# Decarbonization of Clients Accounting Guidelines

*Accounting guidelines for the contribution of ENGIE's products and services to the decarbonization of clients (DoC)*

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# 1 Executive Summary

**To limit global temperature rise to 1.5°C above preindustrial levels and to reduce the destructive impact of climate change on human society and nature, the world needs to reduce by 45% greenhouse gas (GHG) emissions by around 2030 from 2010 levels and reach carbon neutrality (or net-zero GHG emissions) by 2050.** Despite the commitments made by regional organizations and national governments under the Paris Agreement, total anthropogenic GHG emissions continue to increase.

**The corporate sector plays a pivotal role in the global carbon neutrality objective**. The majority of global direct and indirect GHG emissions are influenced by companies, leading to increasing pressure from stakeholders for companies to increase their contribution to the global net-zero agenda. A Company can do so by pulling on three levers: (1) reduce the GHG emissions induced by its value chain; (2) reduce the GHG emissions induced by other players within its value chain; (3) increase the negative GHG emissions within and outside its value chain.

**An increasing number of companies are making claims on the emissions avoided or reduced from their products and services within their value chain, with a focus on their clients.** While some players have being doing so for several years, their number has surged over the past two years, leading to more and more scrutiny from external stakeholders.

**There is today a need for global alignment on the methodology underlying avoided emissions from products and services.** A plethora of terminologies, definitions, scopes of application and accounting methodologies used by the private sector has led standard setting organizations to urge for greater alignment and transparency. For this reason, a pathfinder has been launched as part of WBCSD as well as NZI leading to the publication of new guidelines[1]. The new WBCSD guidance develops strict principles on how avoided emissions should be assessed and reported. In particular, the guidance specifies the scope of products that may or may not be valued as enabling avoided emissions, based on the nomenclature of other standards such as the GHG Protocol.

**There are three main challenges associated with the standardization of an accounting methodology for avoided emissions:** providing a framework that is valid across sectors and thus across a wide variety of products and services; defining core principles that bridge “philosophical” divides; balancing theoretical rigor with practicality and operationalization.

**ENGIE’s Decarbonization of Clients accounting guidelines aims at responding to these challenges and thus moves the conversation one step further.** The current document was built in line with the latest Guideline of the WBCSD on avoided emissions, interviews and workshops with internal and external stakeholders and testing on real-case studies.

**This document provides a framework for each business entity to account for their contribution to the decarbonization of clients while ensuring consistency across the Group’s various activities.** It is designed as a practical guide for a wide variety of users - from sales representatives and project managers to strategic decision makers and marketing teams -, and aims at striking a balance between level of ambition and data availability.

# 2 Introduction

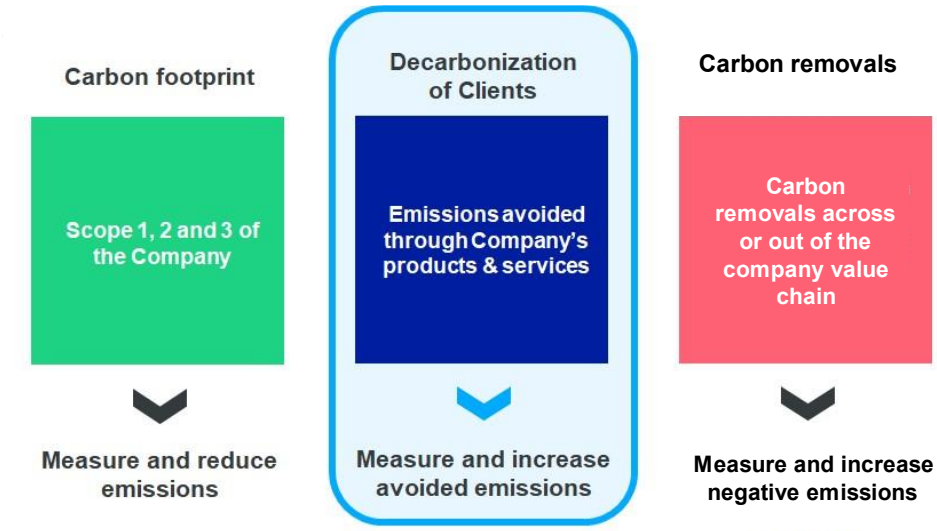
## 2.1 Context & Definitions

To limit global temperature rise to 1.5°C above preindustrial levels, greenhouse gas (GHG) emissions must be reduced 45 percent by 2030 from 2010 levels (IPCC 2018). Companies can contribute to this global objective by pulling **three complementary levers**:

1. **Carbon footprint: Reduce the GHG emissions induced by the company across its value chain**, covering upstream activities (e.g., purchased goods and services, upstream transportation and distribution), operations activities (e.g., product manufacturing, company vehicles, leased assets, employee commuting), and downstream activities (e.g., waste generated in operations, use of sold products). Existing

methodologies and frameworks used to account for and reduce these emissions include the GHG Protocol, ISO 14064, Science-Based Targets, Bilan Carbone, ACT.

2. **Decarbonization of Clients (DoC): Increase the GHG avoided emissions arising from company's products and services**. The company's clients is the main target of this lever, as the direct beneficiaries of the products/services delivered by the company. Several companies and organizations have developed tailored methodologies covering a wide variety of products or services. This document builds upon the existing literature and provides a set of overarching Principles that can be applied across sectors, as well as accounting guidelines tailored to ENGIE's business activities.
3. **Carbon removals: Increase the negative GHG emissions across and outside the company's value chain**. Also called carbon sinks, negative GHG emissions are captured and sequestered through natural or technological means. Organizations that certify removals that stem from such projects include Verra, The Gold Standard, Climate Action Reserve, Plan Vivo.




***The three company levers for global decarbonization[2]***

- While carbon footprint estimation and reporting relies on an accounting methodology that consists of **comparing year N (historical baseline) to year N+1**, **DoC** relies on **scenario analysis** that consists of comparing a **counter-factual baseline** scenario to **the situation** under which the company provides a product/service to the client.

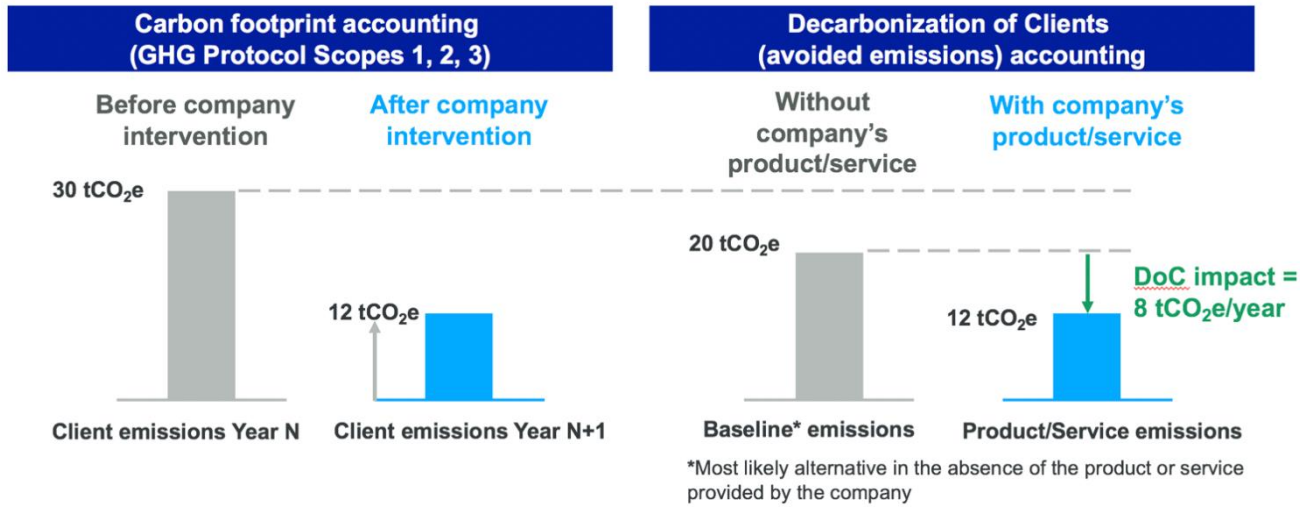
- **DoC cannot be used in combination with another carbon accounting methodology[3]** : it cannot be used by a company to quantify GHG emissions reductions from the "use of sold products" (Scope 3 – Category 11 of the GHG Protocol), nor by its clients to reduce their own GHG emissions (Scope 1, 2 and/or 3, as defined by the GHG Protocol).

- While under **carbon accounting frameworks** accounting for direct emissions (Scope 1) is restricted to the single player responsible for generating GHG emissions, **DoC** encourages to think more holistically about the benefits brought by each player involved in the project and thus **allows double counting between companies**. In the same manner, current Scope 2 and Scope 3 accounting rules allow double counting between companies.

[2] Inspired by the Net Zero Initiative and SBT Foundations for net-zero target setting in the corporate sector, 2020.

[3] In WRI report WRI/WBCSD. 2019, principles referring to this subject: 1°)"Corporate inventory accounting and comparative assessments are complementary approaches to managing a company's impact on the climate, but they use fundamentally different methods." 2°) "Companies should first calculate and report scope 1, 2, and 3 emissions and set science-based reduction targets for these emissions. Comparative assessments should neither take precedence over nor detract from efforts to do so."

**Carbon footprint vs. Decarbonization of Clients accounting**




*Carbon footprint accounting measures the difference between a past and present situation.*

*The GHG protocol is widely used for carbon footprint accounting. To be applied for Clients, it requires to have access to the Client past emissions data. It cannot be applied to greenfield projects.*

*Avoided emissions accounting measures the difference between a baseline scenario and a company intervention.*

*Calculating avoided emissions from products/services has the unique advantage to be applicable to any type of product/service and any type of project (brownfield, greenfield, grid-connected, on-site…). ENGIE can claim avoided emissions as long as it is involved in the project.*

## 2.2 Accounting principles

DoC accounting is a complex and sensitive topic. To ensure a minimum level consistency across products/services and credibility when communicating to stakeholders, companies shall follow some basic principles. Seven core accounting principles have been identified. These principles are detailed below, and an assessment of the compliance with the WBCSD guideline is made systematically.

1. Eligibility and Scope of assessment
2. Credible Baseline
3. Calculation Consistency
4. Pragmatic accounting
5. Managing Double Counting
6. Transparent, verifiable, and separate communication
7. Side effects and rebound effects

See Annex A – Accounting principles for more details.

## 2.3 Decarbonization of customers @ENGIE

**ENGIE's purpose** ("raison d'être") is to accelerate the transition towards a **carbon-neutral economy**, through reduced energy consumption and more environmentally-friendly solutions. The purpose brings together **the company, its employees, its clients and its shareholders,** and reconciles economic performance with a positive impact on people and the planet.

The purpose translates into ENGIE's ambition of becoming a key player in the **decarbonization of the economy, starting with ENGIE clients**. Prior to the release of the WBCSD guidance on avoided emissions[4], businesses were lacking an internationally recognized concept to describe this ambition. This has led ENGIE to embody this concept through **the creation of "the decarbonization of clients", or "DoC"**. At ENGIE, the decarbonization of clients takes place when **ENGIE[5] provides products and/or services that clearly contribute to avoiding client GHG emissions.**

Quantifying ENGIE's contribution to the decarbonization of its clients is key for **the Group and its entities to lead clients** as well as to **embark peers across industries** on their contribution journey to the decarbonization of the economy.

The **objective of accounting** for the decarbonization of clients is to **promote the decarbonization impact at the opportunity and project-levels**, **differentiate ENGIE's products and services offerings** in the market, raise **client awareness** on ENGIE's positive contribution to the decarbonization of its clients, and to **drive the development of ever-lower carbon products and services.**

## 2.4 Guidelines Limitations

This document, designed to promote best practice accounting for client avoided GHG emissions, does not:

- **Differentiate between certified and non-certified client avoided GHG emissions and treats both types alike**.
    - Certified or verified emissions are avoided emissions for which the project has earned carbon credits under or been verified and certified by an international or national standard (e.g., the Gold Standard, Verra, Woodland Carbon Code, the French Label Bas Carbone). The project may or may not be considered as "additional", as defined by the standard.
    - Non-verified emissions are avoided emissions from products and services or projects that have not been certified nor verified by a recognized standard. These emissions are included in the scope of DoC with the provision that these guidelines are used appropriately and that methodological choices are communicated and reported with transparency.
- **Enable to analyze the potential co-benefits linked to other environmental, social and/or economic impacts** since the document focuses on GHGs.
- **Provide a systematic and accurate quantification of the absolute reduction in the client's own GHG footprint**, because: (1) the quantification of the decarbonization of clients depends on the choice of the baseline used to calculate avoided GHG emissions (see Principle 2), and (2) a client's carbon footprint quantification depends on the GHG footprint accounting standard (e.g., GHG Protocol Standard, ISO) used by the client.

# 3 Guidelines in Practice

## 3.1 Scope of Products and Services

ENGIE products and services have been categorized into 4 groups: Production, Electricity Infrastructures, Commodities Sales and Services, that are detailed below.

**ENGIE Products and Services currently in scope of DoC**

| | Level 2 | Level 3 | Definition |
|---|---|---|---|
| Production | Energy production | Green power generation | ENGIE **owns and/or operates** assets that generate power from a **renewable resource** such as solar, wind offshore, wind onshore, hydro, geothermal, biogas, biomass, renewable hydrogen; **connected to the grid**, including green power generation form local energy networks. |

[4] "Assessing avoided emissions of solutions contributing to global net zero efforts", WBCSD (2023)
[5] Any ENGIE entity including Global Business Lines, Business Units and other global entities.

| | | | |
|---|---|---|---|
| | | Onsite Utilities | ENGIE **owns and/or operates** thermal assets that generate one or several output **(heat, cold, power) through combustion process of one or several sources** at the client's site. |
| | | District Heating and Cooling | ENGIE **owns and/or operates** network infrastructure and assets dedicated to the production of **heat and/or cold** (cooling or chilled water**) at district or city scales**, production is consumed by many final end users (DH, DCS, DHC[6]). |
| | Gas production | Biomethane and biogas production | ENGIE **owns and/or operates** assets that generate **biogas or biomethane**, the green gas produced is **sold back to the gas grid**, either directly or through agreements with gas suppliers. |
| | | Green hydrogen generation | ENGIE **owns and/or operates** assets that generate **renewable hydrogen**, the green gas produced is sold back to the gas grid, either directly or through agreements with gas suppliers. |
| **Electricity Infrastructure** | Electricity storage | Battery Energy System Storage (BESS) | ENGIE **owns and/or operates** Battery Energy Storage System (ESS) that stores energy to be delivered later within a grid or at client's site. |
| | | Pumped Hydro Storage (PHS) | ENGIE **owns and/or operates** a large-scale Pumped Hydro Storage (PHS) that stores energy to be delivered later within a grid. |
| | | Battery-paired renewable generation | ENGIE **owns and/or operates** assets that generate power from **a renewable resource** such as solar, wind offshore, wind onshore, hydro, geothermal; **paired with an Energy Storage System** (ESS) asset; connected to the grid or on the client's site |
| **Commodities Sales** | Commodity sales to end customers | Green power sales | ENGIE **sells to clients renewable electricity** that is purchased from external suppliers or from other ENGIE entities. In case the power sold by an entity is purchased from another ENGIE entity, the DoC impact is valued only once (through the volumes sold by the entity selling to end-client). |
| | | Biomethane and biogas sales | ENGIE **sells to clients biomethane** and/or biogas that is purchased from external suppliers. |
| | | Green hydrogen sales | ENGIE **sells to clients green hydrogen** that is purchased from external suppliers. |
| | | Biomass sales | ENGIE **sells to clients biomass** that is purchased from external suppliers. |
| **Services** | Energy services | Energy Performance Services | ENGIE provides services associated with the operations and/or maintenance (O&M) of its clients' energy infrastructures, that **generate energy savings through efficiency improvements**. |
| | | Public lighting | ENGIE **owns and/or operates** lighting assets and infrastructure at district or city scales and implements energy efficiency measures. |
| | | Demand Side Management - Load shedding | Load shedding service is a service that **encourages customers to reduce their energy consumptio**n |
| | Low carbon mobility | Electric vehicles charging stations | ENGIE **owns and/or operates electric vehicles charging stations** in towns and local regions, therefore contributing to an identified solution to reduce greenhouse gas emissions from transport. |

[6] District Heating (DH), District Cooling Systems (DCS), District Heating and Cooling networks (DHC)

| | | | |
|---|---|---|---|
| | | Biogas & H2 fuel stations | ENGIE **owns and/or operates biogas & H2 fuelling stations** in towns and local regions, therefore contributing to an identified solution to reduce greenhouse gas emissions from transport. |

## 3.2 Scope of clients

In this document, the **definition of "clients"** remains broad to cover **all ENGIE BUs/entities' clients**:

**Business-to-business (B2B):** Commercial, industrial, the energy system overall or the grid (e.g., utilities).

**Business-to-territories (B2T):** Governments, public authorities, universities, ports, etc.

**Business-to-consumer (B2C):** Individual consumers, households and in some cases small businesses.

**"internal" clients:** When an ENGIE entity provides products or services to another ENGIE entity, it is considered as an "internal" client.

