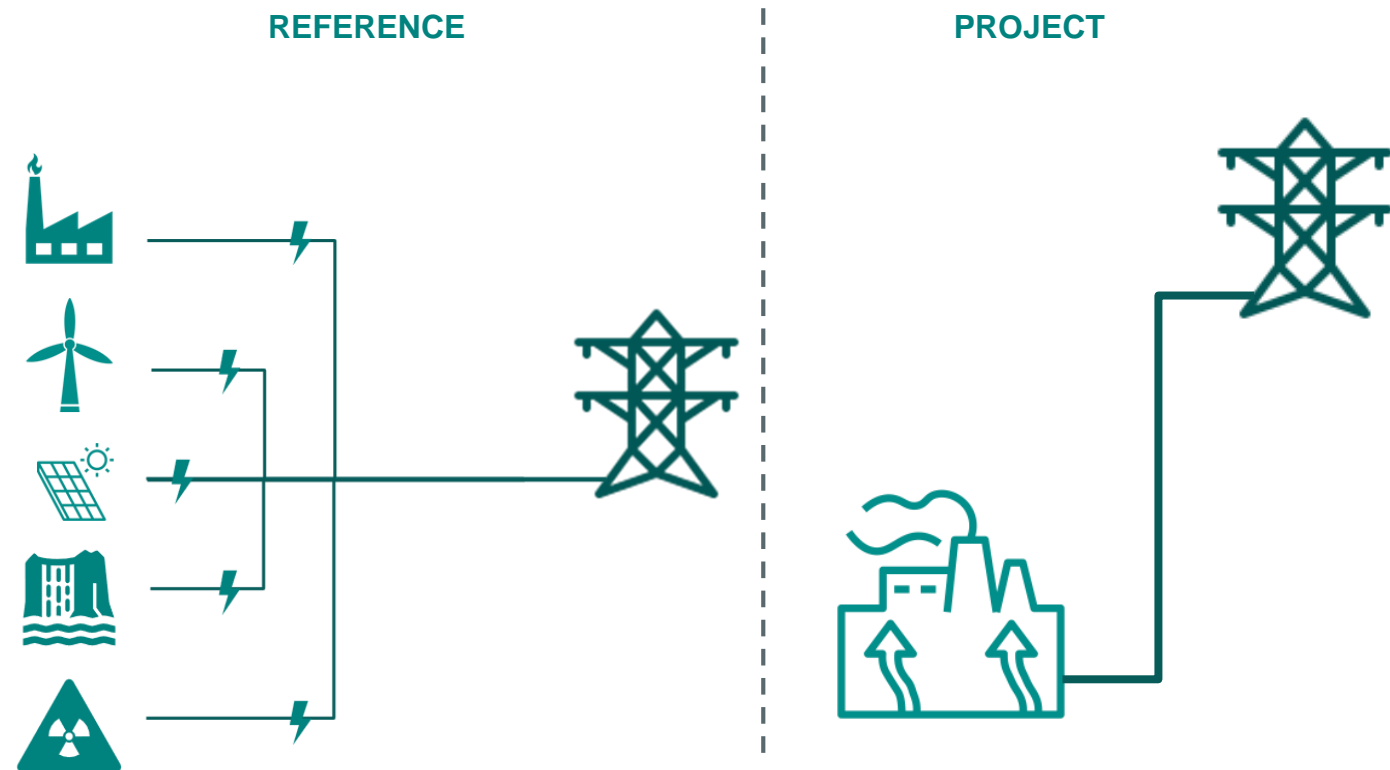
Key issues:

1. **Which simplifications are possible for emissions and conversion factors?**

   - If emissions from the operation of dry or flash steam geothermal plants due to release of non-condensable gases are to be included, would it be adequate to assume a fixed mass fraction of CO_2 and of CH_4 in the composition of the steam released?

   - If emissions from the operation of binary geothermal plants due to physical leakage of non-condensable gases and working fluid are to be included, would it be adequate to define a fixed loss (%) for the steam entering vs leaving the plant?

   - What about the quantity of working fluid leaked/reinjected, is this something that could be tied to the amount of energy generated so that applicants only have to monitor one parameter?

