

EnergyTag



Granular Certificate Use Case Guidelines

Version 1





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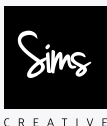
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**THE SPECIALIST DESIGN AGENCY
FOR THE ENERGY SECTOR**


Contents



Note on Structure

Chapter 1 (GC Use Case Guidelines) provides the first version of EnergyTag's Guidelines for the use of GCs. **None of the Use Cases are mandatory**, however, if the consumer does wish to prove their GC Use Case is "**Aligned with the EnergyTag Guidelines**", the Guidelines in the corresponding section must be followed.


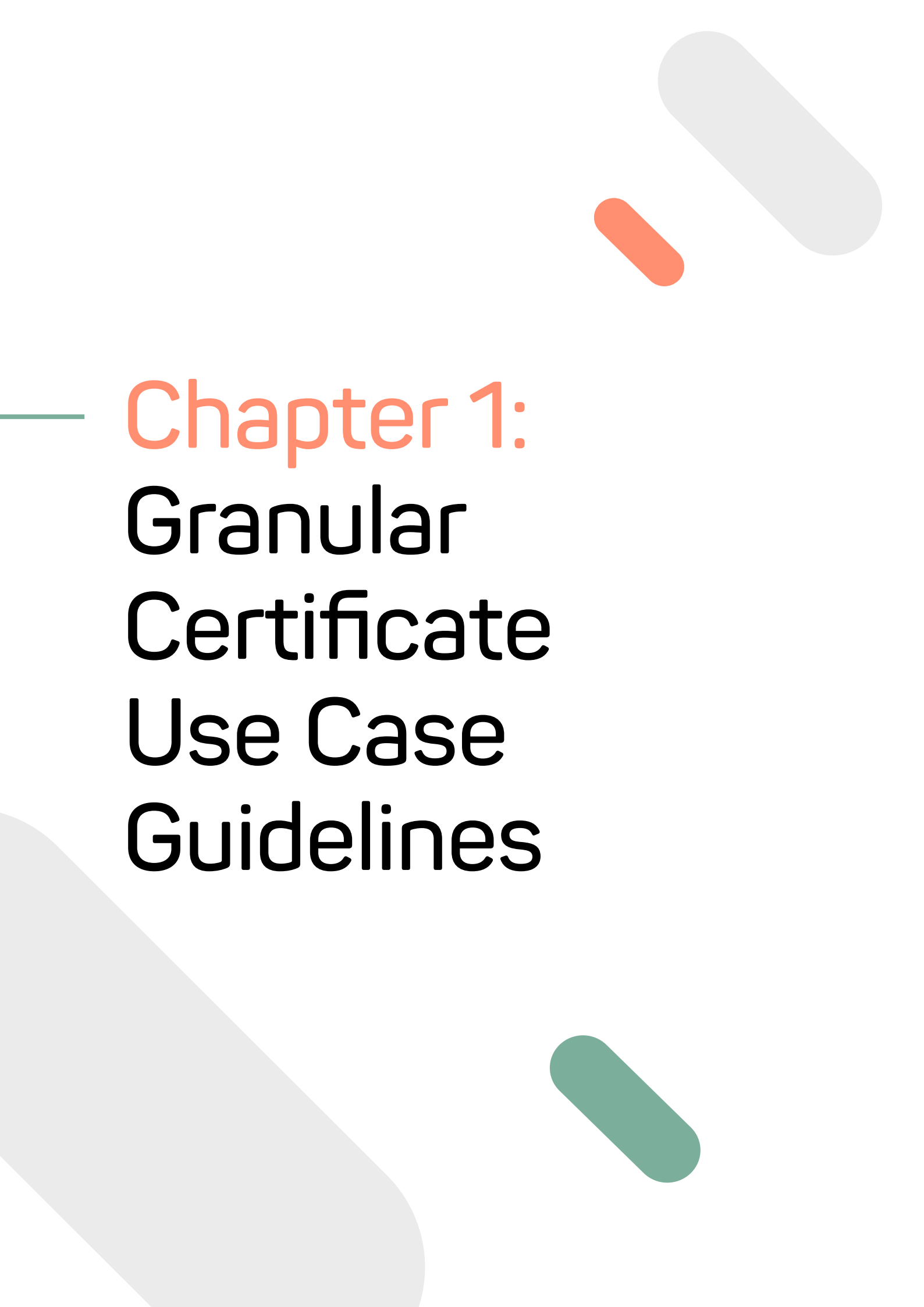
Chapter 2 (GHG Calculation Considerations) gives EnergyTag's initial considerations on temporal GHG calculations that are not yet developed enough to be considered guidelines.



Note on Qualifying Language

Note: the guidance shall qualify the stringency of statements with the following terms ([RFC 2119 compliant](#)):

>	<i>"Shall"</i>	This word, or the terms "required" or "must", mean that the definition is an absolute requirement of the Guidelines.
>	<i>"Shall not"</i>	This phrase, or the phrase "must not", means that the definition is an absolute prohibition of the Guidelines.
>	<i>"Should"</i>	This word, or the adjective "recommended", means that there <i>may</i> exist valid reasons in particular circumstances to ignore a particular item, but the full implications must be understood and carefully weighed before choosing a different course.
>	<i>"Should not"</i>	This phrase, or the phrase "not recommended", means that there <i>may</i> exist valid reasons in particular circumstances when the particular behaviour is acceptable or even useful, but the full implications <i>should</i> be understood and the case carefully weighed before implementing any behaviour described with this label.
>	<i>"May"</i>	This word, or the adjective "optional", means that an item is truly optional. One actor <i>may</i> choose to include the item because a particular marketplace requires it or because the vendor feels that it enhances the product while another actor <i>may</i> omit the same item. An implementation which does not include a particular option must be prepared to interoperate with another implementation which does include the option, though perhaps with reduced functionality. In the same vein, an implementation which does include a particular option must be prepared to interoperate with another implementation which does not include the option (except, of course, for the feature the option provides).
>	<i>"Could"</i>	This word, or " <i>can</i> ", implies that the person to whom it pertains has the power to do such a thing.



Chapter 1:

Granular Certificate Use Case Guidelines

Granular Certificates can enable consumer choice by facilitating claims regarding the origin and/or time of specific energy production or release from storage. This chapter defines some of the potentially major Use Cases for GCs in detail, providing common language and guidelines for their implementation. **It is not mandatory to adopt any of the Use Cases below. However, if the consumer chooses to implement a Use Case and claims that such usage is “aligned with the EnergyTag Guidelines”, then the Guidelines shall be followed.**

While less restrictive than the requirements set out in the GC Scheme Standard, these Guidelines seek to provide the harmonisation that is important for the development of the GC market. The Guidelines will evolve over time to incorporate new Use Cases and potentially see certain Use Cases become part of the standard, depending on market evolution.

1.1. Temporal Matching

Content and Definitions

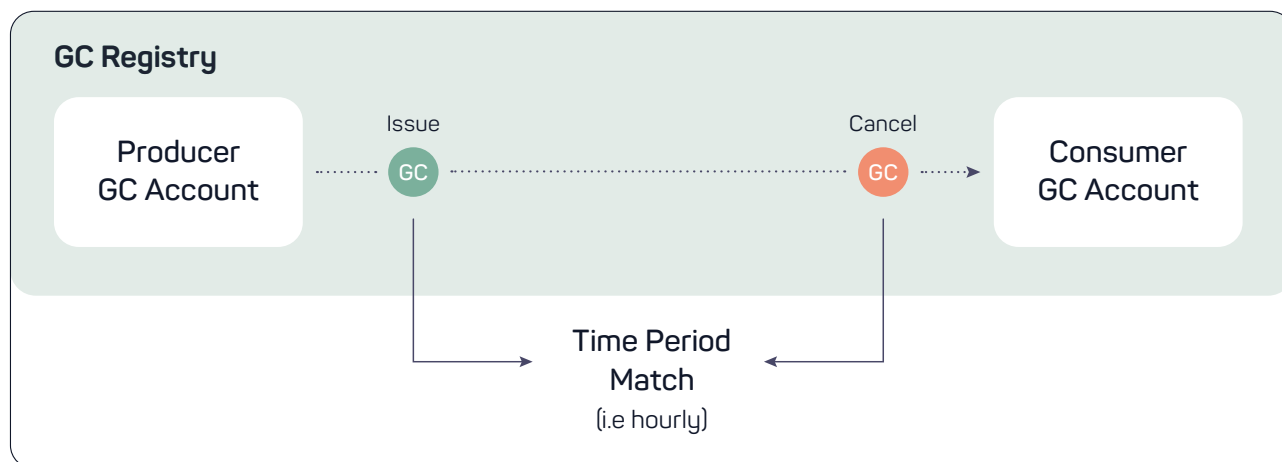
Temporal matching: that is, to allow the (sub)hourly time interval of consumption to be linked with the corresponding time interval of clean energy production using GCs is set to be a key Use Case for GCs.

Temporal matching cannot be performed with conventional EACs alone. Therefore, EACs issuing bodies will increasingly be encouraged to offer the requisite temporal granularity to facilitate this Use Case. Some of the key drivers for Temporal Matching include:

- **Corporate / individual Goals:** Several organisations have established Temporal Matching goals (e.g. “100% or 24/7 Carbon Free Energy”), with the ultimate objectives of decarbonising their own energy supply and incentivising investment in firm and flexible clean generation.
- **Regulatory compliance:** adhering to a regulation or industry standard in order to gain recognition of product class or quality.
- **Carbon impact:** prioritising the development of new clean resources in locations and times with the greatest carbon impact¹.