**Why include "internal" clients in the scope of DoC?**

The **inclusion of "internal" clients** recognizes the contribution of each company entity to the decarbonization of their clients, regardless of the type of client. This approach is aligned with ENGIE Group's purchasing policy which favors insourcing. **Note that internal clients are however excluded from the scope of clients for Group reporting purposes to avoid double counting publicly disclosed figures.** Please refer to the *Guidance on Systematic Measurement at Opportunity Stage and on the Group KPI Reporting* guidelines for more information.

**Example:** ENGIE Entity A owns a solar farm as the main shareholder of the Special Purpose Vehicle of the farm and sells the power back to the grid. The farm is maintained by ENGIE Entity B under an O&M contract. Entity A's client is the grid, Entity B's client is the SPV. Entity A contributes to the decarbonization of the grid, Entity B contributes to the decarbonization of the SPV (Entity A). For accounting at the product-level and for reporting at the ENGIE entity level, both ENGIE entities may account for their respective contribution to the DoC impact. For reporting at the ENGIE Group level, the contribution of ENGIE entity B is excluded.

**Specific case for trading services**

For **trading services,** clients are restricted to **end users,** meaning that the DoC impact is not accounted for when ENGIE purchases products on markets and that these products are sold to intermediaries or entities that are likely to trade the purchased products back on the market.

This applies to the following product/services guidelines:

- Purchasing and Sales of green power/gas/heat/biomass

## 3.3 Step 1 – Define the Business Goal

Companies should clearly define the purpose of any DoC calculation. These guidelines may be used to calculate the client avoided GHG emissions of a product/service under two different contexts:

- **During the commercial phase** (i.e., before the delivery of the product/service) to account for **potential DoC impact** of a product/service, as part of a contract negotiation or an investment process for instance.
- **After the delivery of the product/service** to account for the **actual DoC impact** of a product/service.

For ENGIE reporting purposes, refer to the "*Guidance on Systematic Measurement at Opportunity Stage and on the Group KPI Reporting*" .

## 3.4 Step 2 – Select the Relevant Guideline(s)

The choice of the guideline(s) to use depends on the nature of the product(s)/service(s) provided by ENGIE. The full list is available in chapter 3.1, with their related definitions.

For integrated (complex) projects involving several products or services, break the project into its different "blocks" or "work packages" and use these guidelines to calculate the contribution of each block. The total project DoC impact is the sum of the individual DoC impacts, as long as all Accounting Principles are respected.

## 3.5 Step 3 – Calculate the DoC Impact

Once the relevant product/service guideline is selected, **calculate the DoC impact**, i.e., the difference between the GHG emissions related to the ENGIE's product/service and the GHG emissions related to the baseline. Refer to the specific product/service guidelines in this section.

The DoC impact **should be calculated in alignment with the Accounting Principles** (section 4). At the end of calculations, a sanity check with the Accounting Principles shall be performed, answering the following questions:

1. Is ENGIE's product or service under the scope of assessment?
2. Is the baseline credible?
3. Are emissions calculation between the project and the baseline consistent?
4. Is the pragmatic accounting respected?
5. Is double counting avoided at intra-company level
6. Is the communication transparent, verifiable and separate?
7. Have potential side effects and rebound effect been mentioned?

**Accepted data sources for calculating the DoC impact**

- Measures (e.g., product specifications, metered data);
- ENGIE internally verified source (e.g., analysis of past projects, extrapolation of similar projects);
- Supplier data;
- External studies conducted by credible organizations (e.g., E+C-, LEED, FEDENE/SNCU, IEA, WBCSD);
- Regulations (U.S. EPA, UK DEFRA, RT 2012, ISO, AFNOR, ASHRAE, EU Taxonomy);
- Any other recognized source

# 4 ENGIE's DOC Solutions

This section describes solutions under the Scope of ENGIE Portfolio and their calculation methodology. The structure for each solution is the following:

1. **Definition & Scope** : Describes the solution and specify is included in the solution and what is excluded
2. **WBCSD eligibility gates**: assessment of the solution eligibility to the internationally-recognized guidance on avoided emissions
3. **Formula & Calculation details**: describes the baseline, calculations specificities of the solution

2024 update: since version 4.2., family of solutions have been grouped to align with ENGIE activities framework

## 4.1 Production

### 4.1.1 Energy production

**Definition & Scope**

- ENGIE **owns and/or operates** assets that generate heat, cold and/or electricity from **a low-carbon resource** which can be renewable (solar, wind, hydro, geothermal, biogas, biomass, renewable hydrogen) or decarbonized (fossil-based generation paired with carbon capture and storage);.
- This category includes onsite utilities, decarbonized generation assets, district heating and cooling networks and local energy grids activities as long as they pass the criteria of Gate 2 mentioned below.
- The DoC impact may be related to three factors: the use of a **less carbon intensive source of energy compared to the market's average** (*e.g.,* renewable energy vs grid's average), the gain in **energy efficiency**, the use of **less carbon intensive refrigerants** and/or reduction in leakage (for cold production).
- **Rebound effect assessment** : The "Energy production" solution is defined at system-level and is not linked to any direct energy and/or money savings for end-consumers. The rebound effect for this solution is thus expected to be low.

**Eligibility of Solution to WBCSD Gates**

- Gate 2 : The "Energy production" DoC solution is restricted to Engie assets that meet the EU Taxonomy criteria for climate mitigation solutions or that are lentionned by 2IPCC AR6 as valid climate mitigation solutions. The compliance **with the European Taxonomy is checked annually, and audited by external auditors.**
- Gate 3 : This DoC solution corresponds to assets owned and/or where Engie has operational control, thereby justifying its strategic position in the value chain.

→ "Energy production" is thus eligible to an avoided emissions claim according to WBCSD.

**Formula & Calculation Details**

Depending on the output (or combination of outputs) of the asset, different default baselines can be used to account for avoided emissions (considering lifecycle emissions):

- For heat production: The baseline is the use of a gas boiler, assuming 90% energy efficiency[7]. In the absence of regulation, natural gas is considered as the baseline as "the highest share of heat was produced from natural gas and manufactured gases [in 2020 in the EU]"[8] .
- For power production: The baseline is the national consumption-based power grid mix, yearly average value. In the absence of regulation, the idea is to represent the average market solution with the same purpose that the client would have chosen in the absence of Engie's solution.
- For cold production: The baseline is the use of a stand-alone individual chillers with a standard coefficient of performance (COP) equal to 2,39, using grid electricity (carbon intensity of the country/state consumption-based grid mix) to operate.

**Methodology for hybrid assets**

A revision in methodology for hybrid assets producing low-carbon and grey outputs at the same time has been made to better reflect their decarbonization impact (*e.g.,* Onsite Utilities consuming a mix of fossil gas and biomass).

Compared to the version 3.0 of the DoC methodology, avoided emissions are now computed separately for production associated to "grey" and "low-carbon" inputs consumption. Subsequently, we consider only the positive values from these two calculations and aggregate them for DoC group-level reporting.

$$Asset\ avoided\ emissions = \max(0, AE("low-carbon"\ production)) + \max(0, AE("grey"\ production))$$

Where:

[7]Average of Efficiency factor for heat water (92%) and Efficiency factor for steam (87%) – Source: Commission Delegated Regulation (EU) 2015/2402, "Harmonised efficiency reference values for separate production of heat", https://eur-lex.europa.eu

[8] Eurostat, "Electricity and heat statistics", https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Electricity_and_heat_statistics&oldid=552866#Derived_heat_production

- $AE("low-carbon"\ production)$ = Avoided Emissions linked to the share of the asset's production associated to "low-carbon" inputs consumption (including electricity, biomass, biomethane GO/PPA and green hydrogen consumption)
- $AE("grey\ production)$ = Avoided Emissions linked to the share of the asset's production associated to "grey" inputs consumption (*i.e.,* other inputs such as grid gas, fuel oil, etc.)

*NB* : In case of a multi-outputs asset (*e.g.,* cogeneration asset), we assume an homogeneous consumption of the inputs to produce the different outputs.

This evolution has been introduced to enhance and to better reflect the decarbonization impact of our combustion assets. The previous DoC baseline for heat production – Gas boiler of 90% efficiency – is highly optimistic while comparing to the actual market reality, thus underestimating the true DoC impact of our assets. To be noted, this is how carbon accounting (scopes 1, 2 and 3) is performed.

*Example*

*Let's consider a scenario with a boiler that generates heat by consuming 40 MWh of biomass and 30 MWh of grid gas annually. The emissions linked to the combustion of the 40 MWh of biomass are compared to the baseline for heat production (assuming a 90% efficiency gas boiler) on one side, while the emissions from the combustion of the 30 MWh of grid gas are compared to the same baseline on the other side. We then take the positive part of these two calculations (max(0, value)) and sum them to report the final DoC impact at the group level.*

NB : Group KPI calculations are made on an annual and country basis using the default baseline. For the project-based approach, a specific baseline and/or more precise data can be used as long as the proposed methodology verifies all the DoC principles mentioned in section 4. Namely for electricity production, if the client is not connected to the power grid, the baseline should be the most common source of energy available (e.g., a diesel generator) instead of the power grid mix.

**DoC impact of the low-carbon energy generation asset** [tCO2e/year] **=** Annual **GHG emissions** from the **baseline scenario** [tCO2e/year] **-** Annual **GHG emissions** from the **low-carbon energy generation asset owned and/or operated by ENGIE** [tCO2e/year]

| Formula term | Calculation details |
|---|---|
| Annual GHG emissions from the **baseline scenario** [tCO2e/year] | • **For heat production**<br>$$Baseline\ emissions = q_h \times \frac{1}{\eta_b} \times EF_{bh}$$<br>Where:<br>- $q_h$ = Annual heat produced by ENGIE's assets in the country ($MWh_{heat}$)<br>- $\eta_b$ = Heat production conversion efficiency for a natural gas boiler (%)<br>- $EF_{bh}$ = Annual life-cycle GHG emissions factor of the gas mix in the country (tCO2e/MWh-gas)<br>• **For power production**<br>$$Baseline\ emissions = q_e \times EF_{be}$$<br>Where: |

| | |
|---|---|
| | - $q_e$ = Annual electricity produced by ENGIE's assets in the country ($MWh_e$)<br>- $EF_{be}$ = Annual life-cycle GHG emissions factor of the power mix in the country (tCO2e/MWhe)<br><br>• **For cold production**<br>$$Baseline\ emissions = \frac{E_{cold}}{COP_{ai}} * EF_{grid}$$<br>Where:<br>- $E_{cold}$ is the thermal energy (cold) delivered by the ENGIE asset (MWh)<br>- $COP_{ai}$ is the standard coefficient of performance of the autonomous installations. $COP_{ai}$ = 2,39.<br>- $EF_{grid}$ is the emission factor of the local/national consumption-based electricity grid mix, lifecycle emissions (scopes 2 & 3) |
| Annual GHG **emissions resulting from the ENGIE asset** [$tCO_2e$/year] | • For **heat and power** production based on "low-carbon" inputs:<br>$$Product\ emissions = \sum_{j=1}^{M} c_j \times EF_{p_j}$$<br>Where:<br>- $M$ = Number of "low-carbon" input fuel(s)<br>- $c_j$ = Annual quantity of low-carbon fuel j consumed by ENGIE assets in the country (MWh)<br>- $EF_{pj}$ = Life-cycle GHG emissions factor of the low-carbon fuel j consumed by the ENGIE asset in the country ($tCO2e/MWh_{fuel}$)<br>NB: for the project-based approach if **input fuel data** is not available, the calculation might be performed based on **output energy data** and **energy conversion efficiency.**<br>.<br>• **For cold production** :<br>$$ENGIE\ emissions = q_{green} * EF_{green} + q_{grid} * EF_{grid}$$<br>Where:<br>- $q_{green}$ is the low-carbon electricity consummed by the ENGIE asset for cold production (MWh)<br>- $q_{grid}$ is the grid electricity consumed by the onsite utility asset for cold production (MWh) *i.e.,* the electricity consumed that was **not** purchased through a specific agreement (GO or PPA)<br>- $EF_{grid}$ is the emission factor of the local/national consumption-based electricity grid mix, lifecycle emissions (scopes 2 & 3) (tCO2e/MWh)<br>- $EF_{green}$ is the emission factor of the local/national electricity green mix, lifecycle emissions (scopes 2 & 3) (tCO2e/MWh) |

**Example Green Power Generation**

**Context**

ENGIE operates a solar farm near Houston, Texas (U.S.A) in which it owns 60% of shares. The 100 GWh of electricity in year N generated supply the city under a 20-year Power Purchase Agreement.

**Alignment with Principles**

- Principle #1 Eligibility and scope of assessment: ENGIE operates the solar farm being a service unique to this value chain, which means that ENGIE shall account for 100% of the DoC impact of the solar farm. Solar energy generation is a recognized source by the IPCC AR6.
- Principle #2 Credible baseline: The most common and credible baseline for green power Generation projects is that of the average installed technologies, in this case the electricity production mix of the State of Texas.
- Principle #3 Calculation consistency: LCA data is not available for the Texan electric electricity production mix emissions factor so only direct emissions are used, equal to 0 for the project emissions and to 0.57 tCO2e/MWh for the Texan electricity production mix (source: EPA's eGRID).
- Principle #4 Pragmatic accounting: ENGIE accounts every year for the DoC impact as long as it operates the solar farm (at least 20 years).
- Principle #5 Managing double counting: There is a risk of intra-company double counting in case another ENGIE entity is in charge of the installation of the solar farm.
- Principle #6 Transparent, verifiable and separate communication : The avoided emissions linked to the solar farm power production will be reported separately from Engie Scope 1-2-3 carbon reporting. The avoided emissions calculation methodology is detailed below, and Engie DoC reporting is audited by third parties every year.
- Principle #7 side-effects and rebound effect : The solar farm operations are subject to Engie Group's environmental policy, which aims at preventing and reducing Engie's negative impact on its environment. (Politiques | ENGIE). Regarding the rebound effect, since this DoC solution is targeted at a B2T customer, the behavior change and thus rebound effect is expected to be low.