Potential approaches for quantification
Production of innovative components of renewable and storage technologies
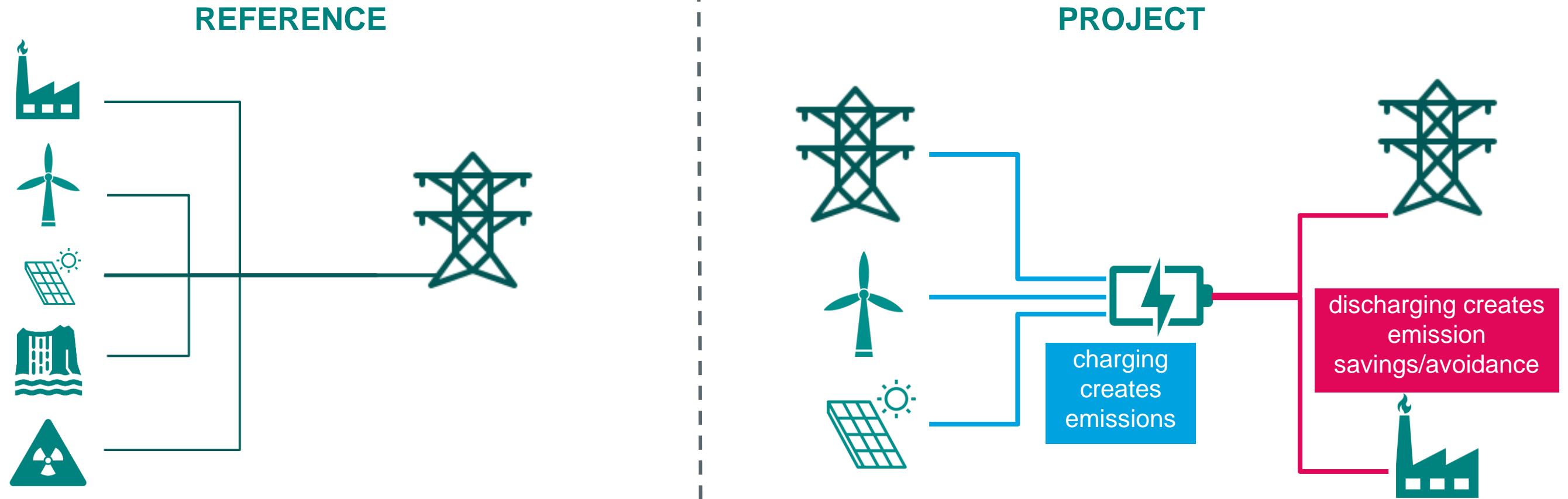
REFERENCE

PROJECT
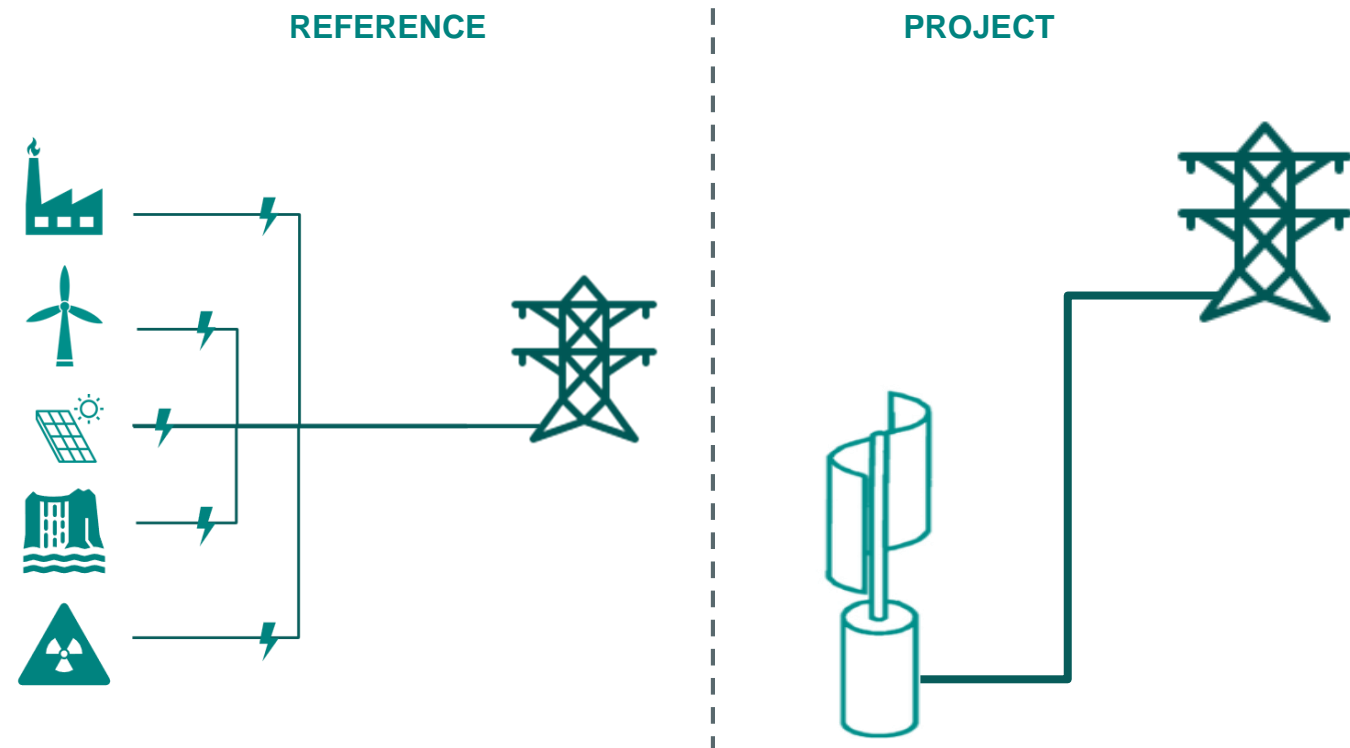
Key issues:

1. **What should be required from participants at the application phases and during monitoring**

   - As GHG emission avoidance will depend on where and how the RES or energy storage components are used, should we require sales contracts for the produced units and use national grid GHG intensity to estimate the emissions saved depending on where the RE or storage units would be installed?

   - How to deal with units produced for non-EU countries? Shall IF be restricted to those components that are produced and which will deliver to EU?

   - How to avoid double claiming of emission savings, i.e. how to prevent that the buyer of the units does not apply for the IF itself?

   - How to deal with the uncertainty about securing the delivery of the planned components to the market?

   - How could project proponents monitor energy generated / stored in this case? What other parameters should be monitored?

8

Main principle behind GHG savings

Energy storage

REFERENCE

PROJECT

charging creates emissions
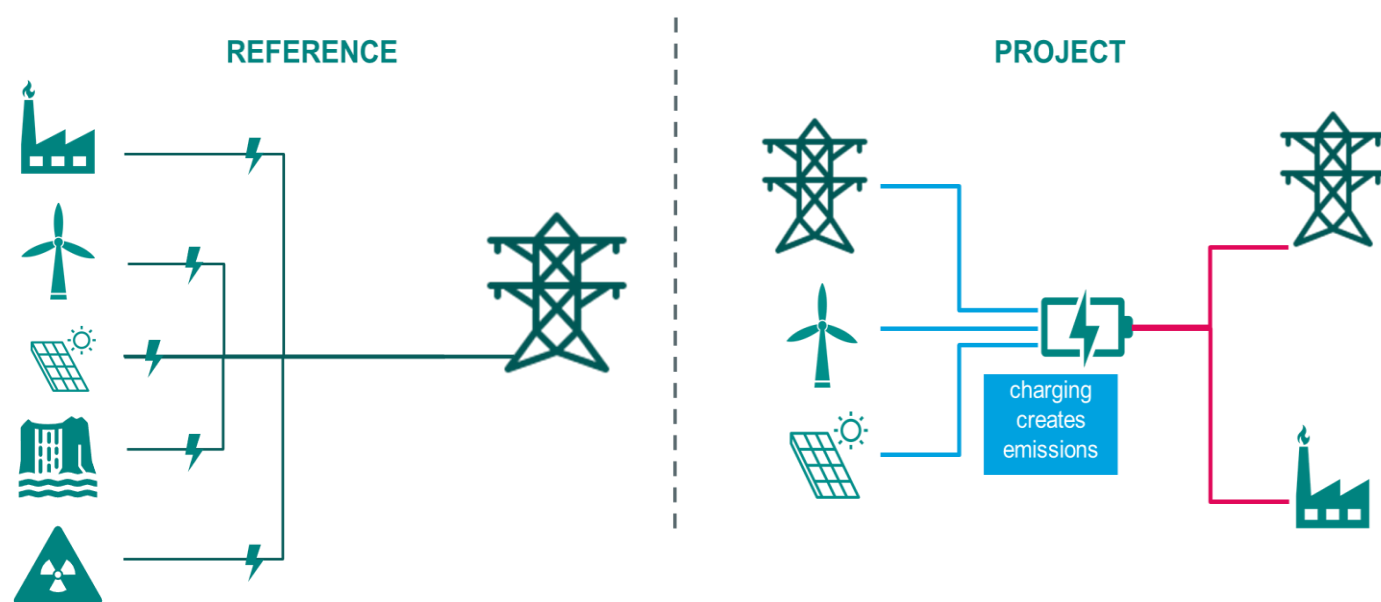
discharging creates emission savings/avoidance