¹EnergyTag acknowledges that precisely evaluating the short-term and long-term carbon impact of market investment and sourcing decisions is still a topic of discussion, with further research required.

Temporal Matching Schematic



Guidelines

Where the consumer chooses to claim GC Temporal Matching, then:

- Temporal Matching *shall* be demonstrated by proving that energy consumption volumes (i.e. Wh) match the volume of Cancelled Production or Storage Discharge GCs in the same matching time interval,
- Therefore, the consumption and the production/storage discharge time intervals (e.g. 15/60 minutes) *shall* be equal to each other and *shall* have a granularity of 60 minutes or less,
- While a 60 minute time interval for this type of matching *shall* be the absolute maximum, aligning the time interval to the local electricity settlement period (which are typically time intervals of 5 minutes, 15 minutes, 30 minutes, or 60 minutes) *may* be more relevant,
- Temporal Matching *shall* be done as an ex-post process within the GC Validity Period as described in chapter 1.7 of the GC Scheme Standard,
- Consumers *shall* be transparent about the Temporal Matching claim by communicating:
 - A. the Temporal Matching granularity (i.e. time interval length),
 - B. the Geographical Matching granularity (see chapter 1.2),
 - C. the proportion of energy that has been temporally matched in the month or year being reported, and
 - D. any complementary monthly or annual matching claim,
- Tools for automating this matching process *may* streamline the process for consumers and create a more dynamic market signal,
- Temporal matching is facilitated by relevant data systems being in place (i.e. granular meter data for both production and consumption) and hence these systems *should* be developed where possible,
- The Consumption Verification Body *shall* review the consumption data and Cancelled certificates to ensure the Temporal Matching was in alignment with these Guidelines, and that any matching percentage claims are accurate. Therefore:
 - A. the Consumer *shall* grant to the Consumption Verification Body adequate access to any information processing facilities (e.g. databases and cloud support where relevant) and
 - B. the Consumption Verification Body *shall* deploy appropriate methodologies and technical expertise to evaluate the quality of the data sets required for granular Temporal Matching.

1.2. Geographical Matching

Context and Definitions

On occasion, existing schemes that use EACs² have been criticised for enabling claims based on physically improbable or impossible flows. In the most criticised cases, some schemes allow Attributes of energy produced on an island to be virtually transferred to a consumer on a system with no physical connection. Increasingly granular Temporal Matching highlights the question of increasingly granular Geographical Matching³.

Motivations for Geographic Matching

The carbon intensity of the physical grid varies significantly over space and time. The introduction of Geographical Matching helps ensure that the local situation and constraints of the grid are taken into account, orienting procurement activities around the grids where companies operate. While the aim is to provide an incentive for the production of energy that *could* reach the point of consumption, it is important to note that specific units of energy cannot be perfectly tracked through a grid or pipeline⁴ - hence the need for EACs⁵. For many consumers, Geographical Matching is important, as it allows the use of GCs to more closely reflect the possible/likely physical grid transmission of energy. Furthermore, a claim with Temporal Matching lacking any Geographical Matching *could* impact its acceptance by consumers.

Defining Geographical Matching Boundaries

When considering how best to define Geographical Matching boundaries, EnergyTag uses current electricity market boundary definitions as a basis. In these Guidelines, the “zonal” concept is used to define the accepted area over which electricity is physically

“deliverable”. This “deliverability” can be considered at various levels of granularity, and hence two types of zones are considered:

- Physically Interconnected Zone, and
- Market Zone.

Finding the balance between current EAC system flows which are often de-linked from physical energy flows, and the push for increased linking of Attribute and physical energy flows needs to be carefully considered when selecting the Geographical Matching boundary. Ultimately, the decision as to the level of zonal granularity required for Geographical Matching is left to the voluntary consumer, local regulatory requirements, or reporting standards bodies⁶. In any case, consumer transparency is key and consumers must declare the granularity of Geographical Matching when making matching claims.

General Guidelines

- A Consumption Verification Body *shall* be in place to ensure compliance with the Geographical Matching guidelines listed below.
- Consumers *shall* be transparent about the Geographic Matching boundaries of their claim.
- The Consumption Verification Body *shall* review the consumption data and Cancelled certificates to ensure the Geographical Matching was done in alignment with these Guidelines. Therefore:
 - the Consumer *shall* grant to the Consumption Verification Body adequate access to any information processing facilities (e.g. databases and cloud support where relevant) and

²It is primarily the regulations and standards that govern the usage of EAC that allow for such behaviour.

³This is reflected in the EnergyTag demos, where Geographical Matching at a country/Bidding Zone level is implemented in almost all cases.

⁴Even if the probability of electricity flows can be estimated to a greater level of accuracy.

⁵It should be noted that most current EACs already contain the necessary information to follow the guidelines for more precise Geographical Matching in this chapter, but lack the information to perform Geographical Matching on a (sub)hourly basis.

⁶Many of which (i.e. CDP, RE100, WRI, Green-e®) already give market boundary rules for EAC flows.

- the Consumption Verification Body *shall* deploy appropriate methodologies and technical expertise to evaluate the quality of the data sets required for granular Geographical Matching.

Case 1: Physically Interconnected Zone

Context and Definitions

Physically Interconnected Zones have at least some level of physical interconnection between the

location of energy production and the location of energy consumption for which the GC is Cancelled (e.g. EU Wide Grid, continental US grid or any other grid worldwide where there are known interconnectors).

Guidelines

- Geographical Matching *shall* meet the minimum criterion of physical interconnection.

Physically Interconnected Zone Matching



Case 2: Market Zone

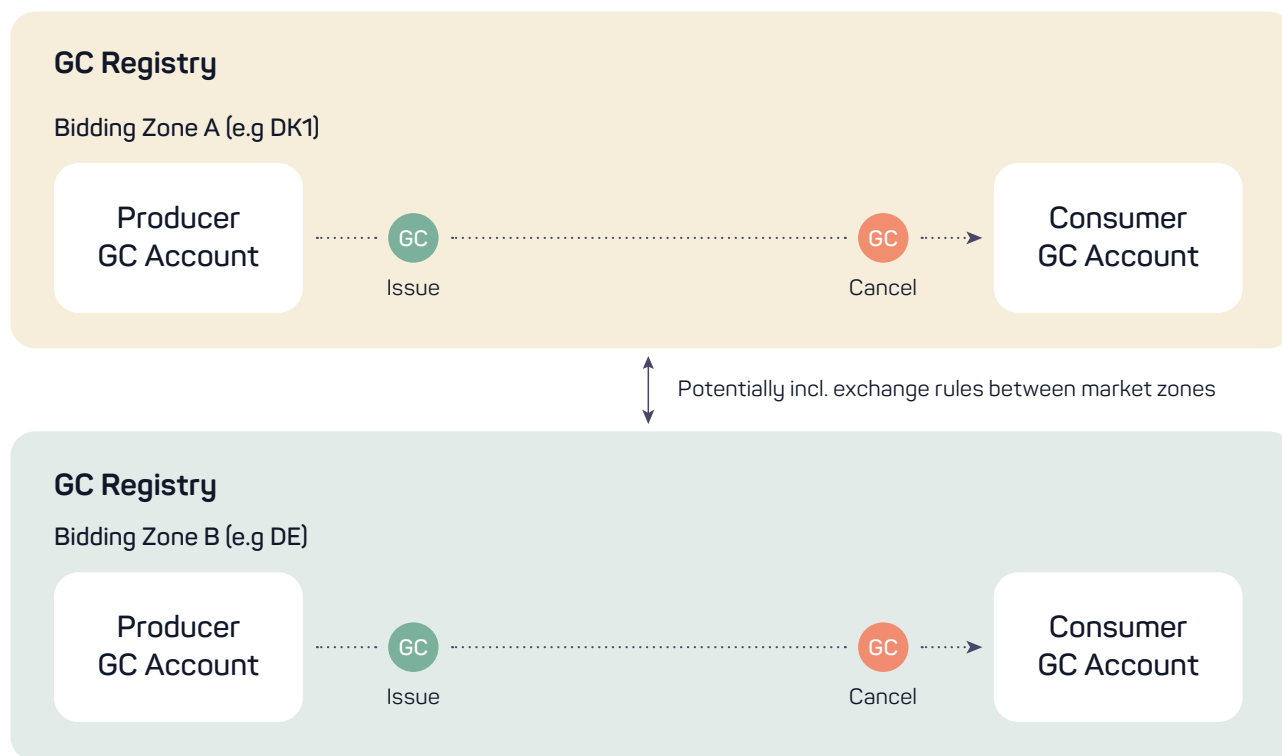
Context and Definitions

Beyond the minimum guidelines of ensuring physical interconnection, the zonal granularity can be increased to facilitate consumers/Use Cases requiring a higher level of linkage between GC and Physical energy flows. Market Zones definitions are based on local energy market boundary definitions,

with a Bidding Zone deemed to be the most granular Market Zone currently considered. For example, a Market Zone⁷ *could* be defined at the level of:

- ‘Single Bidding Zone’⁸ (e.g. FR, DK1 in Europe or NYISO-Zone D in US),
- ‘Aggregated Bidding Zone’ (e.g. DK in Europe or NYISO in the US).

Bidding Zone Level Matching



Demonstration Linkage of GC Flows with Physical Energy Flows

The link between GCs and physical energy flows increases in granularity as we refine the definition of a Market Zone, with single Bidding Zone matching deemed more granular than aggregated Bidding Zone

matching. However, the GC/Physical flow link *may* also be demonstrated between Market Zones where there is physical interconnection and provided that a credible exchange mechanism⁹ is in place to ensure that GC flows do not surpass physical energy flows between markets in a given (sub)hourly interval.