**Calculation details**

$$DoC\ impact\ of\ the\ solar\ farm\ in\ year\ N = baseline\ emissions - project\ emissions$$

$$= Q \times EF_b - Q \times \frac{1}{\eta} \times EF_p$$

$$= 100{,}000 \times 0.57 - 100{,}000 \times \frac{1}{100\%} \times 0$$

$$= \mathbf{57{,}000\ tCO2e\ in\ year\ N}$$

Where:

- $Q$ = Quantity of green power produced by the solar farm, i.e., 100,000 MWh in year N
- η = Energy conversion efficiency, equal to 100% because input source is solar
- $EF_b$ = Direct emissions factor of Texas electric electricity production mix, equal to 0.57 tCO2e/MWh

$EF_p$ = Direct emissions factor of solar, tCO2e/MWh

## 4.1.2 Gas production

### 4.1.2.1 Biomethane and biogas generation

**Definition & Scope**

- ENGIE **owns and/or operates** assets that generate **biogas or biomethane**, the green gas produced is **sold back to the gas grid**, either directly or through agreements with gas suppliers.
- Exclusions:

- This product excludes biomethane production for internal Engie use (*i.e.,* sales to E&C and biogas directly burned in cogeneration plants).
- When the green gas generated is consumed locally by a single or limited number of clients (e.g., manufacturing plants located in an industrial hub), refer to the *Heat, Cold and Power Onsite Generation* guideline.

- **Rebound effect assessment** : The "Biomethane and Biogas Generation" solution is defined at system-level and is not linked to any direct energy and/or money savings for end-consumers. The rebound effect for this solution is thus expected to be low.

**Eligibility of Solution to WBCSD Gates**

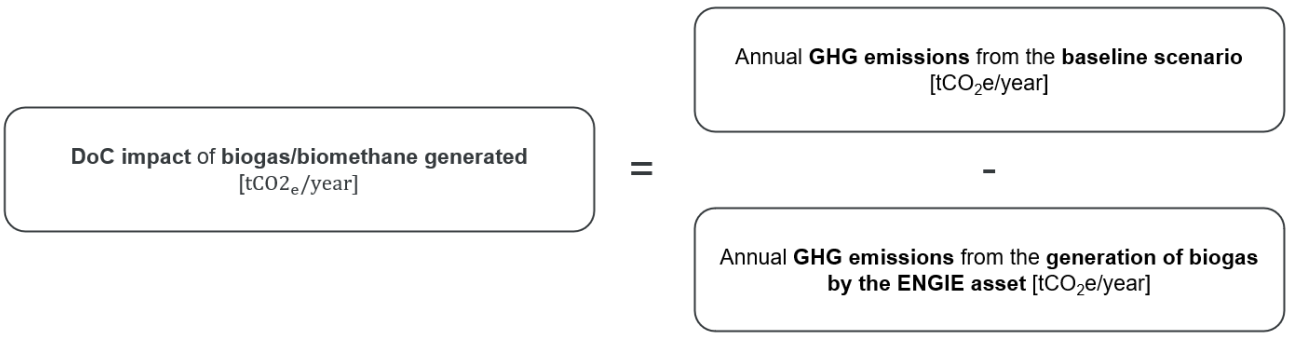
- **Gate 2** : Engie's biomethane and biogas generation assets verify the EU Taxonomy criteria for climate mitigation solutions linked to "Manufacture of Biogas"
- **Gate 3** : This DoC solution corresponds to assets owned and/or where Engie has operational control, thereby justifying its strategic position in the value chain.
- "Biomethane and Biogas Generation" is eligible to an avoided emissions claim according to WBCSD

**Formula and Calculation Details**

The default baseline for the Biomethane and Biogas Generation solution is **the national gas mix carbon intensity, yearly average value**. In the absence of regulation, the idea is to represent the average market solution with the same purpose that the client would have chosen in the absence of Engie's solution.

The methodology considers two distinct grid emission factors (one for Europe and one for the rest of the world) and takes into account an increasing green gas penetration over time, according to the IEA SDS scenario.

NB : Group KPI calculations are made on an annual basis using the default baseline. For the project-based approach, a specific baseline and/or more precise data can be used, provided that the proposed methodology verifies all the DoC principles mentioned in section 4.




| Formula term | Calculation details |
|---|---|
| Annual GHG emissions from the **baseline scenario** [$tCO_2e$/year] | The carbon emissions from the consumption of the equivalent amount of biogas directly from the local (region, country, province) gas generation mix.<br>$$Baseline\ emissions = Q \times EF_b$$<br>Where:<br>- $Q$ = Quantity of biogas generated by the ENGIE[9] asset [MWh]<br>- $EF_b$ = Emissions factor of the local gas generation mix [$tCO_2e$/MWh] |
| Annual carbon emissions from | $$Product\ emissions = Q \times EF_p$$ |

[9] Note that the MWh of green power produced or consumed are those of the ENGIE asset to ensure "apples-to-apples" comparison.

| | |
|---|---|
| the **production of biogas by the ENGIE asset** [tCO2e/year] | Where:<br>- $Q$ = Quantity of biogas generated by the ENGIE asset [MWh]<br>- $EF_p$ = Emissions factor of the ENGIE green gas generated [$tCO_2e$/MWh] |

#### 4.1.2.2 Green hydrogen generation

**Definition and scope**

- ENGIE **owns and/or operates** assets that generate renewable hydrogen, the green gas produced is sold back to the gas grid, either directly or through agreements with gas suppliers.
- **Rebound effect assessment** : The “Green Hydrogen Generation” solution is defined at system-level and is not linked to any direct energy and/or money savings for end-consumers. The rebound effect for this solution is thus expected to be low.

**Eligibility of Solution to WBCSD Gates**

- Gate 2 : Engie’s green hydrogen generation assets verify the EU Taxonomy criteria for climate mitigation solutions linked to “Manufacture of Hydrogen”
- Gate 3 : This DoC solution corresponds to assets owned and/or where Engie has operational control, thereby justifying its strategic position in the value chain.

→ “Green Hydrogen Generation” is eligible to avoided emissions claim according to WBCSD.

**Formula and Calculation Details**

In the absence of regulation and in order to best reflect the state of the hydrogen market, the Green Hydrogen Generation DoC solution requires two separate default baselines depending on the type of client Engie’s green hydrogen production is sold to :

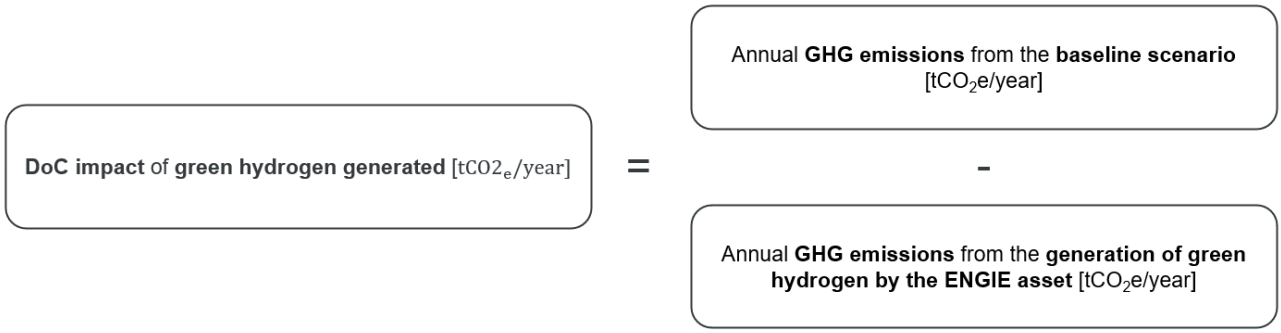
- **Industrial clients** : green hydrogen produced by Engie’s assets replaces **grey hydrogen**, thus allowing industries to decarbonize their activities without changing their industrial process;
- **Transport companies** (road mobility, maritime, aviation): Engie’s green hydrogen directly replaces fuel (diesel) or is used to produce e-fuels, such as e-methane, e-methanol, SAF, to replaces fossil fuels like **heavy fuel oil**.

The idea here is to represent the average solution with the same purpose that the client would have had access to in the absence of Engie’s solution.

Avoided emissions from Green Hydrogen Generation are calculated on a **year-on-year basis**, by comparing the emissions linked to the consumption of green hydrogen produced by Engie’s assets to the relevant baseline.

NB: Group KPI calculations are made on an annual basis using the default baseline. For the **project-based approach**, a specific baseline and/or more precise data can be used based on the type of final energy vector. If the final energy vector is :

- Hydrogen : the baseline should be grey hydrogen if the client is in the industry sector and heavy fuel oil if the client is in the transport sector (cf default baseline);
- Ammonia : the baseline should be grey ammonia if the client is in the industry sector and heavy fuel oil if the client is in the transport sector;
- Sustainable Aviation Fuel (SAF, e-kerosene): the baseline should be heavy fuel oil.




| Formula term | Calculation details |
|---|---|
| Annual GHG emissions from the **baseline scenario** [$tCO_2e$/year] | The carbon emissions from the consumption of the equivalent amount of green hydrogen sold from the baseline fuel.<br>$$Baseline\ emissions = Q \times EF_b$$<br>Where:<br>- $Q$ = Quantity of green hydrogen produced by ENGIE[10] assets [MWh]<br>- $EF_b$ = Emissions factor of the baseline [$tCO_2e$/MWh], *i.e.,*<br>- Grey hydrogen if the client is an industry<br>- Heavy fuel oil if the client is a transport company |
| Annual carbon emissions from the **production of green hydrogen by the ENGIE asset** [tCO2e/year] | $$Product\ emissions = Q \times EF_p$$<br>Where:<br>- $Q$ = Quantity of green hydrogen produced by ENGIE assets [MWh]<br>- $EF_p$ = Emissions factor of the ENGIE green hydrogen produced by Engie assets [$tCO_2e$/MWh] |

## 4.2 Electricity Infrastructure

### 4.2.1 Electricity storage

#### 4.2.1.1 Battery Energy System Storage (BESS)

**Definition & Scope**

- ENGIE **owns and/or operates** a large-scale Battery Energy Storage System (BESS) that stores energy to be delivered later within a grid or at client's site.
- Energy storage length (*i.e.*, a charge / discharge cycle) is short-term *i.e.,* intra-day storage.
- BESS **captures energy production from the grid** and discharge it to substitute fossil fuels-based energy production (for BESS paired with a renewable generation asset, see product *Battery Paired Power Generation*)
- **Rebound effect assessment** : The "Battery Energy Storage System" solution releases stored electricity at times when energy demand is peaking i.e., when the grid mix is carbon intensive and energy price high.
    - When the solution is installed on a client's site, the solution can thus also imply a reduction of energy costs for the client on top of emission reduction, which could provoke a rebound effect.

[10] Note that the MWh of green power produced or consumed are those of the ENGIE asset to ensure "apples-to-apples" comparison.

However, since the solution is targeted at B2B/B2T clients, it is expected that their behavior is less fluctuant than domestic consumers.

- Similarly, if the asset is connected to the grid, the cost reduction will be unsensible for end-customers.

- The rebound effect for this solution is thus expected to be low.

**Eligibility of Solution to WBCSD Gates**

- **Gate 2** : Currently all electricity storage activities are eligible according to the Taxonomy, subject to regular review.
- **Gate 3** : This DoC solution corresponds to assets owned and/or where Engie has operational control, thereby justifying its strategic position in the value chain.

→ "Battery Energy Storage System" is thus eligible to an avoided emissions claim according to WBCSD

Formula and Calculation Details

Avoided emissions from Battery Energy Storage System (BESS) come from the difference between the carbon intensity of the electricity stored in the asset, and the carbon intensity of the power grid at times when the stored electricity is released.

Indeed, this DoC solution stores energy from the grid during off-peak periods (when the grid is less carbon intensive) and releases that energy at peak times :

- if the asset is connected to the grid, it reduces the need for carbon intensive flexible technologies;
- if the asset is on the customer's site, it reduces the customer's consumption on the grid during peak periods.

The baseline should reflect the market average solution in the absence of Engie solution. In the absence of regulation, the baseline scenario corresponds to a client consuming directly from the grid (or to the grid regular functioning). Since BESS assets discharge energy during peak times, the baseline thus corresponds to the power-grid during peak times.

For the default baseline used for the Group KPI DoC reporting, two levels of detail have been adopted to best reflect the reality of the power grid while adapting to the available data:

- Where hourly data is available (mainly Europe): the baseline is the hourly average emission factors of peak/off-peak hours (average of the 3 hours of the **day when the demand in the country is the highest/lowest**[11])
- Where hourly data is not available (mainly rest of the world): the baseline is a single-cycle natural gas turbine (in line with reference scenario proposed in Innovation Fund for Energy storage). An energy conversion gas to power equivalent to 41.8%[12] and the lifecycle emission factor from the regional gas grid are considered. This baseline is then compared to the **national consumption-based power grid mix, yearly average value.**

NB1 : For some countries outside Europe, the gas-to-power baseline might give negative values as the result of the avoided emissions calculation (when the average emission factor is higher than a gas power plant). To avoid this issue, use the positive part of the result for each country, *i.e., max (0, result)*. This adjustment is justified by the fact that negative values for this DoC product correspond to a "bug" of the methodology, and not to a real negative impact on the emissions.

NB2 : Group KPI calculations are made on a daily basis using the default baseline based on average "peak/off-peak" emissions factors. For the project-based approach, a specific baseline and/or more precise data can be used (real-time data for instance), provided that the proposed methodology verifies all the DoC principles mentioned in section 4.

[11] Electricity prices can be used as a proxy for demand to identify demand peaks

[12] Energy Efficiency considered is based on the reported efficiency observed by ENGIE Thermal Europe. OCGT models considered are Siemens 9000 HL and GE 9H4 02

**DoC impact of the Energy Storage System asset** [tCO2e/year]

=

Annual **GHG emissions** from the **baseline scenario** [$tCO_2e$/year]

-

Annual **GHG emissions** from **the Energy Storage System asset owned and/or operated by ENGIE** [$tCO_2e$/year]

| Formula term | Calculation details |
|---|---|
| Annual GHG emissions from the **baseline scenario** [$tCO_2e$/year] | • For Europe :<br>Carbon emissions associated with grid-consumption during the ESS asset discharge periods (corresponding to peak-demand periods):<br>$$Baseline\ emissions = q \times N \times EF_{peaki}$$<br>Where :<br>- $q$ = Quantity of energy discharged per cycle by the ENGIE ESS asset [MWh]<br>- N = Number of cycles per year [#] (assume a maximum of one cycle per day)<br>- $EF_{peak}$ = Annual daily average "peak" emission factor of the country grid consumption mix<br>• For the rest of the world (or when hourly data is not available):<br>$$Baseline\ emissions = N \times \frac{q}{\eta_b} \times EF_b$$<br>Where:<br>- $q$ = Quantity of energy discharged per cycle by the ENGIE ESS asset [MWh]<br>- N = Number of cycles per year [#] (assume a maximum of one cycle per day)<br>- $\eta_b$ = Power production conversion efficiency of a single-cycle natural gas turbine (%)<br>- $EF_b$ = Annual life-cycle GHG emissions factor of the gas mix in the country (tCO2e/MWh-gas) |
| Annual GHG emissions **from the ENGIE asset** [tCO2e/year] | • For Europe:<br>Carbon emissions from the energy charged to the ESS (during off-peak periods):<br>$$Product\ emissions = q \times N \times \frac{1}{\theta} \times EF_{off-peak}$$<br>Where:<br>- $q$ = Quantity of energy discharged per cycle by the ENGIE ESS asset [MWh]<br>- N = Number of cycles per year [#] |

| | |
|---|---|
| | - θ = Round-trip efficiency indicating the amount of usable energy that can be discharged from the storage system relative to the amount of energy that was put in (i.e. the share of energy lost during each charge and discharge cycle) [%].<br>- $EF_{off-peak,}$ = Annual daily average "offpeak" emission factor of the country grid consumption mix<br><br>• For the rest of the world (or when hourly data is not available):<br>$$Product\ emissions = N \times q \times \frac{1}{\theta} \times EF_p$$<br>Where:<br>- $q$ = Quantity of energy discharged per cycle by the ENGIE ESS asset [MWh]<br>- N = Number of cycles per year [#] (assume a maximum of one cycle per day)<br>- $EF_p$ = Annual life-cycle GHG intensity of the power generation mix in the country (tCO2e/MWhe) |

#### 4.2.1.2 Pumped Hydro Storage (PHS)

**Definition & Scope**

- ENGIE **owns and/or operates** a large-scale Pumped Hydro Storage (PHS) that stores energy to be delivered later within a grid.
- Energy storage length (i.e. a charge / discharge cycle) goes from medium to long-term (i.e. from intra-day to inter-seasonal storage) and are used for reserve purpose.
- PHS captures energy production discharged later to substitute fossil fuels-based energy production
- **Rebound effect assessment** : As they are connected to the country grid, PHS assets do not directly imply cost reduction for end-clients. The rebound effect for this solution is thus expected to be low.