Basic assumptions

- energy storage projects **need to include storage of any energy type** for later use

- energy storage projects **may include conversion** of one energy type into another (e.g. power-to-heat)

Potential approaches for quantification
Energy storage

REFERENCE   PROJECT

charging
creates
emissions

Potential approaches for quantification

Simplified: Comparison based on annual amount of energy stored and average emissions factor (+ knowledge-sharing requirements during MRV)

Sensible simplifications: Comparison based on annual energy stored using emission factors depending on type of usage

Detailed: Comparison of reference and project scenarios based on an hourly charging and discharging profile

Key issues:

1. **Which approach is most adequate for the level of accuracy needed for scoring and MRV?**

   • simplified, sensible simplification, detailed

2. **Which use cases of energy storage units to treat separately?**

   • grid purposes based on contract with TSO

   • integrating additional RE / avoiding curtailment

   • producing e-fuels from additional RE

   • balancing markets / wholesale markets

3. **How can energy storage projects prove avoided emissions? What evidence for**

   • for use for grid purposes,

   • for use of additional renewable energies,

   • to demonstrate that the storage was only (dis-) charged at certain times

Fraunhofer
ISI

milieu
Law & Policy Consulting

TURQUOISE
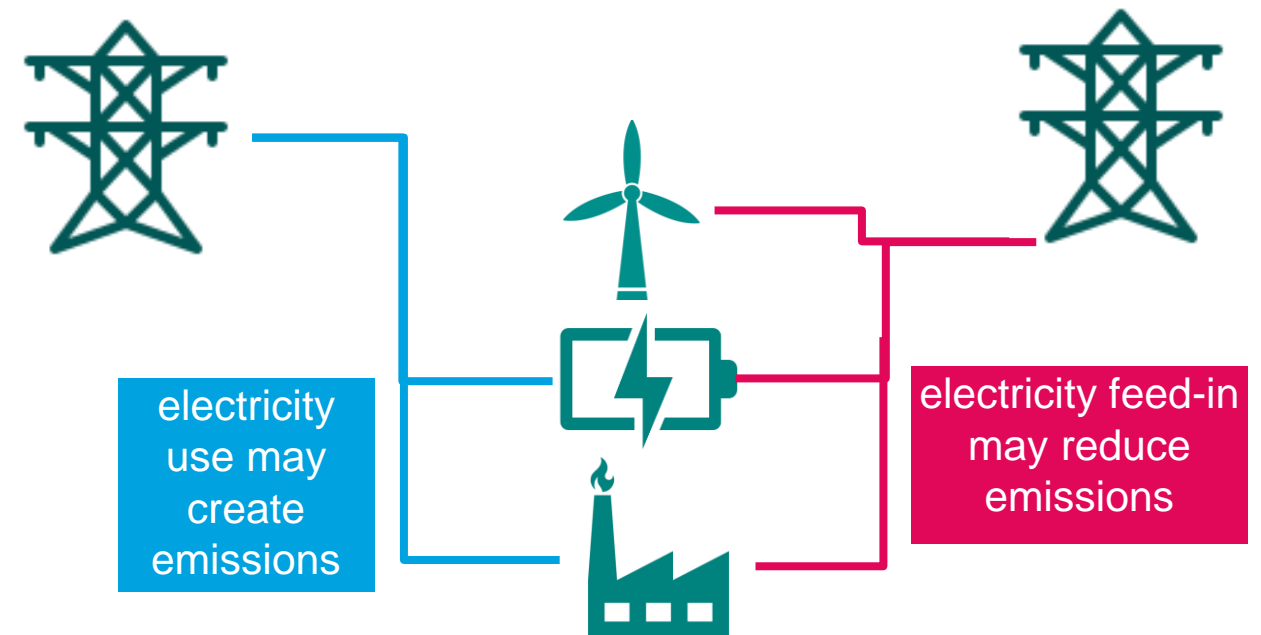Finance | Energy, Environment, Efficiency