⁷Market zones will change over time, and therefore these definitions may have to be revised going forward.

⁸(See here for [EU Bidding Zones](#) and [US example for the NYISO system](#) including its various price/Bidding Zones. Note that in some regulated energy markets (such as the Southeastern US), Bidding Zones do not exist and the minimum geographical granularity is the balancing authority..

⁹The establishment of such interconnection mechanisms is challenging but there are several organisations working on this. EnergyTag may provide guidelines on this in the future once harmonisation emerges.

Therefore, once such a mechanism exists, Market Zone level matching across Bidding Zones *may* be considered as having an equivalent granularity as 'single' Bidding Zone matching. The levels of granularity to be considered in Geographical Matching are defined in the next section.

Geographical Matching Granularity Level

The "Geographical Matching Granularity Level" is defined at three levels, starting with the highest level of granularity moving to the lowest.

1. Single Bidding Zone Level,¹⁰
2. Aggregated Bidding Zone Level,
3. Interconnected Zone Level.

Motivations for Market Zone Matching

Market Zone Geographical Matching comes with a number of potential advantages that increased with its granularity:

1. It allows consumers to demonstrate a level of granularity with a greatly increased probability of physical link and avoidance of congestion,
2. It facilitates a macro-level mechanism for supporting grid capacity reinforcement or production at locations with sufficient existing transport capacity, and
3. As the carbon intensity of the physical grids (e.g. Market Zones) varies considerably over time (i.e. hours, days, months) and across locations (i.e. Market Zone, continent), the introduction of market-zone Geographical Matching helps ensure that the local situation of the grid is taken into account and increases the likelihood that each MWh of consumption will have a similar carbon impact to the GC matched with that consumption.

Potential challenges to implementing Market Zone matching include:

1. Alignment between GC market and electricity Market Zones, and
2. The risk of the market volume/availability of GCs being too low within that Market Zone as it is limited by electricity availability.

Guidelines

- Market zones shall be named following local electricity market definitions where available (e.g. EU Bidding Zones on page 10 of this report),
- Consumers shall state the Geographical Matching Granularity Level being applied,
- When seeking to demonstrate increased granularity of GC and physical energy flows linkage, consumers *should* apply Market Zone level matching as best practice and *should* strive to use the Geographical Matching Granularity Level of highest granularity,
- Where a mechanism exists that proves the physical deliverability of related energy¹¹ between Bidding Zones, the highest granularity of matching - being 'Single Bidding Zone' - *may* be claimed,
- Regulators, standards bodies and System Operators *may* need to further define some level of applicable Market Zones for the use of GCs that encompasses grid balancing constraints. This zonal definition *may* vary between continents or market systems, and
- Consumers *may* apply matching at a more local level than Market Zone (e.g. km distance) if they wish. However, km distance matching does not necessarily indicate increased deliverability of the electricity.

¹⁰or in connected BZ with credible allocation and proof or corresponding physical energy flows once these exist.

¹¹Such as, for example, booking interconnector capacity between these two zones, demonstrating equal power price between zones or booking with limit set to NTC/ATC, etc.

Explanatory Guideline #1: Consumption Metering and Registration Data for Production/Consumption Matching Use Cases

Context and Definitions

This note addresses the consumption data requirements and considerations for Use Cases where GCs are being used for granular matching of production and consumption (e.g. Temporal and/or Geographical Matching).

Hourly or sub-hourly production and consumption data is a prerequisite for these Use Cases. However, (sub)hourly consumption metering data often does not yet exist or is difficult to access. This can be especially challenging for corporations with many global facilities and a mix of monthly, hourly, and 15-minute interval data provided in different formats from a mix of utility provider types or retail consumers, for example without smart metering.

Guidelines

Consumption Data

- If a consumer is performing granular matching of consumption and production, hourly consumption data is required and this chapter *should* be referred to in these cases.
- A Consumption Verification Body shall be in place and shall ensure compliance with the guidelines of this sections where Temporal and/or Geographical Matching is being claimed.
- In all cases where hourly (or sub hourly) consumption data exists from a utility or energy provider's metering or sub-metering system¹², those data shall be utilised.

However, given that hourly consumption data is not measured for all grid access points, there are two main options for practical implementation of matching:

- Hourly data from sub-metering systems along with monthly billing data *should* also be acceptable¹³. All data shall be of sufficient quality for hourly matching, with less than 0.5% missing reads during the matching period.
- Load profiles *may* be applied to the measured consumption on a monthly or annual basis.
 - However, this *should* be limited to situations in which an energy service aggregator is conducting market activity on behalf of customers and uses the same load profiles and meter aggregation levels used for supplier obligations (i.e. matching *should* be done at the portfolio level and include all aggregated customers associated with the market obligations and load profile). Documentation of load profiles used, including data sources and vintages, *should* be provided. Load profile documentation *should* be updated annually.
 - Load profiles *should not* be used for consumption matching for individual Consumption Points.
- The load profile option shall only be allowed for a transition period and cannot be the long-term goal of a granular matching exercise. If hourly (or sub-hourly) metering data becomes available for a Consumption Point, that data *should* be utilised within 12 months of becoming available.

Consumption data reported to the Consumption Verification Body shall include:

- At the time of registration of the Consumption Point:

¹²For instance, the meters used for Wh meter data should be digital, true Root Mean-Squared (RMS) devices that meet or exceed ANSI C12.20 standards (note that high accuracy sub-meters are known in the USA as "revenue grade meters"; and allow businesses to monitor individual areas of buildings, equipment, and even individual tenants).

¹³Monthly data is necessary to ensure that the sub-metering data is consistent with the consumption measured by the utility system operator.

- At the time of registration of the Consumption Point:

- Customer ID,
- Billing address,
- Meter ID,
- Meter type (utility, submeter),
- Meter serial number (for auditability of the meter),
- Indication of the relative location of the consumption meter compared to the grid access point and to various on-site consumers, Storage Devices, and Production Devices, if present, and
- Where consumption matching is executed at the level of an aggregator or supplier to multiple consumers, the identification of this aggregator or supplier, in connection with the relevant consumption meters.

- Per measurement reporting:

- Meter ID,
- Timestamp (UTC "HH:MM:SS, DD/MM/YYYY" interval starting, e.g. "00:00:00 01/01/2021"),
- Timestamp (UTC "HH:MM:SS, DD/MM/YYYY" interval ending, e.g. "00:14:59 01/01/2021"),

- Interval usage (Wh),¹⁴
- Monthly usage from billing (Wh)¹⁵, and
- If load profiles are used to generate the hourly data, load profile data and documentation *should* be included.

Data Transfer

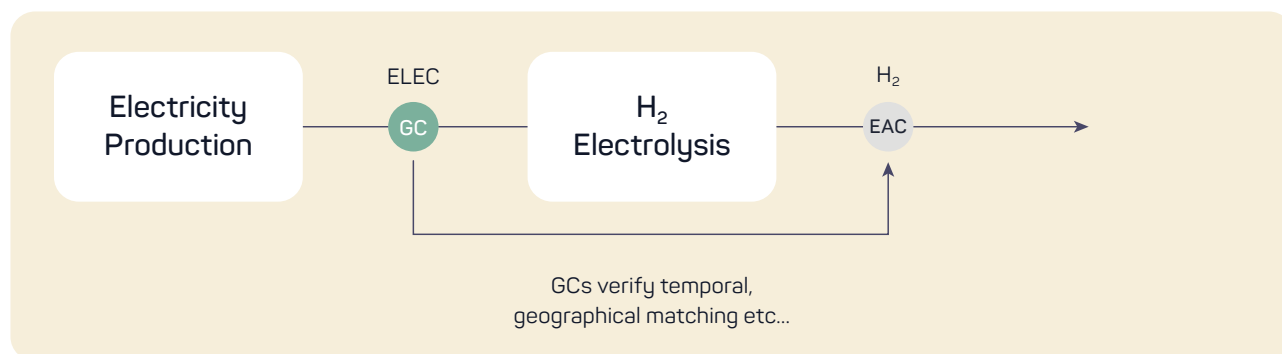
- Consumption data *should* be submitted to the relevant body (e.g. Consumption Verification Body, Product Verification Body and GC Issuer) on at least an annual basis.

1.3. Sector coupling

Context and Definitions

The purpose of this chapter is to ensure that these guidelines and GCs can be used for Sector Coupled¹⁶ use cases where robust verification (e.g. by EU Voluntary Schemes providing certification services for fuels compliance with RED / RED2 / RED3) of granular electricity attributes (e.g. temporal and geographical matching) is required for the certification of coupled energy (e.g. Hydrogen, Steam, etc.). It *should* also be noted that the use of GCs for sector coupling is already being tested in a number of EnergyTag demonstrator projects¹⁷.

Sector Coupling PtX Example with GC Transfer



¹⁴If metering data are not available in Wh, kWh data will be acceptable.

¹⁵Only necessary if submetering systems are used.

¹⁶Electricity converted into another energy form/carrier in Power-to-X, X could be Hydrogen, Steam (boiler), space heat (heat pump) or an e-Fuel.

¹⁷Namely, Air Liquide's Hydrogen electrolyser in Denmark, and Eneco's steam boiler in the Netherlands.

Taking the EU example of Hydrogen production for use in the transport sector (i.e. Renewable Fuels of a Non-Biological Origin or RFNBOs), the 2018/2001 EU Directive (RED II)¹⁸ indicates that in order to be eligible for the renewable transport fuel target, there *could* be a requirement for:

- temporal correlation (e.g. 15 minutes or hourly matching),
- geographical correlation (e.g. same bidding zone/ demonstrate absence of grid congestion), and
- additionality (e.g. PPA asset Commercial Operating Date is in the same 12 months as the hydrogen producing facility).