**Eligibility of Solution to WBCSD Gates**

- **Gate 2** : Currently all electricity storage activities are eligible according to the Taxonomy, subject to regular review.
- **Gate 3** : This DoC solution corresponds to assets owned and/or where Engie has operational control, thereby justifying its strategic position in the value chain.

→ "Pumped Hydro Storage" is thus eligible to an avoided emissions claim according to WBCSD

Formula and Calculation Details

Just like for BESS, avoided emissions from Pumped Hydro Storage (PHS) assets come from the difference between the carbon intensity of the electricity stored in the asset, and the carbon intensity of the power grid at times when the stored electricity is released. The main difference with BESS is the length of the cycle time, as PHS assets typically have a charging cycle of 6 hours compared to 3 hours for a BESS asset.

Indeed this DoC solution stores energy from the grid during off-peak periods (when the grid is less carbon intensive) and releases that energy at peak times :

- If the asset is connected to the grid, it reduces the need for carbon intensive flexible technologies;
- If the asset is on the customer's site, it reduces the customer's consumption on the grid during peak periods.

For the default baseline used for the Group KPI DoC reporting, two levels of detail have been adopted to best reflect the reality of the power grid while adapting to the available data:

- Where hourly data is available (mainly Europe): the baseline is the hourly average emission factors of peak/off-peak hours (average of the **6 hours of the day when the demand in the country is the highest/lowest**[13])
- where hourly data is not available (mainly rest of the world): the baseline is a single-cycle natural gas turbine (in line with reference scenario proposed in Innovation Fund for Energy storage). An energy conversion gas to power equivalent to 41.8%[14] and the lifecycle emission factor from the regional gas grid are considered. This baseline is then compared to the **national consumption-based power grid mix, yearly average value.**

NB1 : For some countries, the gas-to-power baseline might give negative values as the result of the avoided emissions calculation. To avoid this issue, use the positive part of the result for each country, i.e., *max (0, result)*. This adjustment is justified by the fact that negative values for this DoC product correspond to a "bug" of the methodology, and not to a real negative impact on the emissions.

NB2 : Group KPI calculations are made on an annual basis, using the default "gas-to-power". For the project-based approach, a specific baseline and/or more precise data can be used (real-time data for instance), provided that the proposed methodology verifies all the DoC principles mentioned in section 4.

**DoC impact** of **the Energy Storage System asset** [tCO2e/year] = Annual **GHG emissions** from the **baseline scenario** [$tCO_2e$/year] - Annual **GHG emissions** from **the Energy Storage System asset owned and/or operated by ENGIE** [$tCO_2e$/year]

| Formula term | Calculation details |
|---|---|
| Annual GHG emissions from the **baseline scenario** [$tCO_2e$/year] | • For Europe :<br>Carbon emissions associated with grid-consumption during the PHS asset discharge periods (corresponding to peak-demand periods):<br>$$Baseline\ emissions = q \times N \times EF_{peak}$$<br>Where :<br>- $q$ = Quantity of energy discharged per cycle by the ENGIE PHS asset [MWh]<br>- N = Number of cycles per year [#] (assume a maximum of one cycle per day)<br>- $EF_{peak}$ = Annual daily average "peak" emission factor of the country grid consumption mix |

[13] Electricity prices can be used as a proxy for demand to identify demand peaks
[14] Energy Efficiency considered is based on the reported efficiency observed by ENGIE Thermal Europe. OCGT models considered are Siemens 9000 HL and GE 9H4 02

| | |
|---|---|
| | • For the rest of the world (or when hourly data is not available):<br>$$Baseline\ emissions = N \times \frac{q}{\eta_b} \times EF_b$$<br>Where:<br>- $q$ = Quantity of energy discharged per cycle by the ENGIE PHS asset [MWh]<br>- N = Number of cycles per year [#] (assume a maximum of one cycle per day)<br>- $\eta_b$ = Power production conversion efficiency of a single-cycle natural gas turbine (%)<br>- $EF_b$ = Annual life-cycle GHG emissions factor of the gas mix in the country (tCO2e/MWh-gas) |
| Annual GHG emissions **from the ENGIE asset** [tCO2e/year] | • For Europe:<br>Carbon emissions from the energy charged to the ESS (during off-peak periods):<br>$$Product\ emissions = q \times N \times \frac{1}{\theta} \times EF_{off-peak}$$<br>Where:<br>- $q$ = Quantity of energy discharged per cycle by the ENGIE PHS asset [MWh]<br>- N = Number of cycles per year [#]<br>- θ = Round-trip efficiency indicating the amount of usable energy that can be discharged from the storage system relative to the amount of energy that was put in (i.e. the share of energy lost during each charge and discharge cycle) [%].<br>- $EF_{off-peak}$ = Annual daily average "off-peak" emission factor of the country grid consumption mix<br>• For the rest of the world (or when hourly data is not available):<br>$$Product\ emissions = N \times q \times \frac{1}{\theta} \times EF_p$$<br>Where:<br>- $q$ = Quantity of energy discharged per cycle by the ENGIE PHS asset [MWh]<br>- N = Number of cycles per year [#] (assume a maximum of one cycle per day)<br>- $EF_p$ = Annual life-cycle GHG intensity of the power generation mix in country i (tCO2e/MWhe) |

### 4.2.1.3 Battery-paired renewable generation

**Definition & Scope**

- ENGIE **owns and/or operates** assets that generate power from a **renewable resource** such as solar, wind offshore, wind onshore, hydro, geothermal; **paired with an Energy Storage System (ESS) asset**; **connected to the grid or on the client's site (onsite solar and storage)**.

- **A share of the produced electricity is directly consumed** by the client / injected on the grid, while the remaining production is stored in the ESS asset. The battery allows energy to be **stored for consumption during peak periods**, when the electricity network is very carbon intensive.
- This DoC solution is a **combination of the two DoC products "Standalone Energy Storage System" and "Green Power Generation"** : the electricity directly consumed/injected uses the same emissions reduction lever as "*Green Power Generation*", while the electricity stored in the ESS asset relies on the same logic as "*Standalone Energy Storage System*". Please rely on the guidance of these two DoC products for more detail on their functioning.
    - **Rebound effect assessment** : The "Battery Paired Renewable Generation" solution is targeted at B2B/B2T customers, or connected to the grid. B2B/B2T customers are expected to be less fluctuant than domestic customers, and when the asset is connected to the grid, the cost reduction induced is unnoticeable by end consumers. The rebound effect for this solution is thus expected to be low.

**Eligibility of Solution to WBCSD Gates**

- Gate 2 : Wind energy, Solar energy, Bioelectricity and Hydropower are all mentioned by 2IPCC AR6 as valid climate mitigation solutions, and Energy Storage Systems are compliant with the EU Taxonomy climate mitigation criteria.
- Gate 3 : This DoC solution corresponds to assets owned and/or where Engie has operational control, thereby justifying its strategic position in the value chain.

➔ "Battery Paired Renewable Generation" is thus eligible to an avoided emissions claim according to WBCSD

**Formula & Calculation Details**

This DoC solution is a combination of the two DoC products "Standalone Energy Storage System" and "Green Power Generation" :

- Avoided emissions linked to the electricity directly consumed / injected will be calculated according to the guideline for "Green Power Generation", *i.e.,* using the **national consumption-based power grid mix, yearly average value** as the baseline.
- Avoided emissions from the energy stored in the ESS asset will be calculated according to the guidelines for "Standalone Energy Storage System", *i.e.,* using the **national consumption-based power on-peak mix, yearly average value** as the baseline.

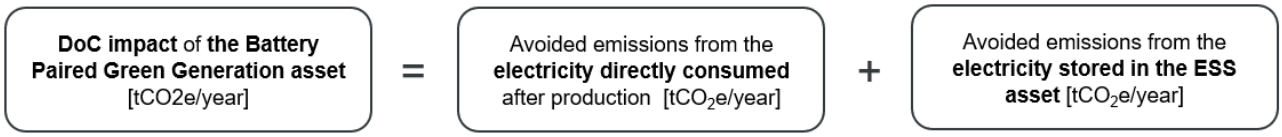
The national power mix emission factor considers life-cycle emissions.

**ESGBU battery-paired renewable assets**

For ESGBU batteries, installed on the client's site, the flexibility is provided to the client and not to the grid. Given that the customer's 'peak' consumption does not necessarily coincide with the grid's peak, it makes no sense to use the grid's peak as a baseline.

Nevertheless, the battery allows the customer to increase the amount of self-consumption of their renewable asset, by storing the energy produced when it was not needed so that it can be consumed later. Since this self-consumption rate is neglected for standalone ESGBU renewable assets (even if the energy produced is not consumed by the customer, it is sent to the grid and therefore contributes to the decarbonisation effort), it is neglected here too. **Renewable ESGBU assets combined with a battery are therefore treated exactly like standalone renewable ESGBU assets.**

NB : Group KPI calculations are made on an annual basis using the default baseline. For the project-based approach, a specific baseline and/or more precise data can be used, provided that the proposed methodology verifies all the DoC principles mentioned in section 4.



For the electricity directly consumed, the calculation is **the same** as the DoC product "Green power Generation". Please refer to the corresponding product guideline for calculation details.

For the electricity stored into the ESS asset to be released during peak times, the methodology is the same as the "Standalone Energy Storage System", except that the energy stored into the asset does not come from the grid, but from the Engie green power generation asset. Calculation details are the following:

| Formula term | Calculation details |
|---|---|
| Annual GHG emissions from the **baseline scenario** [$tCO_2e$/year] | • For Europe :<br>Carbon emissions associated with grid-consumption during the ESS asset discharge periods (corresponding to peak-demand periods):<br>$$Baseline\ emissions = N \times q \times EF_{peak}$$<br>Where:<br>- $q$ = Quantity of energy discharged per cycle by the ENGIE ESS asset [MWh]<br>- N = Number of cycles per year [#] (assume a maximum of one cycle per day)<br>- $EF_{peak}$ = Annual daily average "on-peak" emission factor of the country grid consumption mix<br>• For the rest of the world (or when peak/off-peak data is not available):<br>$$Baseline\ emissions = N \times \frac{q}{\eta_b} \times EF_b$$<br>Where:<br>- $q$ = Quantity of energy discharged per cycle by the ENGIE ESS asset [MWh]<br>- N = Number of cycles per year [#] (assume a maximum of one cycle per day)<br>- $\eta_b$ = Power production conversion efficiency of a single-cycle natural gas turbine (%)<br>- $EF_b$ = Annual life-cycle GHG emissions factor of the gas mix in the country (tCO2e/MWh-gas) |
| Annual GHG emissions **from the ENGIE asset** [tCO2e/year] | Carbon emissions from the energy charged to the ESS i.e. :<br>$$Product\ emissions = N \times q \times \frac{1}{\theta} \times EF_p$$<br>Where:<br>- $q$ = Quantity of energy discharged per cycle by the ENGIE ESS asset [MWh]<br>- N = Number of cycles per year [#]<br>- θ = Round-trip efficiency indicating the amount of usable energy that can be discharged from the storage system relative to the amount of energy that was put in (i.e. the share of energy lost during each charge and discharge cycle) [%] |

| | |
|---|---|
| | - $EF_p$ = Emissions factor of the ENGIE asset fuel source (e.g., solar, wind) [tCO2e/MWh] |

## 4.3 Commodities Sales

### 4.3.1 Commodities sales to end customers

#### 4.3.1.1 Green power sales

**Definition & Scope**

- ENGIE **sells to clients renewable electricity** that is purchased from external suppliers or from other ENGIE entities.
- Typical sales include power sales associated with **guarantees of origin (GO) or renewable energy certificates (REC)** such as Green Power Purchase Agreements. Note that unbundled GOs can be included[15].
- **Exclusions**: clients are restricted to **end users,** meaning that the DoC impact is not accounted for when ENGIE purchases products on markets and that these products are sold to intermediaries or entities that are likely to trade the purchased products back on the market.
- **Rebound effect assessment** : "Green Power Sales" solution is targeted at B2B/B2T customers, whose behavior is expected to be less fluctuant than domestic consumers. The rebound effect for this solution is thus expected to be low.

**Point of attention** : To avoid double counting with the "Green Power Generation" solution at Group level, all power sales are summed at country level, then netted with Engie green power production in the country. This ensure to only account for electricity sold not generated by Engie entities.

**Eligibility of Solution to WBCSD Gates**

- **Gate 2**: Wind energy, Solar energy, Bioelectricity and Hydropower are all mentioned by 2IPCC AR6 as valid climate mitigation solutions;
- **Gate 3**: This DoC solution corresponds only to sales to end-user. This condition ensure Engie strategic position in the value chain of the renewable electricity production sector, as a mid-streamer enabling exchanges between producers and consumers and thus supporting the growth of this strategic sector for climate mitigation.

➔ "Green Power Sales" is thus eligible to an avoided emissions claim according to WBCSD

Formula and Calculation Details

Avoided emissions from "Green Power Sales" come from the fact that Engie provides renewable electricity to its customers, which is less carbon-intensive than the electricity they would have had access to if they had consumed it directly from the grid, without going through the Engie green energy offer.

To best reflect the reality of the power market while adapting to the available data, two levels of detail have been adopted for the "Green Power Sales" baseline:

[15] Guarantee of origin certificates can either be contracted with an electricity supplier (bundled) or with a separate contract with a guarantee of origins supplier (unbundled).

- **Level 0:** use a **location-based** approach, where the baseline corresponds to the national consumption-based power grid mix, yearly average value
- **Level 1**: use a **"residual location-based**" approach, where the baseline corresponds to the residual power consumption mix of the country, yearly average value

Work is underway within Engie to build a reliable residual mix for all countries in which Engie sells electricity. In the absence of data on a country's residual mix, the location-based approach will be applied.

To avoid double counting, all the power production (see product 6.1.1) is subtracted from green power sales and only net sales are considered.

The national power mix emission factor considers life-cycle emissions.

**DoC impact** of **green power sales** [$tCO2_e$/year] = Annual **GHG emissions** from the **baseline scenario** [$tCO2_e$/year] - Annual **GHG emissions** from the **sale of green power** [$tCO2_e$/year]

| Formula term | Calculation details |
|---|---|
| Annual **GHG emissions** from the **baseline scenario** [$tCO_2e$/year | $$Baseline\ emissions = S \times EF_b$$ Where:<br>- $S$ = Quantity of green electricity sold with a GO or REC (for B2B and B2T clients) or quantity of green electricity purchased (for B2C clients) [MWh]<br>- $EF_b$ = Emissions factor of the baseline [$tCO_2e$/MWh] *i.e., :*<br>  ○ Level 0 : national consumption-based power grid mix, yearly average value<br>  ○ Level 1 : national residual power consumption mix, yearly average value |
| Annual **GHG emissions** from the **sale of green power** [$tCO_2e$/year] | $$Product\ emissions = S \times EF_p$$ Where:<br>- $S$ = Quantity of green electricity sold with a GO or REC (for B2B and B2T clients) or quantity of green electricity purchased (for B2C clients) [MWh]<br>- $EF_P$ = Emissions factor of the green electricity sold by Engie (e.g., solar, wind) [$tCO_2e$/MWh] |

### 4.3.1.2 Biomethane, biogas and biomass sales

#### Definition & Scope

- ENGIE **sells to clients biomethane, biogas or biomass** that is purchased from external suppliers or from other ENGIE entities.
- Exclusions:
  - This DoC product only includes biomethane and biogas sales where the biogas/biomethane sold passes the "Cogeneration of heat/cool and power from bioenergy" EU Taxonomy criteria;

- Clients are restricted to **end-users,** meaning that the Doc impact is not accounted for when ENGIE purchases products on markets and that these products are sold to intermediaries or entities that are likely to trade the purchased products back on the market.
- This DoC product only corresponds to biomethane and biogas **purchased and sold** : sales corresponding to gas produced by Engie asset should be accounted for in the "Green Gas Generation" DoC solution.