Cross-cutting challenges / decisions
GHG emission factors for usage/feed-in of grid-electricity

ELECTRICITY MIX CHANGES OVER TIME
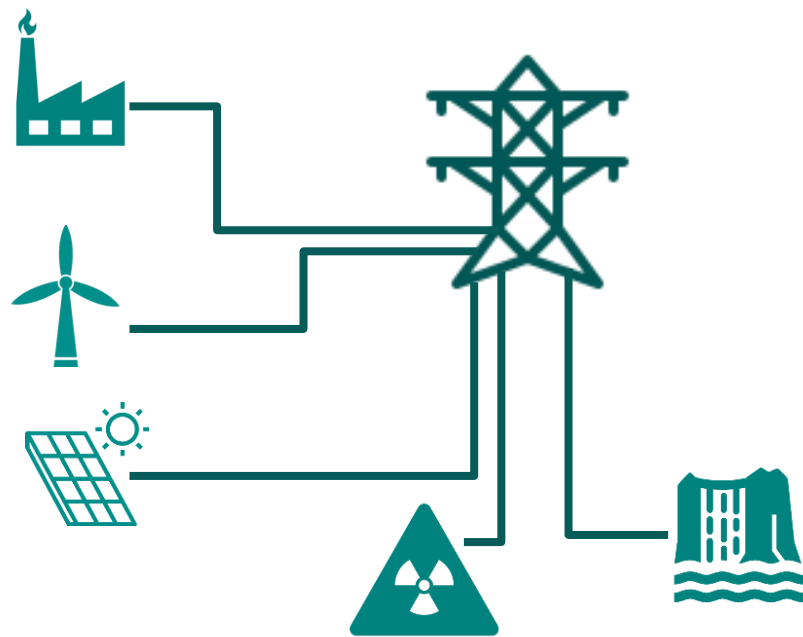
PROJECTS WITH USAGE/FEED-IN OF GRID ELECTRICITY

electricity use may create emissions

electricity feed-in may reduce emissions

Cross-cutting challenges / decisions
Potential alternatives for use/feed-in of grid electricity

Temporal dimension of emission intensity of grid electricity

Continuous / stochastic production/use of grid electricity: emission intensity may be averaged over the period of consideration

Additional renewable electricity production from wind or solar: An appropriate GHG emission intensity to reflect the marginal emissions intensity of the electricity replaced needs to be identified.

Market-dependent usage/feed-in of grid electricity: Appropriate GHG emission intensities both for usage and feed-in to derive the resulting avoidance needs to be identified.

Spatial dimension of emission intensity of grid electricity

National: GHG intensity of the electricity consumed in the country of the plant

EU-wide: GHG intensity of the electricity averaged for all EU

Mixture: A (weighted) average of national and EU-wide

Key issues:

1. **Which GHG emission intensities to use:**
   - for additional renewable electricity production from wind or solar?
   - for market-dependent usage of grid electricity?
   - for market-dependent feed-in of grid electricity?

2. **How should GHG emission factors of grid-based electricity be regionally disaggregated:**
   - national, EU-wide or a mixture?

Cross-cutting challenges / decisions
Timescale and forecasting

Timescale for evaluation of GHG emission savings

- **Requirements from the delegated regulation:**
    - First ten years of operation, starting between 2022 and 2027 (earliest and latest possible date of entry into operation)
    - Perspective on 2050, to evaluate the contribution of projects to the overarching EU ambition of climate neutrality in 2050

Potential approaches for quantification
Yearly forecast: based on baseline emissions, for the first ten years of operation
2030 forecast: typical date at which projects in the first call will be in operation and for which the EU has clear targets
in addition: 2050 forecast, to be considered also under degree of innovation criterion

Challenges for GHG emission savings forecasting
- GHG emission savings from usage/feed-in of grid electricity **highly depend on future development**, due to the anticipated RES and grid expansion
- forecast of future GHG emission intensities of grid electricity needed but in the EU and, in particular, its Member States is **highly uncertain**,
- If EU electricity will be completely "decarbonised" in **2050, no savings** would be achieved from grid-connected RES-E or energy storage projects.