Well-designed guidelines and GCs *could* prove a useful tool for Hydrogen producers and Hydrogen EACs¹⁹ looking for a robust way to ensure electricity attribute criteria are documented in a credible way for certification schemes, helping facilitate regulatory compliance. EnergyTag proposes some initial guidelines around the GC attributes required for sector coupling use cases and calls on organisations working on this value chain to contribute further.

Guidelines

GCs:

As stated in the Standard (see chapter 1.3 in the GC Scheme Standard), the following GC Attributes are of particular interest for sector coupling applications:

- original energy source type,
- timestamp of energy production or release from storage,
- the date when the Production Device became operational (to help demonstrate additionality),
- the Bidding Zone and/or Balancing Authority of the Production Device (if available),
- the geographical location of Production/Storage Device,

- Asset Support Mechanism (e.g. to help demonstrate additionality),

The GC cancellation statement *should* contain information on:

- timestamp of energy consumption to help demonstrate temporal correlation,
- location of the consumption device (e.g. market bidding zone) to help demonstrate geographical correlation, and
- the Commercial Operating Date of the consumption device (to help demonstrate additionality).

(EU only): Note that EU Voluntary Schemes *may* be able to use GCs (and Cancellation statements) to prove the compliance of electricity consumption (e.g. temporal/Geographical Matching) for the production of hydrogen (and other e-Fuels) as counting towards renewable fuels target of the Renewable Energy Directive.

Call to Cooperation

EnergyTag calls on organisations involved in the certification of the origin of Hydrogen and other e-Fuels to contact us in order to provide their feedback on the Use Case and collaborate to ensure that these Guidelines are useful for sectors coupled to the electricity sector.

1.4. Using GCs for non-granular Purposes

Context and Definitions

In a nascent market, the treatment of GCs not Cancelled in time for Temporal Matching is a critical concern, as the annual reporting or electricity sourcing claims of the consumer²⁰ *may* be negatively impacted by an inability to utilise GCs for non-granular claims. With this in mind, EnergyTag presents a number of potential options below for the use of GCs that have not undergone Temporal Matching:

¹⁸<https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32018L2001&from=EN>.

¹⁹e.g. the CertifHy initiative in Europe

²⁰As reporting standards organisations do not currently recognise hourly emissions reporting, maintaining annual emissions is critical for consumers.

1. If GCs were to Expire without being matched to an appropriate consumption time interval, the consumer *may* lose the ability to use the GC for another useful claim (i.e. monthly/annual claim). This *could* damage the viability of the GC market,
2. GC used like EAC. The GC *could* simply be used in the same way as existing EACs are used: to claim the Attributes of energy consumption in a larger time interval (e.g. month/year), but this comes with potential credibility concerns for the instrument, and
3. GC re-converted into EAC. Converting unused GCs back to EACs *could* provide an elegant solution, allowing for monthly/annual matching. However, this *could* be very complex and *may* not be possible in some Schemes.

Guidelines

- Consumers *should* incorporate Granular Certification into their sourcing and accounting schemes as GCs become available,
- GC Schemes *may* choose any of the options listed above for dealing with GCs not used for granular purposes. When choosing a preferred option, GC Schemes *should* consider potential implications for GC market growth, and
- Consumers *should* be fully transparent and provide rationale in cases where GCs are used for non-granular (i.e. annual) matching.

1.5. Energy Storage

Context and Definitions

EnergyTag acknowledges that Use Cases for storage such as Temporal Matching, Avoided Emissions, and/or compliance are complex and are still in an early stage. The goal of this chapter is to provide initial guidelines

on how to implement these Use Cases. Nothing in this chapter *should* be interpreted as a requirement. **EnergyTag will refine these guidelines based on the experiences of pilot projects and further consultation in a sub-group on storage.**

This chapter covers the key topics that *should* be considered in implementing any storage-based Use Case:

- 1.5.1 Quantifying Storage Losses,
- 1.5.2 Storage Record Allocation Methodologies
- 1.5.3 Temporal Matching, and
- 1.5.4 Avoided Emissions.

1.5.1 Quantifying Storage Losses

Definitions

Due to energy losses, the quantity of energy flowing into a Storage Device is not the same as the quantity of energy flowing out of a Storage Device. Subsequently, the number of Storage Charge Records for the input into storage is higher than the number of Storage Discharge Records for the energy released from storage. EnergyTag considers the following three possible methods to account for storage losses, without prescribing any for now:

Method 1 - Measure in and out: Measure all energy input into the Storage Device as well as all output from the Storage Device. The delta between input and output would be the implied storage losses to be applied to the Storage Discharge Record.

Method 2 - Asset-specific efficiency: Perform a periodic capacity test (e.g. annually) of the energy Storage Device to measure the storage losses. Any Storage Charge Record for energy charged into the Storage Device would be multiplied by one minus

the asset-specific efficiency value measured at the most recent capacity test for that specific storage asset to determine the storage losses.

Method 3 - Storage default technology efficiency:

Use a globally accepted standard storage efficiency value²¹ by technology type (e.g. lithium-ion, pumped hydro, flywheel, gravity, etc.). Any Storage Charge Record for energy charged into the Storage Device would be multiplied by one minus the default efficiency value for that technology type to determine the storage losses.

One of the key challenges of Method 1 is that it will require the measurement and tracking of energy Storage Devices' state of charge by the GC Issuer, which *may* be challenging for certain storage technologies as well as administratively complicated. Method 3 can also be as refined as the GC Issuer wishes including the potential addition of further technology subtypes, parasitic losses, years of battery degradation based on system age, etc. The limited materiality of the improved accuracy for Methods 1 and 2 *could* make the cost of implementing these systems hard to justify.

Guidelines

- Methods 1, 2 and 3 (or any other robust method) *may* be used for estimating storage losses.

1.5.2 Storage Record Allocation Methodologies

Definitions

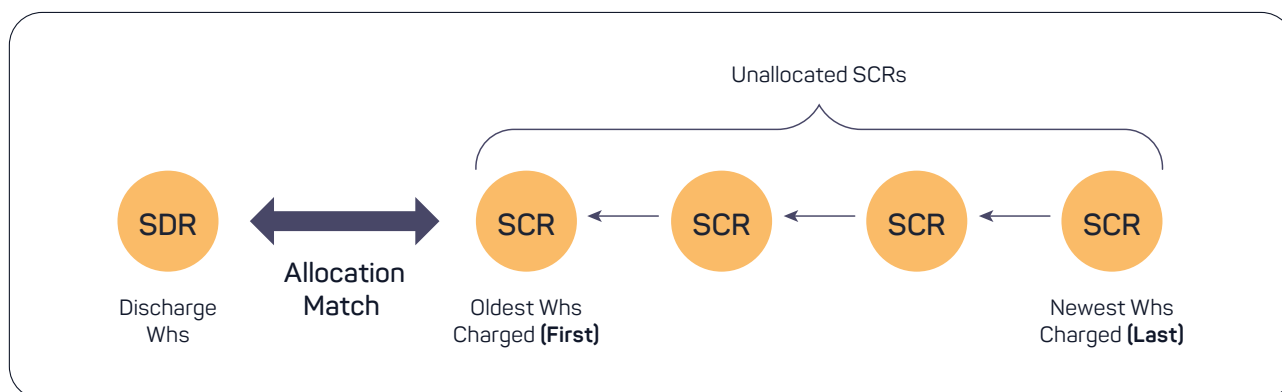
This section deals with options for allocating storage inputs to storage outputs, and the order for doing so. Based on the Standard for Energy Storage set out in the GC Scheme Standard, information recorded on SCRs shall be allocated to SDRs, following an applicable allocation methodology such as "First In, First Out", "Last In, First Out", "weighted-average", or another methodology.

"Last In, First Out", or LIFO, has the disadvantage of potentially creating unused LIFO layers for the life of the project, which would be cumbersome to track. "Weighted-average" would require a recalculation of allocation each time the energy storage asset charges or discharges, which would make it complicated.

Therefore, the guidelines currently suggest the following two approaches for the order of allocation of SCRs to the output of SDRs:

Option #1 First In First Out ("FIFO"): SDRs of the energy Storage Device first consumes unallocated SCRs on a FIFO basis. This option is simple, consistent and provides a clear standard on GC allocation.

FIFO SCR-SDR Allocation Process



²¹An acceptable list of default values shall be identified at a later date.

Option #2 Storage Operator Decides: SDRs of the energy Storage Device first consumes unallocated SCR on a FIFO basis. This option is simple, consistent and provides a clear standard on GC allocation.

EnergyTag recognises that further studies and implementation are required to identify the optimal allocation methodology for grid decarbonisation, operational impact and renewable integration.

Guidelines

- First In First Out or Storage Operator Decides methods *should* be used when allocating SCR to SDRs.