- **Rebound effect assessment** : Biomethane and biogas sales allow to support the development of the biomethane and biomass sector, but do not imply direct cost reduction for consumers. The rebound effect for this solution is thus expected to be low/non-existent.

## Eligibility of Solution to WBCSD Gates

- **Gate 2** :
  - **Biomethane and biogas** : "Biomethane and biogas sales" only include biomethane and biogas sales where the biogas / biomethane sold passes the "Cogeneration of heat/cool and power from bioenergy" EU Taxonomy criteria for climate mitigation solutions.
  - **Biomass** : 2IPCC AR6 mentions "Industry – Fuel switching (electricity, natural gas, bio-energy, H2)" as a valid climate mitigation option. Engie biomass sales to industrial clients are thus aligned with IPCC. Additionally, Engie environmental commitments, namely its "Forest" policy, ensure the durability of the biomass bought by Engie to be sold to customers. **For more details, please refer to the Group's environmental policy:** Politiques | ENGIE

- **Gate 3** : The "Biomethane, biogas and biomass sales" DoC product corresponds only to sales to end-user. This condition ensures Engie strategic position in the value chain of the biomethane and biomass sector, as a mid-streamer enabling exchanges between producers and consumers and thus supporting the growth of this developing sector.

➔ "Biomethane, biogas and biomass sales" is thus eligible to an avoided emissions claim according to WBCSD

## Formula and Calculation Details

The baseline for biomethane, biogas and biomass sales is **the national gas mix carbon intensity** (used as representing the average performance of technologies installed in the country). In the absence of regulation, the idea is to represent the average solution with the same purpose that the client would have had access to in the absence of Engie's solution.

The methodology considers two distinct grid emission factors (one for Europe and one for the rest of the world) and takes into account an increasing green gas penetration over time, according to the IEA SDS scenario. Respecting DOC Principle 3, Life-cycle emissions factors are considered for the baseline and the solution.

To avoid double counting, all the biomethane and biogas (see product 6.1.2) production is subtracted from green sales and only net sales are considered.

**DoC impact of biomethane and biogas sales** [$tCO2_e$/year] = Annual **GHG emissions** from the **baseline scenario** [$tCO_2e$/year] - Annual **GHG emissions** from the **sale of biomethane and biogas** [$tCO_2e$/year]

| Formula Term | Calculation details |
|---|---|

| | |
|---|---|
| Annual GHG emissions from the **baseline scenario** [tCO2e/year] | The carbon emissions from the consumption of the equivalent amount of biomethane/biogas directly from the local (region, country, province) gas generation mix.<br>$$Baseline\ emissions = Q \times EF_b$$<br>Where:<br>- $Q$ = Quantity of biomethane, biogas or biomass sold by ENGIE [MWh]<br>- $EF_b$ = Emissions factor of the local gas generation mix [$tCO_2e$/MWh] |
| Annual GHG emissions from the **sale of biomethane or biogas** [tCO2e/year] | $$Product\ emissions = Q \times EF_p$$<br>Where:<br>- $Q$ = Quantity of biomethane, biogas or biomass sold by ENGIE [MWh]<br>- $EF_p$ = Emissions factor of the biomethane, biogas or biomass sold [$tCO_2e$/MWh] |

#### 4.3.1.3 Green hydrogen sales

**Definition & Scope**

- ENGIE **sells to clients green hydrogen** that is purchased from external suppliers or from other ENGIE entities.
- Exclusions:
    - This DoC products only includes green hydrogen sales where the green hydrogen sold passes the “Manufacture of Hydrogen” EU Taxonomy criteria;
    - Clients are restricted to **end-users,** meaning that the Doc impact is not accounted for when ENGIE purchases products on markets and that these products are sold to intermediaries or entities that are likely to trade the purchased products back on the market.
- **Rebound effect assessment** : Green hydrogen sales allow to support the development of the hydrogen sector, but do not imply direct cost reduction for consumers. The rebound effect for this solution is thus expected to be low/non-existent.

**Eligibility of Solution to WBCSD Gates**

- **Gate 2** : “Green Hydrogen Sales” only includes green hydrogen sales where the green hydrogen sold passes the “Manufacture of Hydrogen” EU Taxonomy criteria for climate mitigation solutions.
- **Gate 3** : This DoC solution corresponds to assets owned and/or where Engie has operational control, thereby justifying its strategic position in the value chain.

➔ “Green Hydrogen Generation” is thus eligible to an avoided emissions claim according to WBCSD

**Formula and Calculation Details**

In the absence of regulation and in order to best reflect the state of the hydrogen market, the Green Hydrogen Sales DoC solution requires two separate default baselines depending on the type of client the green hydrogen is sold to :

- **Industrial clients** : the green hydrogen sold by Engie replaces grey hydrogen, thus allowing industries to decarbonize their activities without changing their industrial process;
- **Transport companies** (road mobility, maritime, aviation): the green hydrogen directly replaces fuel (diesel) or is used to produce e-fuels, such as e-methane, e-methanol, SAF, to replaces fossil fuels like heavy fuel oil[16].

The idea here is to represent the average solution with the same purpose that the client would have had access to in the absence of Engie's solution.

NB : Group KPI calculations are made on an annual basis using the default baseline. For the project-based approach, a specific baseline and/or more precise data can be used, provided that the proposed methodology verifies all the DoC principles mentioned in section 4.

**DoC impact** of **green hydrogen sales** [$tCO_2e$/year] **=** Annual **GHG emissions** from the **baseline scenario** [$tCO_2e$/year] **-** Annual **GHG emissions** from the **sale of green hydrogen** [$tCO_2e$/year]

| Formula Term | Calculation details |
|---|---|
| Annual GHG emissions from the **baseline scenario** [$tCO_2e$/year] | The carbon emissions from the consumption of the equivalent amount of green hydrogen sold from the baseline fuel.<br>$$Baseline\ emissions = Q \times EF_b$$<br>Where:<br>- $Q$ = Quantity of green hydrogen sold by ENGIE[17] [MWh]<br>- $EF_b$ = Emissions factor of the baseline [$tCO_2e$/MWh], *i.e.,*<br>  ○ Grey hydrogen if the client is an industry<br>  ○ Heavy fuel oil if the client is a transport company |
| Annual carbon emissions from the **sales of green hydrogen by ENGIE** [tCO2e/year] | $$Product\ emissions = Q \times EF_p$$<br>Where:<br>- $Q$ = Quantity of green hydrogen sold by ENGIE [MWh]<br>- $EF_p$ = Emissions factor of the ENGIE green hydrogen sold [$tCO_2e$/MWh] |

## 4.4 Services

### 4.4.1 Energy services

[16] In the RED II directive, renewable fuels of non-biological origin, or RFNBOs, are compared to the fossil fuel comparator at 94gCO2eq/MJ. The fuel closest to this value is heavy fuel oil.
[17] Note that the MWh of green power produced or consumed are those of the ENGIE asset to ensure "apples-to-apples" comparison.

### 4.4.1.1 Energy Performance Services

## Definition & Scope

- ENGIE **provides services** associated with the operations and/or **carries out works** on its clients' energy infrastructures, that generate **energy savings through efficiency improvements**. No significant CAPEX (initial investment) is involved when performing the service.
- For avoided emissions linked to a more decarbonized way of operating the asset by ENGIE, only **P1 contracts** (contracts with energy supply) are considered.
- The DoC impact may be related to three factors. Before operating the asset, ENGIE carries out works generating **white certificates** (called CEE on the French market). During the operating phase, ENGIE helps reducing the asset's emissions through **efficient energy management with energy performance contracts** and **green energy sourcing**.
- Exclusions: Note that this definition excludes services that are not expected to have a decarbonization impact as part of the contract. In other words, it excludes services that are not clearly associated with the energy or carbon savings such as soft facility management (e.g. plumbing, IT/digital, security/safety, janitor)[18].
- **Rebound effect assessment** : Energy Performance Services improve energy efficiency on clients' sites, and could thus imply a rebound effect on energy consumption. However, since the solution is targeted at B2B customers mostly, it is expected that their behavior is less fluctuant than domestic consumers. The rebound effect for this solution is thus expected to be low.

### Eligibility of Solution to WBCSD Gates

- **Gate 2** : 2IPCC AR6 mentions the following actions as valid climate mitigation options : "Buildings – Avoid demand for energy services", "Industry – Energy efficiency", "Other – Reduce emission of fluorinated gas" and Green electricity. Energy Performance Services DoC solution thus passes WBCSD Gate #2.
- **Gate 3** : This DoC solution corresponds to O&M services directly provided by Engie entities, thereby justifying Engie's strategic position in the value chain.

→ "Energy Performance Services" is thus eligible to an avoided emissions claim according to WBCSD

### Formula and Calculation Details

Depending on the decarbonization factor, one or more baselines can be used to account for avoided emissions. The different impacts can be calculated separately and summed to compute the total avoided emissions associated to the Energy Performance Service provided to the client.

#### 1. Works operated by ENGIE and generating White certificates

The aim is to quantify, over a given annual period, the energy savings generated by White certificates works. The avoided $CO_2$ emissions generated by the CEE works are evaluated using the issuance data of the CEEs, on the operator's perimeter, taking into account their conventional lifetime. This calculation applies to CEEs filed during the current year, to which are added the annual emission savings calculated according to the same methodology for the CEEs filed in the previous years, as long as the operations are still in their conventional life. Annualized savings are considered constant over the conventional lifetime.

$$Avoided\ emissions_{CEE} = E \times \frac{(1 - R_{bonus}) \times (1 - R_{rev})}{d} \times EF_t$$

[18] Please contact the authors of this document (Decarbonization-Clients Support (Engie SA) decarbonization-clients.support@engie.com) with any suggestion on how to account for such services.

Where:

- $E$ = White certificates volume
- $R_{bonus}$ = Bonus rate = 38% (cf. IGF-CGE- CGEDD report)
- $R_{rev}$ = Revaluation rate = 25% (cf. IGF-CGE- CGEDD report)
- $EF_t$ = Emissions factor associated with energy source (e.g., electricity grid mix for power, natural gas mix for gas) [tCO2e/MWh]
- $d$ = discounted lifetime = $\frac{1-\left(\frac{1}{1+0,04}\right)^{DDV_{conv}}}{1-\left(\frac{1}{1+0,04}\right)}$

Where $DDV_{conv}$ = Conventional lifetime of the operation considered

The table below lists the discounted lifetimes ($d$) depending on the conventional lifetime :

| Lifetime | 4% discounted lifetime | Lifetime | 4% discounted lifetime | Lifetime | 4% discounted lifetime |
|---|---|---|---|---|---|
| **1** | 1 | **11** | 9,1109 | **21** | 14,5903 |
| **2** | 1,9615 | **12** | 9,7605 | **22** | 15,0292 |
| **3** | 2,8861 | **13** | 10,3851 | **23** | 15,4511 |
| **4** | 3,7751 | **14** | 10,9856 | **24** | 15,8568 |
| **5** | 4,6299 | **15** | 11,5631 | **25** | 16,2470 |
| **6** | 5,4518 | **16** | 12,1184 | **26** | 16,6221 |
| **7** | 6,2421 | **17** | 12,6523 | **27** | 16,9828 |
| **8** | 7,0021 | **18** | 13,1657 | **28** | 17,3296 |
| **9** | 7,7327 | **19** | 13,6593 | **29** | 17,6631 |
| **10** | 8,4353 | **20** | 14,1339 | **30** | 17,9837 |

### 2. Efficient energy management related to energy performance contracts

The first decarbonization lever of the activity of the asset operated by ENGIE corresponds to a gain in efficiency compared to the market average. This lever is applied to the “grey” commodity inputs purchased by ENGIE to operate the asset. The aim is to quantify, over a given annual period, the energy savings achieved by a plant under operating contract (P1 contracts only). These energy savings are evaluated on the basis of CEE operation sheet BAR-SE-105 - Contrat de Performance Énergétique Services, which states that Operation and Maintenance (O&M) contracts enable an average energy savings of 10% per year. For the grey fuels consumed by the assets operated by ENGIE, we consider that we are therefore saving 10% on consumption compared with the baseline.

$$Avoided\ emissions_{efficiency} = 10\% * \sum_{i=1}^{M} c_i \times EF_{p_i}$$

Where:

- $M =$ Number of “grey” input fuel(s)
- $c_j =$ Annual quantity of grey fuel j consumed by the asset operated by ENGIE (MWh)
- $EF_j =$ Life-cycle GHG emissions factor of the grey fuel j consumed by the asset operated by ENGIE (tCO2e/MWh$_{fuel}$)

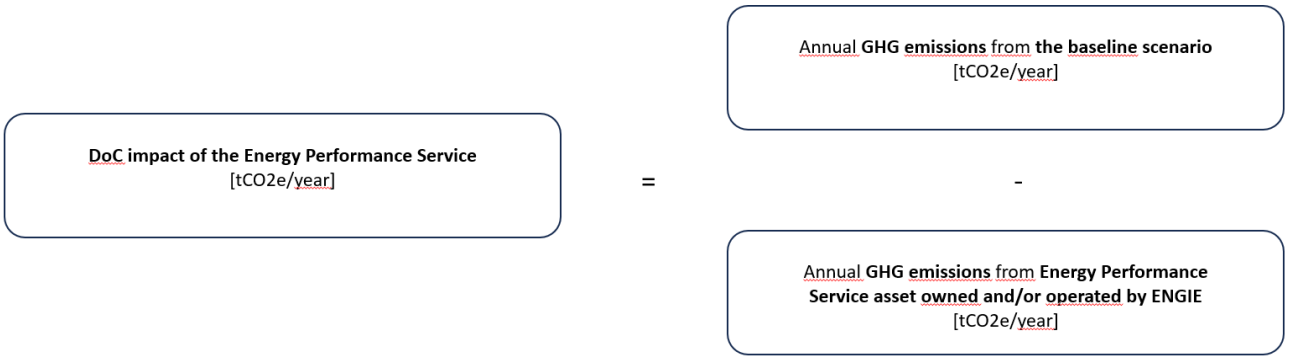
### 3. Green energy sourcing

Another lever for decarbonizing the activity of the asset operated by ENGIE is the use of green fuels as inputs. Here, the baseline considered is the equivalent separate heat production with a gas boiler (assuming 90% energy efficiency[19]). The "green part" of the production of the asset operated by ENGIE can be determined at pro rata of the asset's grey and green energy consumption. In the absence of regulation, gas is considered for the baseline as "the highest share of heat was produced from natural gas and manufactured gases [in 2020 in the EU]" (source European Commission20). Respecting Principle 3 of the DOC guideline, lifecycle emissions of gas production are considered.

$$Avoided\ emissions_{green\ inputs} = \frac{p_{green}}{\eta_b} \times EF_{gas} - \sum_{j=1}^{M} c_j \times EF_{p_j}$$

Where :

- $p_{green}$ = Annuel "green energy" produced by the asset operated by ENGIE (MWh)
- $\eta_b = 90\% =$ Heat production conversion efficiency for a natural gas boiler (%)
- $EF_{gas}$ is the emission factor of natural gas, lifecycle emissions (tCO2e/MWh)
- $M =$ Number of "green" input fuel(s)
- $c_j =$ Annual quantity of green fuel j consumed by ENGIE assets in the country (MWh)
- $EF_{pj} =$ Life-cycle GHG emissions factor of the green fuel j consumed by the ENGIE asset in the country (tCO2e/MWh$_{fuel}$)




The total avoided emissions for an Energy Performance Service can thus be computed by summing the different levers above when they apply :

$$Total\ avoided\ emissions = Avoided\ emissions_{CEE} + Avoided\ emissions_{Efficiency} + Avoided\ emissions_{green\ inputs}$$

## 4.4.1.2 Public lighting

**Definition & Scope**

- ENGIE owns and/or operates **lighting assets and infrastructure** at district or city scales.