Key issues:
1. **Which timescale(s) to consider in proposals?**
2. **How should the future development of the electricity mix be reflected?**
3. **How should the requirements differ for the 1st and 2nd stage of application, reducing burden at the first stage to encourage applications?**

Cross-cutting challenges / decisions
Summary

Timescale for GHG emission savings to be evaluated

- 2030, typical date at which projects in the first call will be in operation and for which year the EU has clear targets;
- Yearly forecast based on yearly baseline emissions, e.g. for the period 2022 (earliest possible date of entry in operation) to 2037 (latest possible date of entry into operation)
- 2050, to evaluate the contribution of projects to the overarching EU ambition of climate neutrality

GHG emission savings forecasting

GHG savings from grid-connected electricity projects are expected to reduce over time, given the anticipated uptake of renewable energy in Europe due to national RE targets. If it is assumed that EU electricity will be completely "decarbonised" in 2050, no savings would be achieved from grid-connected electricity renewable or energy storage projects. However, in that case the decarbonisation would not happen. Therefore, to encourage the RE uptake should the uptake itself be disregarded from GHG savings forecasting for IF application purposes?

Application phases

How should the requirements for project applicants differ for the first and second phases of application with the views of reducing burden at the first phase to encourage applications? Specifically, which simplifications to quantification could be proposed for:

- first phase (e.g. annual savings only and use of default EF),
- second phase for the projects that have been pre-selected (e.g. total GHG savings for the first 3 to 10 years, taking into consideration the expected penetration of RES)?

Emission factor for grid-connected electricity projects

- Regional component may reflect the regional RES generation and its potential curtailment on the level of Member States, but it may benefit/reward Member States that have a dirtier energy matrix, discouraging applications from cleaner Member States.
- EU-wide average reflects that the marginal power plant is often located in another EU Member State given the high integration of EU electricity markets.

Break-out session

Summary of Technical Workshop discussions

- Preference for a comparison of most significant emission sources within the project boundaries, with a pre-defined reference scenario

- Sources for inclusion to be defined based on a cut-off % for the lifecycle emissions

Boundaries

- No consensus. What makes sense for one set of projects, might not make sense for others

Forecasting

- Alignment with RED2, where possible

- Use of fixed ratios and fuel related factors

- Interest in granting some flexibility for applicants

Simplifications

- First phase: GHG displaced by the RE generated / stored, CO_2 stored for CCS. One year fully operational.

- Full: GHG considering main emissions sources, 10 years period

Application Requirements

- National vs. EU-wide emission intensity → preferences differ among participants

- Marginal vs. mean emission intensity → complexity to be checked versus robustness

Grid factor

- Hourly calculations for storage can be replaced by simplifying assumptions, but may be optional.

- Need to consider the variations in project lifetime and implementation curve.

Timescale

ICF

Fraunhofer
ISI

milieu
Law & Policy Consulting

TURQUOISE
Finance | Energy, Environment, Efficiency

Summary of Technical Workshop discussions – Energy storage

Key issues:

1. **Which approach is most adequate for the level of accuracy needed for scoring and MRV?**

   - to take into account emissions from charging favoured by most

   - complexity of hourly calculations is partly seen as too high

   - broad variety of use cases needs to be considered, while cases with no GHG emission avoidance may need to be cut off

2. **Which use cases of energy storage units to treat separately?**

   - multiple outcomes (electricity, heat, hydrogen) and multiple users (industry, transport) important to cover

   - usage based on contract with TSO relevant only in some MS

   - balancing markets differ between MS, look at IE and UK

   - integrating additional RE and avoiding curtailment are key

   - e-fuels as a storage to be consistent with other purposes

   - arbitrage usage of storage of little relevance in the near future

3. **How can energy storage projects prove avoided emissions?**

   - for use of additional renewable energies, not all certificates of origin sufficient; PPAs may be one appropriate evidence

   - evidence for avoidance of curtailment challenging; one option to consider is to derive benchmarks from balancing markets

   - individual information required to demonstrate that the storage was only (dis-)charged at certain emission intensities

   - an option for MRV to be explored is to use the same baselines as in the application process.

4. **Which GHG emission intensities to use for market-dependent usage/feed-in of grid electricity?**

   - hourly spread important to consider; maybe only optional

5. **How should GHG emission factors of grid-based electricity be regionally disaggregated?**

   - national perspective may create an appropriate regional spread

   - EU-wide consideration more in line with long-term development

Thank you