1.5.3 Temporal Matching

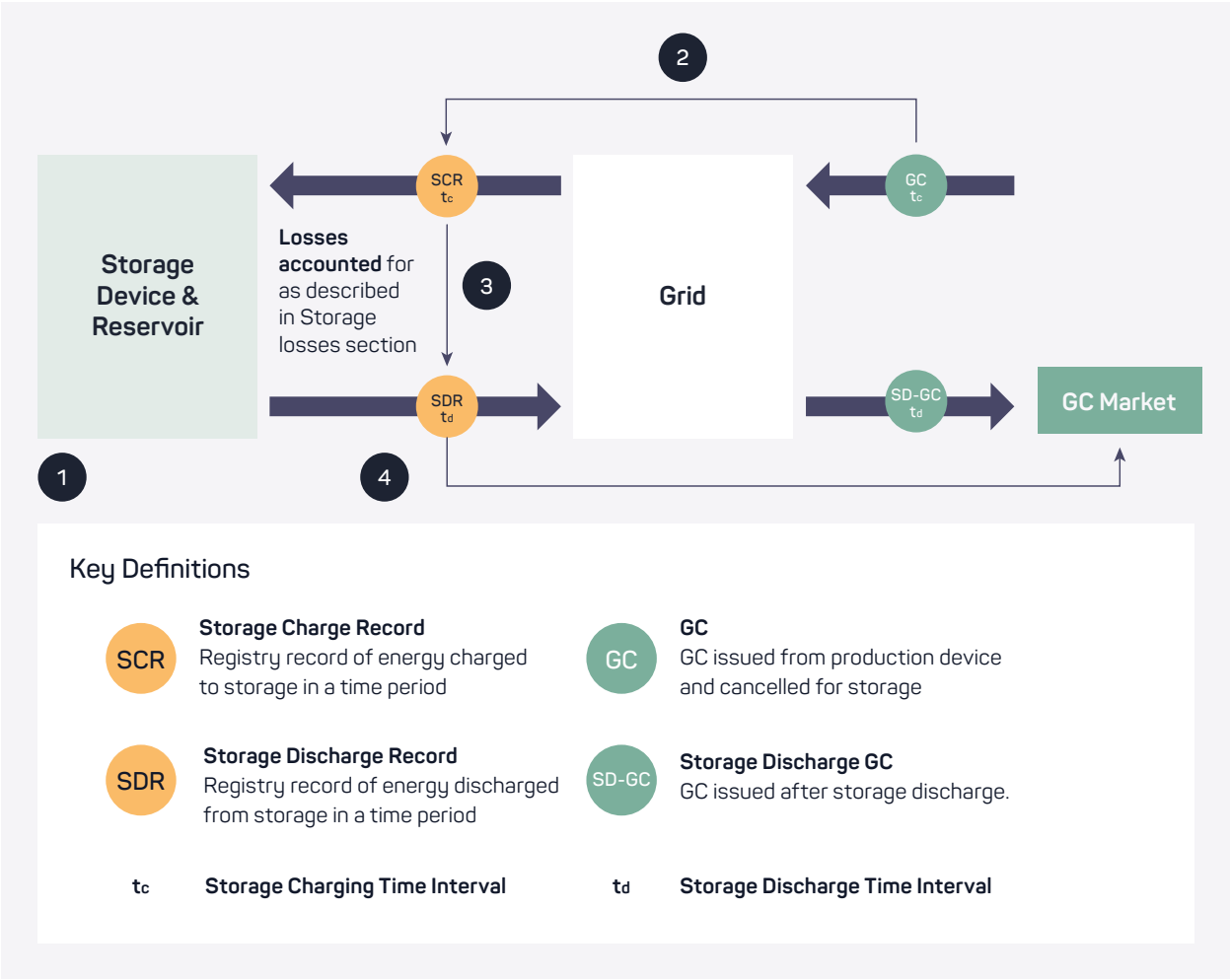
The following set of guidelines apply only where Temporal Matching is being performed for energy storage.

Definitions and Guidelines

i) Process

In order to make a temporal claim that an energy Storage Device has moved energy Attributes from one time to another, it is necessary to ensure that the following collection of elements are Cancelled (GCs)/ withdrawn (Charging Records) and no longer available for further use:

Storage Temporal Matching Use Case Schematic



In this section, the process to be followed in implementing Temporal Matching for storage is outlined using the steps below and the Schematic on the previous page.

- The Temporal Matching storage scheme shall comply with all requirements as laid out in chapter 1.6 of the GC Scheme Standard.

1. Storage Device Management:

- The Storage Device is registered in the GC Registry as a specific type of Production Device. It shall have Storage Charging Records (SCRs) and Storage Discharging Records (SDRs) as defined in the GC Scheme Standard chapter 1.6 on storage.
- A Storage Device is reflected in the Registry by keeping track of the 'Reservoir charge status'. The Reservoir holds SCRs that are not yet allocated to SDRs. Once SCRs are allocated to SDRs, they are no longer part of the Reservoir and can move to the Storage Device history on the Registry. Where storage is discharged, but the corresponding SDRs are not allocated to a specific market party, then the Storage Device operator *may* allocate these SDRs to an 'unknown beneficiary' in order to ensure that the Reservoir reflects the physical capacity of the Storage Device.

2. GC-SCR Allocation:

- GCs for energy produced in the same time interval as the SCR shall be Cancelled, indicating that this Cancellation is "for charging" energy into a Storage Device.
- Attributes like the Energy Source information obtained from GCs that are Cancelled "for charging", *may* be recorded on a corresponding (energy quantity of) Charging Record(s) by referring to these GCs.
- The corresponding quantity of Charging Records from then onwards includes the Energy Source of the Cancelled GCs.

3. SCR-SDR Allocation:

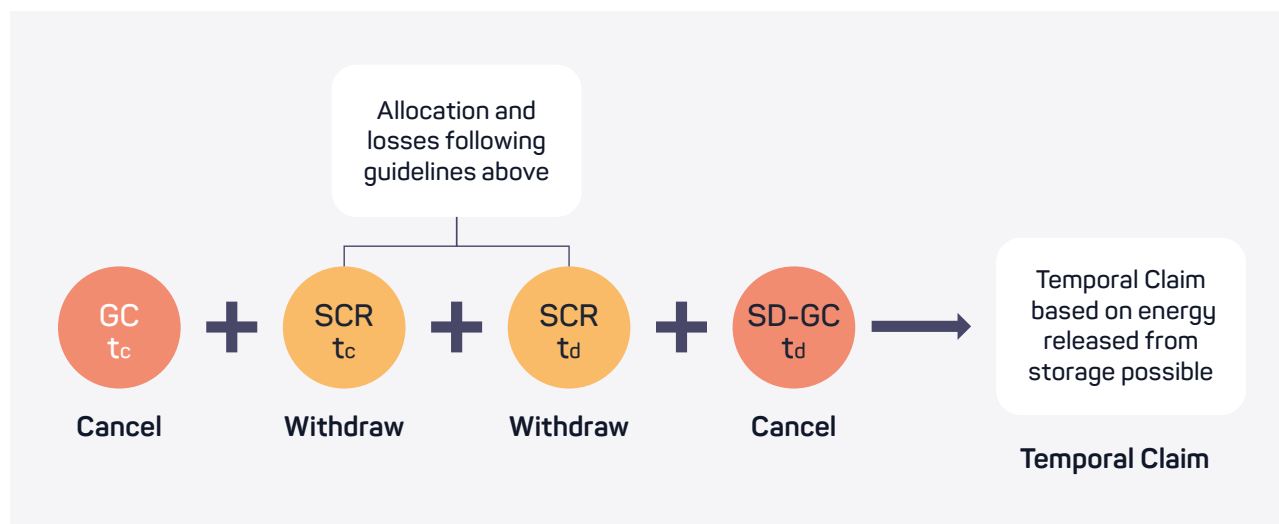
- SCRs shall be allocated to SDRs. Each SCR *may* only once be allocated once to an SDR. The order by which SCRs are allocated to SDRs *should* follow the allocation guidelines explained in chapter 1.5.2 above.
- When allocating SCRs to SDRs, storage losses shall be taken into account. This *should* follow the guidelines outlined in this chapter.

4. SD-GC Issuance:

- SDRs to which SCRs have been allocated which contain Attributes like Energy Source information, *may* copy these Attributes into the SDRs.
- SD-GCs, being tradable electronic certificates with a specific energy source and granular time interval referring to the storage release period, shall be Issued equal to the quantity of their corresponding SDRs. Accordingly, the information on these SDRs shall no longer be available for further usage/ allocation.
- In addition to the requirements listed in chapter 1.3, all Storage (Discharge) GCs:
 - i. *Shall* record an indication that the GC is related to Storage (i.e. Storage Tag),
 - ii. *Shall* record data as specified in "Explanatory Guideline #1" above on "Consumption Metering and Registration Data for Production/ Consumption Matching Use Cases", though they record the time interval of release from storage instead of the period of generation of their underlying energy.
 - iii. *Shall* record Attributes like Energy Source as recorded on the Storage Discharge GC which is conveyed from the original GC from step 1 above.
 - iv. *May* record a reference to the SCR allocated to their related SDR
 - v. *May* record additional details as determined by the GC Registry that are necessary to enable Use Cases.

ii) Storage Discharge GC based Temporal Claims

Process for Temporal Claim from SD-GC



1. GC from the storage charge time interval (time C),
2. SCR from the storage charge time interval (time C),
3. SDR from the storage discharge time interval (time D), and
4. SD-GC from the storage discharge time interval (time D).