[19]Average of Efficiency factor for heat water (92%) and Efficiency factor for steam (87%) – Source: Commission Delegated Regulation (EU) 2015/2402, "Harmonised efficiency reference values for separate production of heat", https://eur-lex.europa.eu

[20] Eurostat, "Electricity and heat statistics", https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Electricity_and_heat_statistics&oldid=552866#Derived_heat_production

- For the Group KPI reporting, avoided emissions for this DoC service come from the switch to more efficient light bulbs (LEDs), sometimes combined with system optimization (power dimming).
- For the project-based approach, green energy sourcing can also be valued as a lever for avoided emissions. This corresponds to projects where renewable energy is produced directly on the client's site to be supplied to the Public Lighting asset. A calculation methodology can be proposed by ENGIE entities for such projects.
- **Rebound effect assessment : The DoC solution "Public Lighting"** improves energy efficiency on clients' sites, and could thus imply a rebound effect on energy consumption. However, since the solution is targeted at B2B/B2T customers, it is expected that their behavior is less fluctuant than domestic consumers. The rebound effect for this solution is thus expected to be low.

**Eligibility of Solution to WBCSD Gates**

- **Gate 2** : 2IPCC AR6 mentions "Buildings – Efficient lighting, appliance and equipment" as a valid climate mitigation option.
- **Gate 3** : This DoC solution corresponds to assets owned and/or where Engie has operational control, thereby justifying its strategic position in the value chain.

➔ The "Public Lighting" solution is thus eligible to an avoided emissions claim according to WBCSD.

**Formula and Calculation Details**

The default baseline for the Public Lighting product is an **average public lighting system powered by the national power grid**. An increasing LED penetration in the baseline is considered (85% by 2030)[21].

We consider **average values** for energy efficiency gain from power dimming and from conversion to LED based on the latest Public Lighting projects realized.

NB : Group KPI calculations are made on a country and annual basis using the default baseline. For the project-based approach, a specific baseline and/or more precise data on efficiency gains can be used, provided that the proposed methodology verifies all the DoC principles mentioned in section 4.

**DoC impact** of **public lighting asset** [$tCO_2e$/year] **=** Annual **GHG emissions** from the **baseline scenario** [$tCO_2e$/year] **-** Annual **GHG emissions** from the **public lighting asset owned by ENGIE or where ENGIE has operational control over** [$tCO_2e$/year]

| Formula Term | Calculation details |
|---|---|
| Annual GHG emissions from the **baseline scenario** [$tCO_2e$/year] | $$Baseline\ emissions = L_b \times Q_b \times EF_{Eb}$$ Where:<br>- $L_b$ = Number of lamps in the baseline system [#]<br>- $Q_b$ = Annual energy consumed by a baseline lamp considering an average LED penetration [MWh/#] |

[21] Based on "EF dec2020_Public Lighting GBL Client Solutions_LFR.xlsx" (v2020-01-14), tool provided by ESGBU (Cities & Infrastructures, Public Lighting & Safety Solutions)

| | |
|---|---|
| | - $EF_{Eb}$ = Annual life-cycle GHG intensity of the power consumption mix in the country [tCO2e/MWhe] |
| Annual GHG emissions from the **ENGIE public lighting asset** [$tCO_2e$/year] | $$Product\ emissions = L_b \times Q_b \times EF_{Eb} \times (1 - c_{LED}) \times (1 - c_{dimming})$$ Where:<br>- $L_b$ = Number of lamps in the baseline system [#]<br>- $Q_b$ = Annual energy consumed by a baseline lamp considering an average LED penetration [MWh/#]<br>- $EF_{Eb}$ = Annual life-cycle GHG intensity of the power consumption mix in the country [tCO2e/MWhe]<br>- $c_{LED}$ = Average energy efficiency gain linked to LED conversion (%) – To be updated by ES-GBU<br>- $c_{dimming}$= Average energy efficiency gain linked to power dimming (%). If no power dimming is applied, use $c_{Dimming} = 0\%$ - To be updated by ES-GBU |

#### 4.4.1.3 Demand Side Management – Load shedding

**Definition & Scope**

- ENGIE **offers to its B2B and B2C clients a load shedding service**.
- Load shedding service is a service that **encourages customers to reduce their energy consumption.**
- ENGIE's load shedding service is a valuable **tool for both B2B and B2C clients**. It allows clients to adjust their electricity usage when prices are low, promoting carbon savings, cost savings and energy efficiency.
- **Rebound effect assessment** : The aim is to ensure that energy reductions achieved during load shedding are not offset by increased consumption during other periods. In the case of B2C clients, it is expected that the rebound effect would be relatively low, as they are more likely to adhere to the load shedding recommendations. However, for B2B clients, additional considerations are necessary. As these clients often have production commitments to meet, it becomes essential to verify if the reduction in energy consumption during load shedding is not merely shifted to another time slot.

**Note on terminology**

Within the ENGIE group, the term "grid mix" refers to the carbon intensity of energy consumed by an end-customer. Third-party entities may also use terms such as "consumption mix," "supplier mix," or "generation mix" to describe the same concept. It is important to distinguish grid mix from production mix, which represents the carbon intensity of power generated within a country for a specific time period.

- **Grid Mix**: Refers to the carbon intensity of energy consumed by an end-customer. It may also be referred to as "consumption mix," "supplier mix," or "generation mix" by third-party entities.
- **Production Mix**: Represents the carbon intensity of power generated within a country during a specific time period.
- **Load Shedding**: A service that encourages customers to reduce their energy consumption.
- **Load Shifting**: A service where energy consumption is shifted to another period with lower energy prices and grid carbon intensity.

**Eligibility of Solution to WBCSD Gates**

- **Gate 2** : Load Shedding is mentioned in the IPCC through the category buildings “avoid demand for energy services”.
- **Gate 3** : This DoC solution is directly related to a service offer solely provided by ENGIE, thus justifying a direct and significant decarbonization impact.

**Formula and Calculation Details**

**Depending on the available data, different baseline options can be considered**. The emissions factor (EF) for each country can be determined using the following options, ranked from less accurate to more accurate:

1. Average grid mix (consumption mix).
2. Average grid mix at peak, which can be measured on a yearly, monthly, or daily basis, depending on data availability.
3. For a given day, blocks of consecutive hours with the highest emissions factor, corresponding to the period when the load shedding service is offered.
4. Grid mix during activation hours, which represents the period when the load shedding is implemented.

Since load shedding involves not consuming energy, the total emissions of a load shedding service are considered to be zero. Therefore, baseline emissions are equivalent to avoided emissions.

| | | |
|---|---|---|
| **DoC impact** of load shedding [$tCO_2e$/year] | = | Annual **GHG emissions** from hours at peak period when electricity was not consumed by the client (**baseline scenario)** [$tCO_2e$/year] |

| Formula Term | Calculation details |
|---|---|
| Annual GHG emissions from the **baseline scenario** [$tCO_2e$/year] | • For case 2 to 4<br>$$Baseline\ emissions = \sum_{j=1}^{M} c_j \times H_j \times EF_j$$<br>Where:<br>- $M =$ Number of load shedding services offered by ENGIE<br>- $c_j =$ **Reduction of energy consumed** thanks to load shedding service j in MWh<br>- $h_j =$ Number of hours shedded with load shedding service j<br>- $EF_j =$ **average emissions factor of electricity at peak** for relevant period (hourly, 6 hours, 12 hours, daily, monthly, yearly) of load shedding service j offered by ENGIE ($tCO2e/MWh_{ectricity}$)<br>• For case 1<br>$$Baseline\ emissions = \sum_{j=1}^{M} c_j \times H_j \times EF_j$$<br>Where:<br>- $M =$ Number of load shedding services offered by ENGIE<br>- $c_j =$ Reduction of energy consumed thanks to load shedding service j in MWh |

| | |
|---|---|
| | - $h_j$ = Number of hours shedded with load shedding service j<br>- $EF_j$ = **emissions factor of electricity grid mix** for relevant period of load shedding service j offered by ENGIE (tCO2e/MWh$_{ectricity}$) |
| Annual carbon emissions of **load shedding** solution [tCO2e/year] | Since load shedding involves not consuming energy, the total emissions of a load shedding service are considered to be zero. |

### 4.4.2 Low carbon mobility

#### 4.4.2.1 Electric vehicles charging stations

**Definition & Scope**

- ENGIE owns and/or operates **electric vehicles charging stations** in towns and local regions, therefore contributing to an identified solution to reduce greenhouse gas emissions from transport.
- Electricity can be produced onsite, through solar photovoltaic or hydrogen electrolysis for instance, or purchased from the local power network.
- **Rebound effect assessment** : The "Electric Vehicles Charging Stations" solution contributes to the development of the electric vehicles sector. However, the development of this sector will be coupled with a decline in the market for thermal vehicles. As the energy demand for transport is not elastic, the rebound effect for this solution is thus expected to be low.

**Eligibility of Solution to WBCSD Gates**

- **Gate 2** : 2IPCC AR6 mentions "Electric light duty and heavy duty vehicles" as a valid climate mitigation option. The solution Doc "Electric Vehicles Charging Stations" contributes to the development of the electric vehicles sector, and thus passes WBCSD Gate 2.
- **Gate 3** : This DoC solution corresponds to assets owned and/or where Engie has operational control, thereby justifying its strategic position in the value chain.

➔ The "Electric Vehicles Charging Stations" solution is thus eligible to an avoided emissions claim according to WBCSD

**Formula and Calculation Details**

The baseline for the Electric Vehicles Charging Stations product is the **average light vehicle fleet of a specific country/region traveling an equivalent distance**. In the absence of regulation, the idea is to represent the average equivalent travelling solution the client would have had access to in the absence of Engie solution. Note that it is assumed that **electric charging stations are mainly for light road transport**, unlike biogas and hydrogen stations, which are mainly for heavy vehicles.

The baseline considers the increasing penetration of BEV and PHEV vehicles in the total fleet by geography based on ENGIE Corporate Scenarios central scenario (updated yearly).

NB : Group KPI calculations are made on a country and annual basis using the default baseline. For the project-based approach, a specific baseline and/or more precise data can be used (real-time data for instance), provided that the proposed methodology verifies all the DoC principles mentioned in section 4. In particular, when data is available, the annualized LCA of the EV charging station can also be added to the product emissions for a more precise assessment of avoided emissions.

**DoC impact of EV charging station** [$tCO2_e$/year] = Annual **GHG emissions** from the **baseline scenario** [$tCO_2e$/year] - Annual **GHG emissions** from the **EV charging station owned and/or operated by ENGIE** [$tCO_2e$/year]

| Formula Term | Calculation details |
|---|---|
| Annual GHG emissions from the **baseline scenario** [$tCO_2e$/year] | $$Baseline\ Emissions = \frac{q}{\eta_p} \times EF_b = D_b \times EF_b$$ Where:<br>- $q$ = Annual energy delivered to ENGIE electric vehicles charging stations [kWh]<br>- $\eta_p$ = Average efficiency rate of electric vehicles [kWh/km]<br>- $D_b$ = Total annual distance covered by the baseline mobility asset(s) [km]<br>- $EF_b$ = life-cycle GHG emissions factor associated to the fuel consumption of the average light vehicle in the country [$tCO_2e$/km] (based on Corporate Scenarios) |
| Annual GHG emissions from the **ENGIE electric charging asset** [$tCO_2e$/year] | $$Product\ Emissions = q_{green} \times EF_{green} + q_{not\ green} \times EF_{not\ green}$$ Where:<br>- $q_{green}$ = Annual green electricity (purchased through a GO or REC) delivered to ENGIE electric vehicles charging stations [kWh]<br>- $EF_{green}$ = Annual life-cycle GHG emissions factor of the green electricity supplied to the charging station [tCO2/kWh]<br>- $q_{not\ green}$ = Annual grid electricity (not purchased under any specific contractual agreement) delivered to ENGIE electric vehicles charging stations [kWh]<br>- $EF_{not\ green}$ = Annual life-cycle GHG emissions factor of the grid electricity [tCO2/kWh]:<br>  ○ Level 0 : national consumption-based power grid mix, yearly average value<br>  ○ Level 1 : national residual power consumption mix, yearly average value |

### 4.4.2.2 Biogas & H2 fuel stations

**Definition & Scope**

- ENGIE owns and/or operates **biogas or H2 fueling stations** in towns and local regions, therefore contributing to an identified solution to reduce greenhouse gas emissions from transport.
- **Rebound effect assessment** : The “Biogas & H2 fuel stations” solution contributes to the development of alternatives to fossil fuel based transport. However, the development of these new alternatives will be coupled with a decline in the market for thermal vehicles. As the energy demand for transport is not very elastic, the rebound effect for this solution is thus expected to be low.

**Eligibility of Solution to WBCSD Gates**

- **Gate 2** : 2IPCC AR6 mentions “Biofuel” as a valid climate mitigation option.
- **Gate 3** : This DoC solution corresponds to assets owned and/or where Engie has operational control, thereby justifying its strategic position in the value chain.

➔ The “Biogas Fuel Stations” solution is thus eligible to an avoided emissions claim according to WBCSD.

**Formula and Calculation Details**

The baseline for the Biogas & H2 fuel stations product is the **average heavy vehicle of a specific country/region traveling an equivalent distance**. In the absence of regulation, the idea is to represent the average equivalent travelling solution the client would have had access to in the absence of Engie solution. Note that it is assumed that **biogas and H2 charging stations are mainly for heavy road transport**, unlike electricity charging stations, which are mainly for light vehicles.

The baseline considers the increasing penetration of BEV and PHEV vehicles in the total fleet by geography based on ENGIE Corporate Scenarios central scenario (updated yearly)..

NB : Group KPI calculations are made on a country and annual basis using the default baseline. For the project-based approach, a specific baseline and/or more precise data can be used (real-time data for instance), provided that the proposed methodology verifies all the DoC principles mentioned in section 4. In particular, when data is available, the annualized LCA of the biogas fueling station can also be added to the product emissions for a more precise assessment of avoided emissions.

**DoC impact of biogas fueling station** [$tCO2_e/year$] = Annual **GHG emissions** from the **baseline scenario** [$tCO_2e$/year] − Annual **GHG emissions** from the **biogas fueling station owned and/or operated by ENGIE** [$tCO_2e$/year]

| Formula Term | Calculation details |
|---|---|
| Annual GHG emissions from the **baseline scenario** [$tCO_2e$/year] | $$Baseline\ Emissions = \frac{q}{\eta_p} \times EF_b = D_b \times EF_b$$ Where:<br>- $q$ = Annual energy delivered to customers by ENGIE biogas or H2 fueling stations [kWh]<br>- $\eta_p$ = Average efficiency rate of biogas or H2 vehicles [kWh/km]<br>- $D_b$ = Total annual distance covered by the baseline mobility asset(s) [km]<br>- $EF_b$ = life-cycle GHG emissions factor associated to the fuel consumption of the average heavy vehicle in the country [$tCO_2e$/km] (based on Corporate Scenarios) |
| Annual GHG emissions from the **ENGIE electric charging asset** [$tCO_2e$/year] | $$Product\ Emissions = q \times EF_P$$ Where:<br>- $q$ = Annual energy delivered to ENGIE biogas or H2 vehicles charging stations [kWh]<br>- $EF_p$ = Annual life-cycle GHG emissions factor of the biogas or H2 delivererd to ENGIE charging station [$tCO_2e$/kWh] |

## 4.5 Pending new services and products

In the course of the version update (2023), additional solutions have been identified. These solutions will be further assessed in a future update of this document.

### 4.5.1 Load Shifting

ENGIE's dedication to energy efficiency has grown amid the Ukrainian crisis, resulting in the expansion of load shifting and load shedding services. Proven effective in the B2C market, these solutions are becoming more central to ENGIE's strategy. Recognizing its key potential to avoided emissions, discussions about extending load shifting to B2B clients have commenced. After initial discussions with stakeholders from GEMS and ENGIE OneRetail, a first methodology applicable to both B2C and B2B clients, has been formulated.

A load shifting service differs from load shedding in that energy consumption is not reduced but rather shifted to another period when energy prices and grid carbon intensity are lower. By carefully evaluating and implementing load shifting solutions, ENGIE can help B2B clients strike a balance between reducing energy consumption and fulfilling production obligations effectively.

As with load shedding, the accuracy of the solution's avoided emissions depends on the quality and availability of data. The emissions factor (EF) for each country can be determined using the following options, ranked from less accurate to more accurate:

**Formula and Calculation Details**

1. yearly average grid mix at peak
2. daily or monthly grid mix at peak, depending on data availability
3. For the day of activation of the load shifting service, blocks of consecutive hours with the highest emissions factor, corresponding to the period when the load shifting service is offered.

For calculating the emissions of the solution, the off-peak emissions factor will be considered based on the same baseline used for load shifting. In the case of option 3, the emissions will be compared to blocks of hours with the lowest emissions factor, which correspond to the period when the load is shifted.

**DoC impact** of Load Shifting services [$tCO_2e$/year] = Annual **GHG emissions** from hours at peak period **(baseline scenario)** [$tCO_2e$/year] - Annual **GHG emissions of** hours shifted to off-peak period [$tCO_2e$/year]

### 4.5.2 Sales of heat pumps, solar PV & batteries for B2C customers

ENGIE sells decarbonizing equipment. In reference to the WBCSD gate 3 direct and significant impact, in case where ENGIE only plays a liaise role, the solution is not eligible to avoided emissions. This product excludes installations where ENGIE holds an operation and maintenance contract of the installed asset.

The suggested methodology for such products would be to apply a forward-looking approach since the monitoring of these installations is not possible.

Even if ENGIE does not sell a large number of heat pumps and solar PV today, ENGIE sales figures have along with market trend increased the last years and are likely to gain importance in the upcoming years.[22] Default values and common assumptions for these installations shall be discussed before developing an extensive methodology for these products.

[22] As of 2023, ENGIE is selling Solar PV and Heat pumps in France, Belgium, The Netherlands, Romania and Italy. The acquisition trend for such equipment is rising in all these geographies.

### 4.5.3 Carbon Capture and Storage assets and services

ENGIE currently does not have carbon capture and storage assets or services in its portfolio. However, there are ongoing prospects and studies being conducted to explore the development of these solutions in this area where ENGIE could potentially position itself.

While the simplest approach to calculating avoided emissions would be to account for all CO2 stored, it is essential to consider that the GHG Protocol imposes strict criteria for identifying "net removals" of CO2 from the atmosphere. This means that not all CO2 storage can be counted as avoided emissions.

For any carbon capture and storage solutions to be considered eligible, they must first meet the eligibility gates established by the WBCSD and second probably also adhere to the requirements specified in the GHG Protocol guidance on CCUS (Carbon Capture, Utilization, and Storage). These requirements encompass data quality requirements[23] and the precise definition of CO2 net removals[24].

To ensure accurate reporting and compliance with industry standards, ENGIE's potential involvement in carbon capture and storage would have to first align with these stringent guidelines and criteria.

# 5 Annex

# Annex 1 - Accounting Principles

**Compliance of DoC principles with WBCSD principles**

The WBCSD principles guidance aim to ensure full transparency when communicating on avoided emissions and defines **nine reporting principles, detailed hereafter**:

2) ensure that **avoided emission**s are reported **separately** from GHG inventory footprint, and that carbon sinks and financial contribution to transition (abatement, avoidance or removals) outside of the value chain are reported separately.

   →This principle was already included in ENGIE accounting principles: Principle 6 *"Transparent, verifiable, and separate communication"*.

3) **do not use** avoided emissions reporting to claim carbon neutrality, net zero and other claims.

   → The DoC principle 6: *"Transparent, verifiable, and separate communication"* has been amended to include this principle.

4) provide a **description of the lifecycle and baseline** used under company's methodology. A lifecyle approach is mandatory and the choice of a baseline is extendedly discussed in the guidance and varies depending on the nature of the product or the service: new demand, existing demand, regulation to name a few aspects

   → the lifecycle aspect was already embedded in Principle 3: *"Calculation consistency*"

   → Principle 2: *"Credible Baseline"* has been amended to describe the baseline decision tree drawn by the WBCSD guideline.

5) specify whether a **forward-looking or a year-on-year approach** has been used. Both methods are allowed under the guidance and both approaches are allowed to coexist

[23] The concept of ownership, on going storage monitoring, traceability, primary data, uncertainty and reversal accounting must be met. For further reference please consult to the GHG Protocal on Land Sector and Removals

[24] Industrial CO2 such as CO2 captured from CCGT are not eligible to removals, since these are not removed from the atmosphere.

→ This principle was already included in ENGIE accounting principles: Principle 4 *"Pragmatic Accounting"*.

6) provide evidence of products and services **compliance to each gate.**

   → Principle 1: *"Eligibility and scope of assessment"* has been amended to describe WBCSD eligibility gates.

7) disclose percentage of sales generating **avoided emissions against total revenue.** This condition is to limit the risk of "greenwashing" and avoid double-counting within a company. This should be reported at the entity level.

   → Principle 5: "Managing double counting"

8) mention whether the reporting has been **audited by a third party**. However, we should note that an audit is not mandatory

   → Principle 6: *"Transparent, verifiable, and separate communication"* has been amended to include this principle.

9) identify and **report any side-effects of products** in terms of environmental and sustainability goals and mitigation plans to countervail these.

   → This aspect was not thoroughly discussed under ENGIE V3 DoC methodology and constitute the addition of a new principle *"side effects and rebound effects".*

10) finally mention any possible **rebound effects** of the solutions.

   → Similarly to WBCSD 8th principle, this aspect was not thoroughly discussed under ENGIE V3 DoC methodology and constitute the addition of a new principle *"side effects and rebound effects".*

## Principle 1 – Eligibility and scope of assessment

Products or services that are eligible to DoC are those that have a direct and measurable decarbonization impact to the clients they are provided to. Also, they should be recognized as mitigation sources by either the IPCC Sixth Assessment Report or the European Taxonomy.

Sub-products and services entering in their composition are also considered as contributing to the DoC if they are "unique" to their value chain (i.e. they are critical to achieving the final "direct and measurable" decarbonization impact).

For DOC products which correspond to assets reported as equities, reporting follows the GHG Protocol Guidance on Scope 3 (investment), ENGIE " should account for the proportional scope 1 and scope 2 emissions of the investments [..] Proportional emissions from equity investments should be allocated to the investor based on the investor's proportional share of equity in the investee"

For all products and services compliant with the above conditions, the DoC impact should be 100% of the DoC impact resulting from the use of the product or service that has the direct and measurable impact, null otherwise.

Financing and advisory solutions are not included in the scope of assessment.

All companies delivering or owning such product or service, should refer to their 'contribution' to DoC.

Indeed, 'Direct and measurable' serves as a pragmatic test to identify which products and services should be considered when measuring the DoC impact of a value chain. This approach recognizes that products and services that have a direct and measurable impact on emissions are typically part of complex value chains, with often many sub-products and services critical to achieving the decarbonization impact. Deciding which (sub-)product or service contribute to the decarbonization impact and by how much is a difficult question with no obvious answer. Within a value chain, only the products and services that are unique to the value chain contribute to the DoC impact. In contrast, raw inputs, or standard products and services, are not considered to contribute to DoC impact. In addition, to avoid arbitrarily assigning an impact on DoC to specific products and

services in a value chain, 100% of the DoC impact of the final product or service is proposed and to always refer to their 'contribution' to DoC.

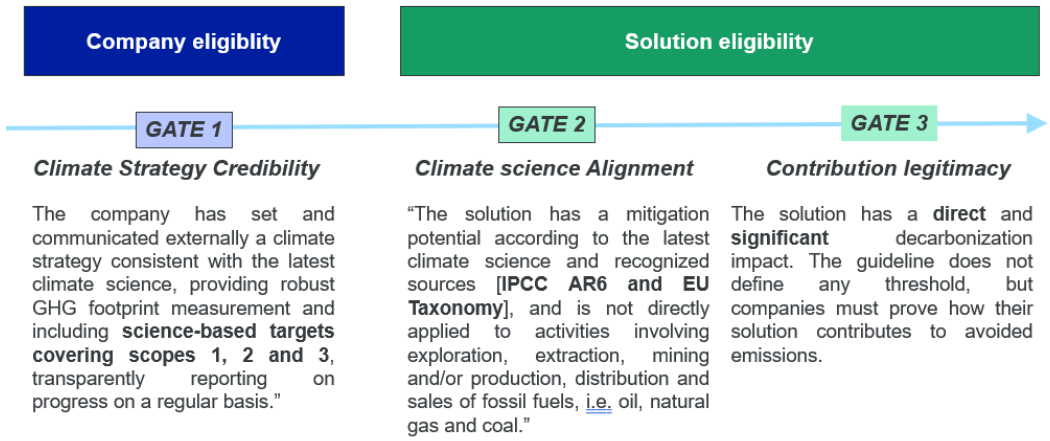
Always using 100% of the DoC impact resulting from the use of the product or service that has the direct and measurable impact avoids trying to measure an exact and unavoidably arbitrary contribution.

Referring to "contribution" recognizes that a company is not the sole party responsible for the DoC impact.

## Compliance with the WBCSD

ENGIE Principle 1 is consistent with the eligibility gates defined by the WBCSD guidance and presented in the Figure below. According to the WBCSD, the eligibility of a solution is subject to three gates, one at company level and two at solution level.

Figure: WBCSD eligibility gates




**Engie passes Gate 1** thanks to its SBT commitments on all scopes.[25] On the solution eligibility front, ENGIE must built arguments – for each of its products and services – to support that its solutions meet conditions set in **Gate 2** "Climate science alignment" and **Gate 3** "Contribution legitimacy". This assessment is done in the present document.

The WBCSD guidance precises that financing of climate mitigation projects, though contributing to the decarbonization of the society, are not covered in the current guideline.

## Examples

For example, when considering wind power, the product or service that has a direct and measurable impact on emission is the windfarm itself. The windfarm should therefore be used to measure the DoC impact. However, a windfarm involves numerous sub-products and services unique to the windfarm value chain. These include the wind turbines, parts, such as blades, towers, or generators, but also services, such as project development, and installation. All such products and services can claim to contribute to 100% of the DoC impact of the windfarm. In contrast, nonspecific inputs to the wind farm value chain, including standard cabling, cement, or steel, should not be considered to contribute to the windfarm DoC impact.

Another related example is concrete. If a standard grade of concrete is used in the value chain of another product or service, such as the example above, it should not be accounted for in the DoC impact. However, if a new type of concrete has itself emissions avoidance properties vs standard concrete, then the new concrete has a direct and measurable impact and should be included in DoC calculation. Similarly, to the windfarm example above, other sub-products and services unique to the new concrete value chain should also be considered to contribute to 100% of the DoC impact.

[25] SBTi is a recognized source by the WBCSD *« Assessing avoided emissions of solutions contributing to global Net Zero efforts ».*

## Principle 2 – Credible Baseline

**Companies shall select a credible baseline corresponding to the most likely alternative in the absence of the product or service provided by the company.**

Specifically, **one of the baselines among the 5 options** below shall be selected:

1. Baseline that is **defined by or in collaboration with the customer,** that is specific to a given project/contract;
2. Baseline representing the local Minimum **Regulatory Requirements** (MRR) for new product /service commercialized or commissioned;
3. **New demand**: Baseline representing the average performance of technologies installed in the country (e.g., local electricity production mix, research papers and studies) ;
4. **Improvement**: Baseline representing the continued use of the same solution before improvement;
5. **Replacement:** Baseline representing the average performance on the market for the same kind of replacement.

Products/services may rely on a combination of baselines. In such cases, the "custom" baseline should be communicated transparently.

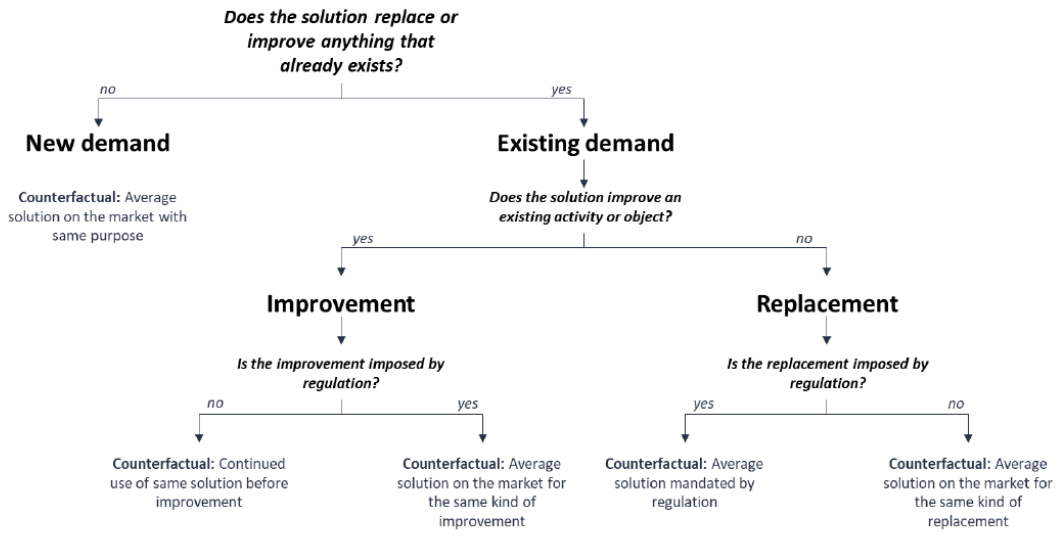
In the case where the definition of the baseline is not clear, the most conservative baseline among all options shall be selected. To ensure credibility, all solutions shall avoid overstating, the selected baseline shall be justified.

For each product/service, the trigger of the solution shall be stated: new demand, improvement or replacement.

Always use the most recent data for the baseline and, when available, forecast data to account for future baseline evolutions (dynamic baseline, see principle 4).

For a product/service that is delivered simultaneously to several clients for which the DoC impact relies on different baselines, the baseline to retain is that of the client generating the highest revenue from the delivery of the product/service.

### Compliance with the WBCSD




WBCSD guidance precisely indicates how to define a baseline accordingly to the nature of a solution and the context under which it is used. The definition of the appropriate baseline shall be based on the following decision tree:

- New demand: the demand was triggered by a growth in customer's need (e.g., installation of a distributed solar asset on a new building of the client), i.e., no "previous situation" existed before.
- In this context, the reference scenario shall be the expected situation based on the market at the year of sale for solutions with the same purpose. for ENGIE, this could be the emission factor of the national electricity grid without ENGIE's solution.
- Existing demand: the solution fulfills an existing level of activity, and therefore replaces or improves an existing system.
- Improvement (not imposed by regulation): If improvement is not imposed by exogeneous factors (such as regulation) : the baseline should be the continued use of the previous system without the improvement brought about by the solution
    - Improvement imposed by regulation: the baseline should be the average market solution to perform this kind of improvement
- Replacement (not imposed by regulation): the baseline should be the continued use of the previous system without the improvement brought about by the solution
    - Replacement imposed by regulation : the baseline should be the average solution aligned to the new regulation chosen to replace the existing one at the year of the sale
- ENGIE is consistent with the rules of the WBCSD guideline and its baseline follows the WBCSD decision tree.