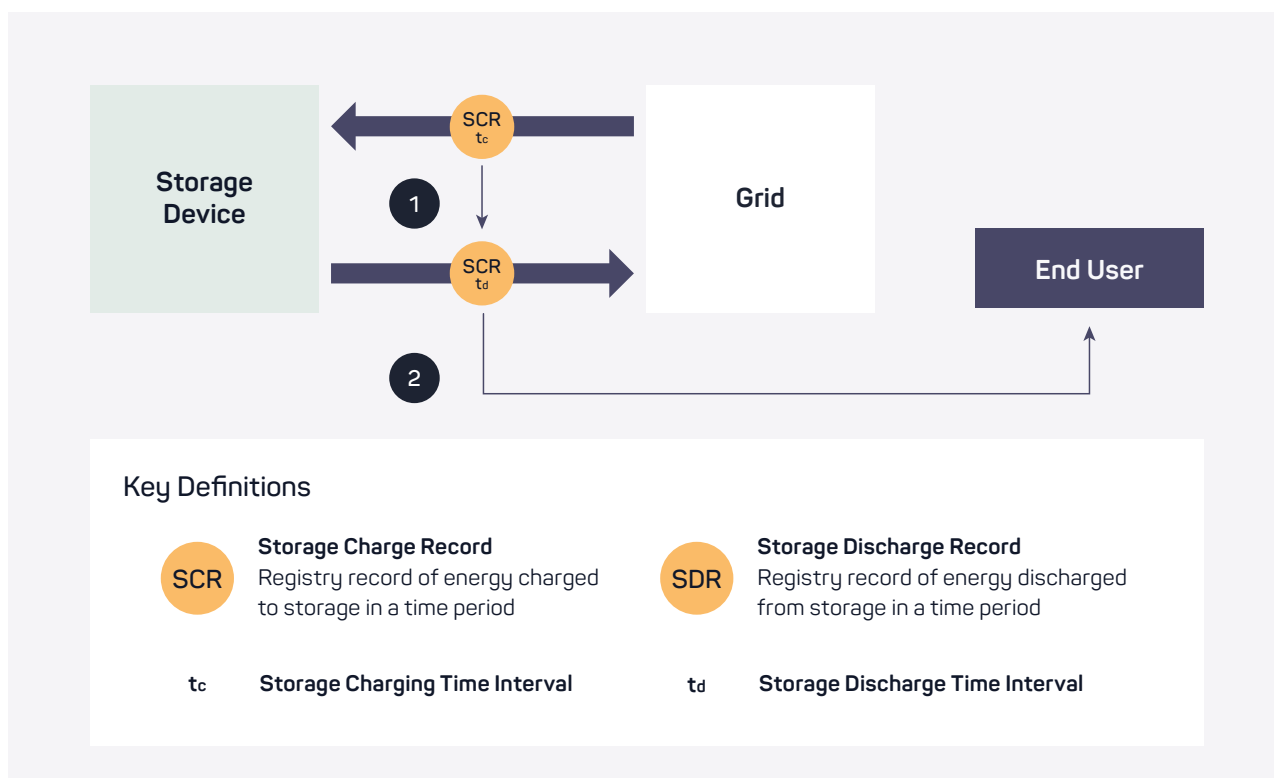
1.5.4 Avoided Emissions Use Case

Definitions and Guidelines

The following set up guidelines apply where the Avoided Emissions Use Case is being performed for energy storage. Note that this Use Case it does not entitle one to make a claim on the primary source of energy.

- The Avoided Emissions Use Case storage scheme shall comply with all requirements as laid out in chapter 1.6 of the GC Scheme Standard.

Avoided Emissions Schema



1. SCR-SDR allocation

- SCRs shall be allocated to SDRs. This *may* be done in batches without the requirement for 1-1 matching and shall ensure that losses are accounted for.

2. End-User Allocation

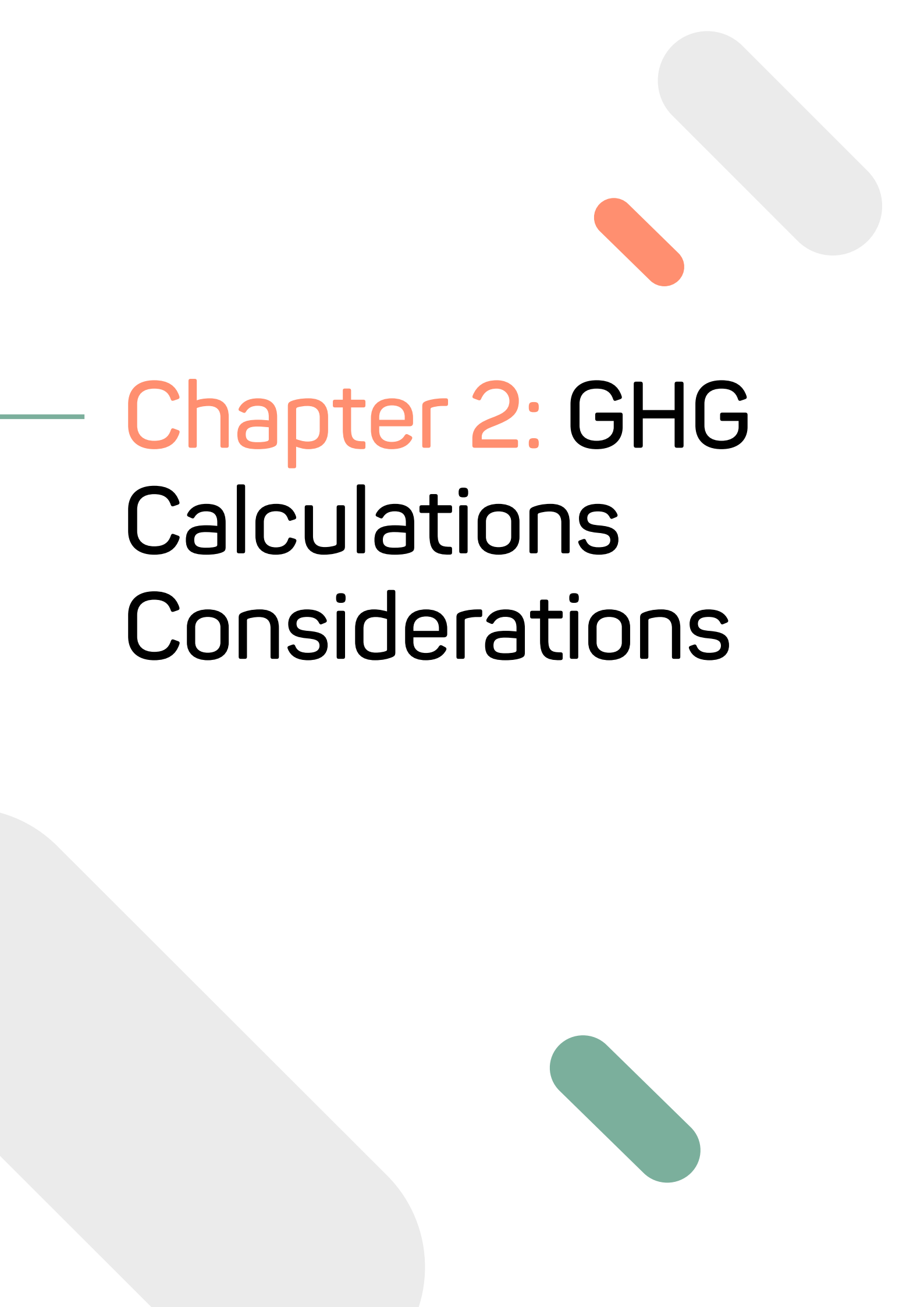
- For a given energy consumption interval, all SDR and SCR shall be allocated to a particular end user → These records are then no longer available for other uses.
- SDRs do not specify the energy source of the energy they represent.
- SDRs (unlike SD-GCs) are not tradable instruments.
- SDRs *may* be used to determine the emissions impact of energy storage:
 - The energy amount represented by SCRs is multiplied by the marginal emissions during the corresponding time intervals. This is the

emissions increase caused by the Storage Device.

- The energy amount represented by the SDRs is multiplied by the marginal emissions during the corresponding time intervals. This is the emissions benefit caused by the Storage Device.
- The emissions displaced are subtracted from the emissions caused to determine the net emissions effect.

- SCRs and SDRs *may* be allocated and used only once.

Call for cooperation: For the purpose of clarity, it is acknowledged that this chapter of the guidelines will require further work. EnergyTag shall set up a specific storage working group over the coming months to resolve key issues and further clarify these guidelines. If you are interested in contributing, please reach out.



Chapter 2: GHG Calculations Considerations

Introduction

This chapter contains some initial views on how GCs can facilitate a move towards more temporal GHG calculations. EnergyTag hopes that this can help facilitate the vital transition to more granular GHG emissions calculations and seeks to encourage dialogue with interested parties to advance this movement. EnergyTag recognises that there is need for more research and discussion on these topics before conclusions can be drawn. Therefore, this chapter will be further developed after publication of the first version of the standard and we encourage those with relevant interest and expertise to contribute.

2.1. Attributional Emissions

Context and Definitions

Although the definition of emissions accounting principles is not the purpose of these Guidelines, it is an important consideration, as GCs *could* be a valuable instrument in increasing the accuracy of corporate emissions reporting. Currently, corporations use EACs for their scope 2 market-based reporting, which involves matching on an annual basis and over large geographical boundaries. Granular Certificates *could* enable a more precise market-based calculation by enabling consumers to match and report production and consumption within a particular time interval and region.

Considerations

When considering temporal attributional emissions calculations the following elements *should* be considered:

- Including the point Emission Factor of the source on the GC. Where possible, this Emission Factor *should* be based on unit-specific and time-specific (e.g. hourly) emission rates from a trusted source.

Where such detailed information is not available, the point emission calculation factor *should* be based on a consistent default calculation method where possible (i.e. using common Emission Factors (kgCO₂/MWh) per electricity production type i.e. Coal, Natural Gas Closed Cycle Gas Turbine, Natural Gas Open Cycle Turbine etc. from a source such as the Intergovernmental Panel on Climate Change (IPCC)). Incorporating point Emission Factors is important as GC systems develop to track all production sources (not just renewables).

- Where stated, the production Emission Factor used shall refer to its source and methodology specifically (e.g. IPCC or ISO 14067 which gives a methodology for example). Emissions factors published by local/default emissions authorities *should* be referred to where recognised, relevant and available.
- Temporally and spatially granular operational grid level Emission Factors (average and residual²²) *should* be developed. The Emission Factors *should* also be consumption-based to account for power trade flows where data is available. A reference *should* be made to the source/methodology used for determining these emission factors. These emission factors *could* contribute to a more granular calculation of Scope 2 carbon footprints.

Call to Cooperation

EnergyTag supports using granular Emission Factors for carbon accounting as best practice and encourages reporting standards, such as the Greenhouse Gas Protocol, to a move towards more granular emissions calculations as the preferred methodology in the future.

Given the complexity of this topic, EnergyTag calls for additional research and evaluation of the various methodologies and data streams that are available for supporting attributional emissions calculations.

²²Note that granular/hourly residual mix factors are optimal for granular attributional accounting.

Further developing plant level operating Emission Factors and standardised granular grid Emission Factors *could* help in developing a harmonised, universally applicable methodology for granular emissions reporting. EnergyTag encourages organisations involved in setting standards for GHG reporting to contribute to the EnergyTag initiative and to develop more granular emissions reporting standards.

2.2. Avoided Emissions

This chapter describes how GCs *could* be useful for tracking the consequential/Avoided Emissions of an organisation's actions. Understanding the potential emissions impact can create price signals to incentivise development of resources that can produce more clean energy in the most effective hours for carbon reduction. However, further research and application are required to fully understand these potential benefits.

Use case 1: Emissions-targeted procurement

Context and Definitions

The first Use Case is sourcing Certificates from time intervals and locations where the overall emissions displacement *could* be highest, in order to provide support for actions aimed at reducing emissions. For example, a corporate energy user *may* wish to purchase Granular Certificates from a generation facility that is providing maximal emissions displacement within their particular grid region. Even if the generation profile of this facility does not align with their own consumption profile, the user *may* purchase Certificates from this facility from periods with the highest emissions displacement values.

Use case 2: Enabling energy load/supply shifting / temporal optimisation

Definition

The second Use Case is leveraging GCs to inform and track the operations of a technology, resource or device that shifts load/supply between time intervals to optimise for a certain outcome. As an example, a grid-scale Storage Device *could* be operated to capture excess clean electricity when generation exceeds demand and renewable generation would otherwise be curtailed/spilled, and then discharges electricity when the grid generation is the most emissions-intensive. Similarly, a corporate energy user *could* install a behind-the-meter battery in order to support load shifting. The user would charge the battery during periods of high renewable availability, and draw energy from the battery when grid emissions are high, thus reducing their contribution to emissions peaks. In both cases, SDRs/SCRs with associated grid emissions data can be used for tracking the Avoided Emissions due to the supply or load shifting²³. Refer to the sections on Energy Storage for more information on Storage related Avoided Emissions considerations.

Considerations

When considering Avoided Emissions Use Cases and calculations, the following elements *should* be considered:

- Temporally and spatially granular operational grid level Emission Factors (marginal) *should* be developed to facilitate consumer choice in calculating the Avoided Emissions of their actions. A reference *should* be made to the source/methodology used for determining this emission factor²⁴.

Call to Cooperation

While marginal emissions *should* be used for calculating avoided emissions, due to the lack of data access and standardisation of methodologies, consumers are still using different emissions factors

²³Note that while Production GCs cannot be used for load shifting, Storage Discharge GCs/ Storage Records could serve this purpose.

²⁴EnergyTag acknowledges that the method for calculating marginal emission factors is not standardised.

to calculate their avoided emissions (i.e. short-run or long-run marginal emissions factors, or even average emissions factors as a proxy when marginal data is not available). Depending on the metric of choice, the calculation of avoided emission *may* be based upon uncertain models so the precise identification of emissions displacement impact *may* be unattainable, making it difficult to add this data as a GC attribute. However, an increasing number of data tools are available that can reliably indicate times and places where avoided emission rates are relatively higher or lower. Given the complexity of this topic, EnergyTag calls for additional research and evaluation of the various methodologies and data tools that are available for supporting consequential/avoided emissions calculations.

2.3. Residual Mix

Context and Definitions

The (sub)hourly or temporal Residual Mix (RM) is the mix of Attributes for energy consumption that is not covered by Cancelled Granular Certificates or other EACs. Its exact scope and definition depends on the boundaries of the relevant regulatory framework.²⁵ The temporal Residual Mix is different from the temporal grid mix, which includes all injection, including the production for which Certificates are Issued. Using the average grid mix for consumption claims would cause double-counting, since both the grid mix and the Issued Certificates are used for claims. Calculating a temporal RM will be necessary until all production receives Granular Certificates and all consumption is matched on a temporal basis using GCs. Once all consumption is matched with a GC, there is no longer a requirement for a residual mix. Challenges for determining and using a temporal RM include:

1. The timely availability of information; including hourly generation by source/technology and Issued GCs per hour by source/technology,

2. Requirement for the collaboration of multiple GC Domains,
3. The parallel usage of temporal RM by some companies and annual RM by others that needs to be coordinated to prevent undermining the reliability of both residual mixes,
4. Additional work for suppliers and/or EAC bodies, who will need to aggregate the total yearly energy supply for that supplier for each hour and account for the interaction of GCs and EACs,
5. Attributing the Issued EAC impact on an hourly level (i.e. if information on an hourly level is not available from all EACs),
6. Deciding how to overcome interference from the annual RM calculation,
7. Different closing/settlement periods for EACs in different programs (e.g. compliance programs) across a market.

The actual calculation of the hourly RM might be conducted on a periodic basis, perhaps monthly or even yearly, given that the base information is always retrospective, and can be delayed by energy settlement timescales. Yearly retrospective calculation *could* alleviate some of the practical problems of data availability and timeliness, although it would still require cooperation with national data agencies as hourly source-specific electricity production data can be difficult to access.²⁶

The calculation *could* be undertaken for each country/market level, and broadly follow the logic of the annual residual mix, such that after the end of each period (month, year ...), the GC Issuer would publish:

- Grid average emission for each hour of the grid for which RM is being calculated,
- Volume and energy origin of GCs Issued for that hour,
- Volume, energy origin and Emission Factors (if available) of EACs Issued for that hour, day (average) or month (average) depending on the accuracy of data reported by each EAC Issuing Body, and

²⁵The current European means of determining the residual mix on an annual basis can be found at: [European Residual Mix | AIB \(www.aib-net.org\)](http://www.aib-net.org/)

²⁶It is noted that organisations (e.g. [LF Energy Carbon Data Specification](http://www.lfenergy.com/)) are developing technical data standards to facilitate better data access.

- An adjusted hourly residual mix calculated as the entire energy mix and emission factor of the hour corrected with the effect of GCs and EACs Issued for that hour.

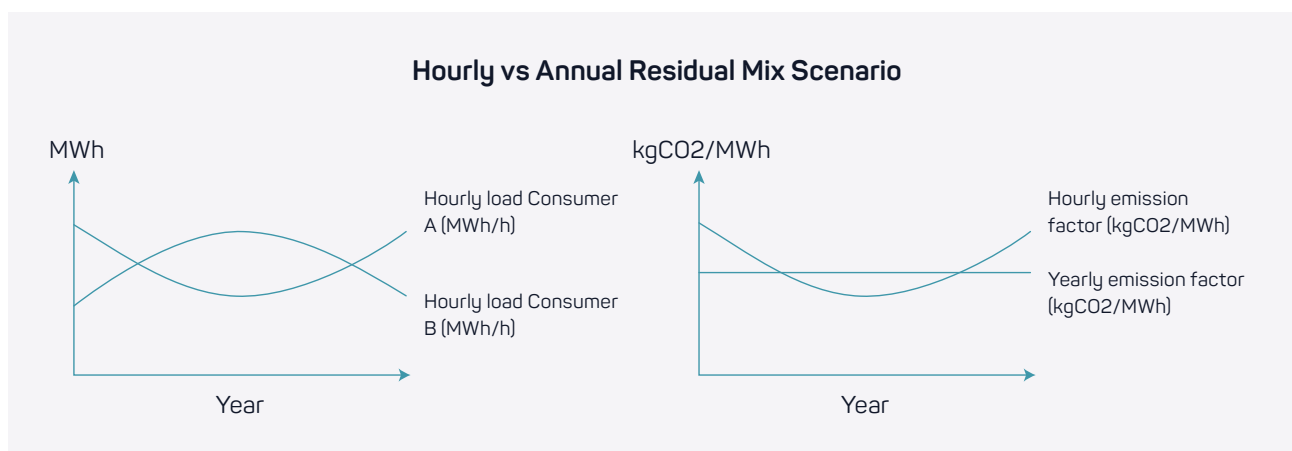
For example, in cases where GCs and EACs are only Issued for zero carbon electricity production, this would in simplified terms mean:

$gCO_2/kWh \text{ factor for RM of the hour} = (\text{Hourly total emissions} / (\text{Hourly total generation} - \text{GCs and EACs Issued for the hour}))$.

Naturally, the same logic *could* be extended to cases where GCs would not only be for zero-carbon electricity, but also for fossil-fuel based electricity. In this case, the emissions “carried” with GCs would be added to the formula above.

Based on this information, electricity suppliers and large consumers *could* then calculate their periodic (hourly, yearly ...) aggregated emission factors (while it is acknowledged that this might require considerable effort, specialist service providers *may* be willing to conduct such calculations on their behalf).

Regarding the coexistence of RMs based on annual and hourly emission factors, which *could* lead to significant unreliability if suppliers and large consumers *could* select their preferred calculation methodology, given the potential for different emissions depending upon whether an hourly or annual RM is adopted. A solution might be to require the reporting of both values from companies using hourly reporting.