**Note**: It is always assumed that replacements take place at the end-of-life of the asset, as it allows to simplify as well as to be conservative when assessing avoided emissions.

**Examples**

A company replaces an existing boiler whose remaining lifespan is 2 years. If the applicable MRR in the country of installation considers the existing boiler as outdated, the company shall select the MRR as baseline over the entire new boiler's lifetime. The baseline may be dynamic to consider future evolutions of the MRR. In this case, the country's MRR is more ambitious than the average installed technologies in the country.

A company installs and operates a new district heating and cooling system in a city. The company has modelled in collaboration with the client an alternative scenario with projections of carbon emissions specific to the city it is located in. In this case, the modelled alternative which is more ambitious than the country's MRR or average installed technologies in the country shall be considered as the baseline.

## Principle 3 – Calculation Consistency

**The emissions calculations shall be consistent between the baseline and the product/service delivered by the company. Companies shall account for the full life-cycle GHG emissions (based on a Life-Cycle Analysis or LCA) whenever possible, and shall use direct GHG emissions as default when LCA data is not available.**

The full Life-Cycle Analysis (LCA) approach shall be consistent across the calculations of the baseline and ENGIE's product/service emissions, so if life-cycle GHG emissions data is not available for either the baseline or ENGIE's product/service or both, then only direct emissions shall be considered for both the baseline and the product/service. This is defined as the iso-perimeter rule.

Companies shall strive to use emissions factors that account for the full lifecycle of the product/service, i.e., from cradle to grave, not only for the direct emissions related to the operating phase of the product/service[26].

An exception to this rule is for client projects that are certified or apply to certification by a carbon standard and or by a white certificate standard that do not rely on LCA methodologies.

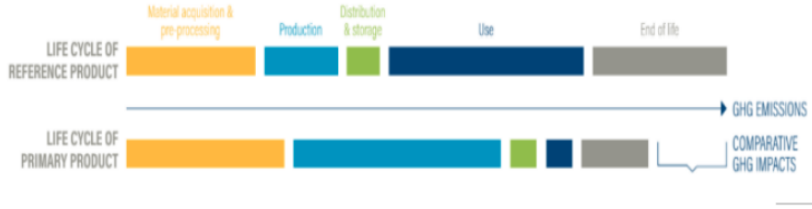



Figure 3.

Representation of the avoided emissions concept, drawn from WRI working paper, 2019

**Compliance with the WBCSD**

The principle refers to WBCSD **principle 3**:

" When communicating and reporting at solution level, companies shall **provide a description and the lifecycle GHG emissions of the solution**(s) and reference scenario(s) on which the avoided emissions are based "

Regarding lifecycle reporting, the level of details given by ENGIE is more extensive than what it is described in the WBCSD.

**Examples**

A company installs a new Heating, Ventilation and Air Conditioning (HVAC) system in a building. Use the LCA associated with the new HVAC system being installed compared to the LCA of an HVAC system defined according to the baseline, provided LCA data is available for both the new and the baseline systems.

**A Company operates a gas network. It must include the LCA of the gas sold from its extraction, transmission, distribution and storage.**

A company operates a wind park in a European country. Use LCA associated to the wind power plant compared to the grid mix of the country defined as the credible baseline, provided LCA data is available for the wind park and the country's grid mix.

## Principle 4 – Pragmatic accounting

**The reporting shall adapt the accounting of the DoC impact based on the nature of the transaction with customers.**

### Year-on-Year avoided emissions approach

- For products and services involving an **ongoing contract**, account for the actual DoC impact **on an annual basis** until the end of the contract.

[26] This principle recognizes the preference for an "attributional" approach, as defined by the WRI (Russell, Stephen. 2018. "Estimating and Reporting the Comparative Emissions Impacts of Products." Working Paper. Washington, DC: World Resources Institute. Available online at http://www.wri.org/publication/comparativeemissions)

- For products and services where monitoring is feasible, e.g., that could be reported in Scope 1 or in downstream leased assets (Scope 3), the year-on-year approach shall be employed.
- This approach is preferred to the second as it smooths a solution impact overtime and limit large impact of non-recurring products and services.
- Note that all product/service for which ENGIE owns and/or operate an asset fall in the year-on-year avoided emissions approach.

**Forward Looking avoided emissions approach**

- For products and services delivered to the client via **one-off transactions**, **account at the time of the transaction for the estimated decarbonization impact over the estimated lifetime of the product/service**. When calculating such ex-ante cumulated impact, attention should be paid by companies to avoid any overestimations. Indeed, it has been shown across industries that the average actual performance of products/services in use phase may be lower than manufacturing data or ex-ante assumptions. Therefore, the use of a systematic correction factor specific to the product or services considered is encouraged.
- This approach is intended for products where precise monitoring is not possible.
- At ENGIE level, this primarily concern one-off transactions such as sales of products including solar PV and heat pumps.

For projects certified or applying to white certificates, the calculation approach is the one defined by the standard.

**Compliance with the WBCSD**

This principle recognizes the challenge of accounting for the decarbonization impact of products and services of different nature, in particular when consolidating ENGIE total DoC impact. The WBCSD guideline does not require companies to choose one specific approach for all solutions and allows both approaches to co-exist.

**Examples**

If a company installs an energy efficiency lighting system in a building or factory and has a contract to operate it for 10 years, the company should account for the DoC impact on an annual basis for the 10-year contract. The year-on-year approach is then preferred and shall be employed.

In contrast, if a company produces energy efficient lighting equipment, the company should account for the estimated DoC impact over the lifetime of the product at the time of the transaction and adopt a conservative correction factor based on known performance data. The forward looking approach is then preferred and shall be employed

## Principle 5 – Managing Double Counting

**The reporting shall acknowledge possible double counting of the decarbonization impact across the value chain, though avoid double counting intra-company**

Inter-company (across the value chain): Double counting may exist when several companies are contributing to a common decarbonization impact. Several companies may therefore claim to “contribute” to the decarbonization of clients. This is consistent with the GHG Protocol’s standard for GHG corporate accounting, since Scope 3 of one company corresponds to the Scopes 1 and 2 of its suppliers.

Intra-company (among the reporting company’s products and services): When consolidating and reporting on decarbonization impacts at company-level, the company shall mitigate the risk of double counting its contribution

to the decarbonization impact by (1) excluding the contributions of products/services delivered to other entities of the reporting company; and (2) when several company entities deliver products/services within the same value chain that lead to a common decarbonization impact, retaining only the decarbonization impact of the entity that generates the highest product/service revenue.

**Compliance with the WBCSD**

Intra-company double counting resonates with the principle 6 of the WBCSD "disclose percentage of sales generating avoided emissions against total revenue."

Inter-company double counting: The WBCSD stresses that claim to avoided emissions is not intended to be unique as it considers that each company has a degree of influence along the value chain. Allowing double counting facilitate multiple companies to take on actions simultaneously.

**Examples**

- **Inter-company double counting**: Company A, which installs and guarantees the performance of a biomass boiler for a client in the U.S. (one off model), accounts for the cumulative DoC impact over the estimated lifetime of the boiler. Company B, which owns and operates the new biomass boiler (ongoing contract), accounts every year for the DoC impact of the boiler it operates. In this case, the decarbonization impact of the biomass boiler may be double counted between Company A and B.
- **Intra-company double counting**: Intra-company entity A installs a high-performing co-generation plant in a factory in Italy, eligible for white certificates. Intra-company entity B supports the client in earning white certificates from the co-generation plant. The company shall only account for the decarbonization impact of the cogeneration plant as calculated by entity generating the highest revenue.

## Principle 6 - Transparent, verifiable, and separate communication

**Decarbonization of Clients should be verifiable and communicated transparently, separately from companies' own carbon footprint. It should not be combined, added, or removed from a company's own carbon footprint.**

Decarbonization of Clients can become an important indicator of how companies contribute to decarbonize the economy beyond their own footprints. It is therefore critical to have a transparent and verifiable communication of DoC[27].

DoC shall be communicated separately from the company's own carbon footprint[28].

DoC cannot be used to claim carbon neutrality, net zero and claims which imply company does not have any impact on the climate.

To ensure full transparency, ENGIEs shall disclose percentage of sales generating avoided emissions against its total revenue. This should be reported at the level of the entity reporting the avoided emissions.

When communicating avoided emissions, ENGIE should specify whether its results have been verified by a third party. Audit results should be made available to other parties.

Information supporting DoC calculations, including baseline, data used, but also how the above principles were applied, should be made available to third parties.

[27] This rule refers to the transparent criteria as defined by the WRI report WRI/WBCSD. 2019

[28] In line with WRI's principle "Companies should first calculate and report scope 1, 2, and 3 emissions and set science-based reduction targets for these emissions. Comparative assessments should neither take precedence over nor detract from efforts to do so."

**Compliance with the WBCSD**

This principle is compliant with the following principles of the WBCSD guidance :

**Principle 1**: Avoided emissions shall always be reported separately from:

- GHG inventory footprint;
- Carbon sinks;
- Financial contributions to transition (abatement, avoidance or removals) outside of the value chain

**Principle 2**: Avoided emissions shall not be used to claim a company's carbon neutrality, net zero emissions, or any other claims implying a company's absence of impact on the climate

**Principle 6**: Avoided emissions shall not be communicated externally without specifying which percentage of total revenue are represented by the solutions generating those avoided emissions. This should be reported at the level of the entity claiming avoided emissions.

**Examples**

An entity communicating a decarbonization impact of its Green Gas Generation products equivalent to 4,000 CO2e tons without making explicit the baseline used for this calculation is not transparent neither verifiable.

An entity presenting the decarbonization impact of its Green Power Generation products equivalent to 6,000 CO2e tons for year 2021 considering the country power generation mix as baseline for the same year and using only direct emissions due to availability of data (LCA data not available) and explaining how the above principles were applied is transparent and verifiable.

## Principle 7 – Possible side-effects and rebound effect

**Identify and report any side-effect and rebound effect associated with DOC product**

### Side effects assessment

A company shall identify any negative side effects of its solutions including environmental, social and economic side effects. Furthermore companies shall communicate and describe actions taken at a company-level to mitigate these effects.

Risks related to climate change, overexploitation of natural resources including water, biodiversity loss and air pollution are central concerns for the Group and the resilience of its activities. Environment is one of the key CSR issues for a leader in the world of energy and energy services like ENGIE.[29] At the ENGIE group level, an environmental policy document has been publicly made available and describe the ambitious extent to which ENGIE is engage in mitigating side effects of its solutions along their value chain.

### Rebound effects assessment

Any potential rebound effects shall be mentioned. WBCSD acknowledges the difficulty to precisely report rebound effects but these shall still be mentioned for the sake of transparency.[30] Even if these are hard to quantify, companies shall provide a description of its potential effects including an order of magnitude. Inclusion or exclusion of rebound effects in DoC calculation shall be indicated. When applicable, mitigation actions to rebound effects shall be identified and applied.

[29] https://www.engie.com/en/group/social-responsibility/policies
[30] WBCSD Practioners' on avoided emissions Sprint (2023)

**ENGIE | Environmental Policy**

The Engie Group's environmental policy is based on five areas: climate, biodiversity, water, forests and the circular economy. For each of these aspects, the Group has made demanding commitments to 2030, aiming to limit its impact as much as possible along its value chain, including during the construction, exploitation and end-of-life of industrial assets such as green power generation assets. For more details on Engie's commitments and actions on these various aspects, please refer to the Group's environmental policy.

**Compliance with the WBCSD**

ENGIE Principle 7 is compliant with the following principles of the WBCSD guidance :

**Principle 8**: Any identified negative side-effects of the solution(s) in terms of environmental trade-offs and sustainability goals beyond GHG impact should be communicated publicly, with the company providing a description of the actions undertaken to mitigate those effect(s).

**Principle 9**: Company should mention if potential rebound effects have been identified, if they have been included in the assessment or not, as well as providing a description of their nature and of the actions undertaken to mitigate them

# Annex 2 - Acronyms

| | |
|---|---|
| BU | Business Unit |
| CO2e | Equivalent Carbon Dioxide |
| DoC | Decarbonization of Clients |
| GHG | Greenhouse Gases |
| HVAC | Heating, Ventilation and Air Conditioning |
| LCA | Life Cycle Assessment |
| NPV | Net Present Value |
| O&M | Operation and Maintenance |

# Annex 3 - Glossary

**Annual energy savings [kWh]:** Estimated/actual energy savings to which ENGIE contributes (annual average in kWh) as defined by the relevant guideline. The amount depends on the baseline selected.

**Annual energy savings percentage [%]:** Average estimate/actual annual energy savings (kWh) divided by the baseline average estimated/actual annual energy savings (kWh). The ratio depends on the baseline selected.

**Annual avoided $CO_2e$ emissions [tons of $CO_2e$]:** Estimated/actual avoided GHG emissions to which ENGIE contributes (Annual average in kg $CO_2$ equivalent) according to the ENGIE Decarbonization of clients guidelines. The amount depends on the baseline selected.

**Annual avoided $CO_2e$ emissions percentage [%]:** Average estimated/actual annual avoided GHG emissions ($tCO_2e$) divided by the baseline average estimated annual greenhouse gases emissions (in $tCO_2e$). The amount depends on the baseline selected.

**Carbon credits:** Generic term for any tradable certificate of permit representing the right to emit one ton of carbon dioxide or the equivalent amount of a different greenhouse gas ($tCO_2e$).

**Certificats d'Economies d'Energie (CEE):** Certificates that fall under the French market for white certificates. The value of each certificate is based on final energy saved, expressed in kWh cumulated over the life time and discounted (so-called kWh *cumac*).

**$CO_2$-equivalent ($CO_2e$):** The universal unit of measurement to indicate the global warming potential (GWP)

of each greenhouse gas, expressed in terms of the Global Warming Potential of one unit of carbon dioxide. It is used to evaluate releasing (or avoiding releasing) different greenhouse gases against a common basis.

**Decarbonization of Clients:** The Decarbonization of Clients takes place when the use of ENGIE's products and services contributes to reduce or avoid the greenhouse gas emissions of its clients.

**Decarbonization of Clients (DoC) Impact:** ENGIE's contribution to the decarbonization of clients.

**Direct emissions [kgCO2e]:** GHG emissions generated during the use phase of a product/service (e.g., energy combustion).

**Emissions factor [kgCO2e/activity unit]:** Coefficient that converts activity data into GHG emissions. It is the average emissions rate of a given source, relative to units of activity or process/processes.

**Energy conversion efficiency ratio [%]:** The ratio between an asset's output (e.g., energy produced) and input (e.g., energy consumed), the difference representing a loss.

**ENGIE:** ENGIE Group, ENGIE Business Units (BUs) and any other ENGIE entity.

**ENGIE Product/Service**: Any good or service that is in the scope of the Decarbonization of Clients, as defined in the *Scope of Products and Services* section.

**Project:** A client project that consists of one or more contracts associated with at least one ENGIE product/service.

**Greenhouse gas (GHG):** They consist mainly $CO_2$, $CH_4$, $N_2O$. Other greenhouse gases will be progressively taken into consideration in these guidelines, e.g., fluorinated gases.

**Indirect emissions:** GHG emissions generated during the upstream and downstream phases of a product/service (e.g., raw materials extraction, transportation and distribution, end-of-life treatment).

**Life Cycle Assessment (LCA)*:*** Measurement of a product/service GHG emissions throughout its lifecycle, from raw material acquisition or generation of natural resource to manufacturing, use and disposal/decommissioning.

# Annex 4 - Main References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