The coexistence of carbon reporting based on either hourly or annual residual mix values *could* lead to less emissions reported than have actually been emitted in that timeframe. This would be the case if for example Consumer A, whose hourly load pattern is parallel with the hourly emission factor, would do reporting based on the annual residual mix whereas Consumer B, whose hourly load pattern is converse with the hourly emission factor, would do reporting based on the hourly residual mix as illustrated above.

EnergyTag prefers (sub)hourly granular reporting as this provides more accuracy.

Considerations

If using a temporal residual mix for consumption claims (once it has been specified) in the GHGP Market Based Method, it *should* only be done by applying a residual mix methodology that excludes Attributes for which the consumption claims are already covered EACs/GCs.



Annex

Glossary of Terms

Account	A record of the Certificates held on a Registry by a company or individual.
Account Holder	The person in respect of whom an Account is maintained on a GC Registry.
Attribute	A data item specifying the characteristics of an energy unit produced by a Production Device in terms of the input(s) used and/or the details of that Production Device and production process.
Avoided Emissions	Emission reductions that occur outside a product's life cycle or value chain, but as a result of the use of that product.
Beneficiary	The person (usually the consumer) that ultimately benefits from EAC/GC Cancellation.
Bidding Zone	The largest geographical area within which market participants are able to exchange energy without capacity allocation. For example, Bidding Zones in Europe are currently defined according to differing criteria. While the majority are defined by national borders (e.g. France or the Netherlands), some are larger than national borders (e.g. Austria, Germany and Luxembourg or the Single Electricity Market for the island of Ireland), while others are smaller zones within individual countries (e.g., Italy, Norway or Sweden). In the US, Bidding Zones are analogous to Market Zones where the locational marginal price is the same (e.g. NYISO-Zone D in NYISO).
Cancel	(European term - in the US " Retire " is normally used, while the I-REC Standard uses " Redeem ") To use a Certificate as proof of the Attributes (source, production time, etc.) of supplied energy, to prevent it from being used again for this purpose, and to prevent it from being Transferred to another Account.
Certificate	A record or guarantee (in any form, including an electronic form) in relation to the Attributes of the energy consumed, and/or the method and quality used, in the production of a quantity of energy.
Consumer	The final beneficiary of GC/EAC Cancellation and potentially the user of associated consumed energy.
Consumption Point	Location of energy consumption. For the electricity Energy Carrier, the Consumption Point is a separately measured grid access point at which electricity is consumed.
Consumption Verification Area	The geographic area or market sector containing the Consumption Points for which a Consumption Verification Body has responsibility for verifying that Granular Certificates (GCs) have been Cancelled against consumption.

Consumption Verification Body	An organisation checking that Granular Certificates (GCs) are Cancelled against the energy consumption measured at one or a group of multiple Consumption Points in compliance with the guidelines in the GC Use Case Guidelines. This organisation can be a GC Issuer or a different organisation, such as an auditor.
Domain	The geographic area or market sector containing the Production Devices for which an EAC Issuing Body and/or a GC Issuer has exclusive responsibility for a Certificate system.
Double Counting	See detailed definition in chapter 1.2 of the GC Scheme Standard.
EAC Issuing Body	An organisation responsible for the administration of the existing EAC Scheme within a Domain for an Energy Carrier, that operates regardless of any interrelationship with EnergyTag.
EAC Scheme	The arrangements for the creation, administration, and usage of Energy Attribute Certificates.
e-Fuel	Fuels that are made by storing energy from renewable sources in the form of liquid or gaseous fuels.
Emission Factor	A unique value for determining an amount of a greenhouse gas emitted for a given quantity of activity (e.g. metric tons of carbon dioxide emitted per barrel of fossil fuel burned).
Energy Attribute Certificate (EAC)	A generic term for a unique Transferable electronic record or guarantee created to provide to a consumer evidence of the characteristics of a specific unit of energy conveyed by an Energy Carrier which <i>may</i> include the method and quality of its production. Examples include Guarantees of Origin (GO), Renewable Energy Certificates (RECs), and Emission Free Energy Certificates (EFECs).
Energy Carrier	Means of conveying energy – this can be electricity, gas, hydrogen, or heating/cooling.
EnergyTag Initiative	The non-profit organisation that oversees the creation of these EnergyTag Standards and Guidelines and promotes the use of GC Schemes and markets with a time granularity of a maximum of one hour.
Expire	To make a Certificate ineligible for Transfer or Cancellation as a consequence of the passage of a given period of time since the production of the associated energy.

Geographical Matching	Associating the geographical location of energy production or storage which has been recorded on a GC at its Issuance, with the geographical location of energy consumption and for which the GC is Cancelled. For example, Geographical Matching <i>may</i> take place within physically interconnected zone(s) or Bidding Zone(s).
Geographical Matching Granularity Level	<p>The three levels of Geographical Matching granularity, starting with the highest level of granularity moving to the lowest:</p> <ul style="list-style-type: none"> • Single Bidding Zone Level • Aggregated Bidding Zone Level, • Interconnected Zone Level.
Granular Certificate (GC)	A Granular Certificate compliant with EnergyTag is a Certificate relating to the characteristics of energy produced during a period of one hour or less, Issued in compliance with the requirements and rules of operation of the EnergyTag GC Scheme Standard.
Granular Certificate Consumer	An energy consumer, a supply company or any other party on their behalf, for whom GCs are Cancelled to prove the Attributes of their energy consumption.
Granular Certificate Issuer (GC Issuer)	A Granular Certificate Issuer is an organisation responsible for the administration of the Granular Certificates within a Domain for an Energy Carrier, ensuring the avoidance of Double Counting of the Attributes represented by the Granular Certificates it administers throughout their lifetime.
Granular Certificate Platform	A software service which maintains and/or accesses a GC Registry to provide GC market enabling services such as inventory management, consumption matching or trading.
Granular Certificate Platform Operator	A person responsible for administering a GC Platform.
Granular Certificate Scheme (GC Scheme)	The arrangements for the creation, administration, and usage of Granular Certificates.
Granular Certificate Validity Period	The period of time, ex-post, in which participants <i>may</i> buy and make claims using GCs.
Guidelines	Refers to the EnergyTag GC Use Case Guidelines.
Issue / Issuance	The process of creating a GC/EAC as a record on a Registry.
Market Zone	A set of geographical zones and/or virtual zones often having the same zonal electricity price. This <i>could</i> be a single bidding/price zone or potentially an aggregation of contiguous bidding zones.

Measurement Body	An organisation responsible for measuring the energy produced by or input to a Production Device, and/or the energy consumed at a Consumption Point.
Producer	The owner of a Production Device which is valid for GC Issuance.
Product Verification Body (PVB)	Registry record of energy discharged to storage in a time interval.
Production Device	Separately measured facility for Transferring energy from a primary energy source into an Energy Carrier or from one Energy Carrier to another – for instance, a power station or a gasifier.
Production Granular Certificate	A GC Issued directly to a Production Device as opposed to a Storage Discharge GC.
Power-to-X / PtX	The term is used to describe applications where electricity is converted into another energy form/carrier, X being Hydrogen, Steam or an e-Fuel.
Redeem	(I-REC term - in Europe "Cancel" is normally used, while in the USA "Retire" is used) See definition of "Cancel" .
Registry / GC Registry / EAC Registry	A database administered by an EAC Issuing Body or GC Issuer, recording the characteristics of the Production Devices for which that Issuing Body or GC Issuer is responsible, and the Accounts and the Certificates held in such Accounts.
Reservoir	Refers to the Storage Device's inventory of records at time "i" resulting from record charging that are available for allocation to Storage Discharge Records. This mechanism is needed to record the information of the SDRs that are used to prove the Attributes of the energy input into storage.
Retire	(US term - in Europe "Cancel" is normally used, while I-REC uses "Redeem") See definition of "Cancel" .
Role	A liable entity in a GC Scheme.
Standard	Refers to the EnergyTag GC Scheme Standard
Storage Charge Record (SCR)	Registry record of energy charged to storage in a time interval.
Storage Device	Separately measured device for storing energy.
Storage Discharge Record (SDR)	Registry record of energy discharged from storage in a time interval.

Storage Discharge Granular Certificate (SD-GC)	A GC Issued following Storage discharge in compliance with all necessary requirements in both the Standard and Guidelines.
Temporal Matching	Associating the period of time during which energy is produced or stored and which has been recorded on the GC at its Issuance with the corresponding time at which the GC is Cancelled and the energy is consumed. The time interval is equal to or less than 60 minutes and evidence of energy production and consumption is provided by GCs.
Timestamp	The date and time when an event happened in the format (UTC "HH:MM:SS, DD/MM/YYYY" e.g. "00:00:00 01/01/2021"),
Transfer	The handover of a Certificate from one Account to another, whether on the same or on another Registry.
Use Case	A scenario of a possible usage of GCs.

Acronyms

AML	Anti-Money Laundering
API	Application Programming Interface
CFT	Combatting the Financing of Terrorism
EAC	Energy Attribute Certificate
EECS	European Energy Certificate System
EU ETS	European Union Emissions Trading System
GC	Granular Certificate
GHG	Greenhouse Gas
GO	Guarantee of Origin
GPS	Global Positioning System
I-REC	The International REC Standard
KYC	Know-Your-Customer
LEA	Law Enforcement Agency
MTIC	Missing Trader Intra-Community
PPA	Power Purchase Agreement
PtX	Power-to-X
PVB	Product Verification Body
REC	Renewable Energy Certificate
RPS	Renewable Portfolio Standard
SCR	Storage Charge Record
SDR	Storage Discharge Record
SD-GC	Storage Discharge Granular Certificate
UTC	Coordinated Universal Time

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