EnergyTag

Granular Certificate Use Case Guidelines

Version 2

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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):

"Shall"	This word, or the terms "required" or "must", mean that the definition is an absolute requirement of the Guidelines.
"Shall not"	This phrase, or the phrase "must not", means that the definition is an absolute prohibition of the Guidelines.
"Should"	This word, or the adjective "recommended", means that there may 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.
"Should not"	This phrase, or the phrase "not recommended", means that there may exist valid reasons in particular circumstances when the particular behavior is acceptable or even useful, but the full implications should be understood and the case carefully weighed before implementing any behavior described with this label.
"May"	This word, or the adjective "optional", means that an item is truly optional. One actor may choose to include the item because a particular marketplace requires it or because the vendor feels that it enhances the product while another actor may 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).
"Could"	This word, or "can", 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 harmonization 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

Context 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. The Matching Standard elaborates the framework for Temporal Matching in section 1.2.

1.2 Geographical Matching

Context and Definitions

On occasion, existing schemes that use EACs[1] have been criticized for enabling claims based on physically improbable or impossible flows. In the most criticized 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 Matching.[2]

Motivations for Geographical 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 pipeline[3] - hence the need for EACs.[4] 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:

1. Physically Interconnected Zone, and
2. Market Zone.

Finding the balance between current EAC system flows which are often de-linked from physical energy

[1] *It is primarily the regulations and standards that govern the usage of EAC that permit such behavior.*
[2] *This is reflected in the EnergyTag demos, where Geographical Matching at a country/Bidding Zone level is implemented in almost all cases.*
[3] *Even if the probability of electricity flows can be estimated to a greater level of accuracy.*
[4] *It 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.*

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 bodies.[5] In any case, consumer transparency is key and consumers must declare the granularity of Geographical Matching when making matching claims.

General Guidelines

- A Claim Verifier *shall* be in place to ensure compliance with the Geographical Matching guidelines listed below.
- Geographical Matching boundary definitions *shall* use the 'zonal' concept.
- Consumers *shall* state the Geographical Matching Granularity Level of their claim.
- The Claim Verifier *shall* review the consumption data and Canceled certificates to ensure the Geographical Matching was done in alignment with these Guidelines. Therefore:
  - the Consumer *shall* grant to the Matching Verier adequate access to any information processing facilities (e.g. databases and cloud support where relevant), and
  - the Claim Verifier *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

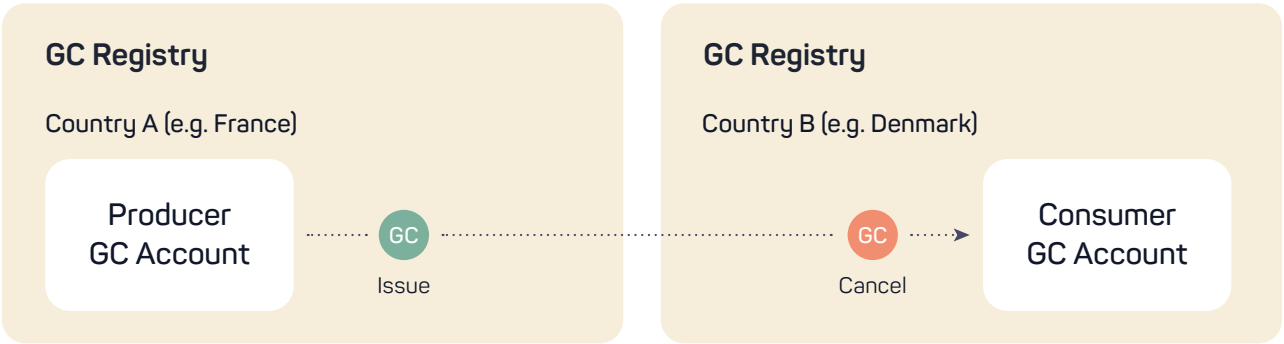
Context and Definitions

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 Canceled (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



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

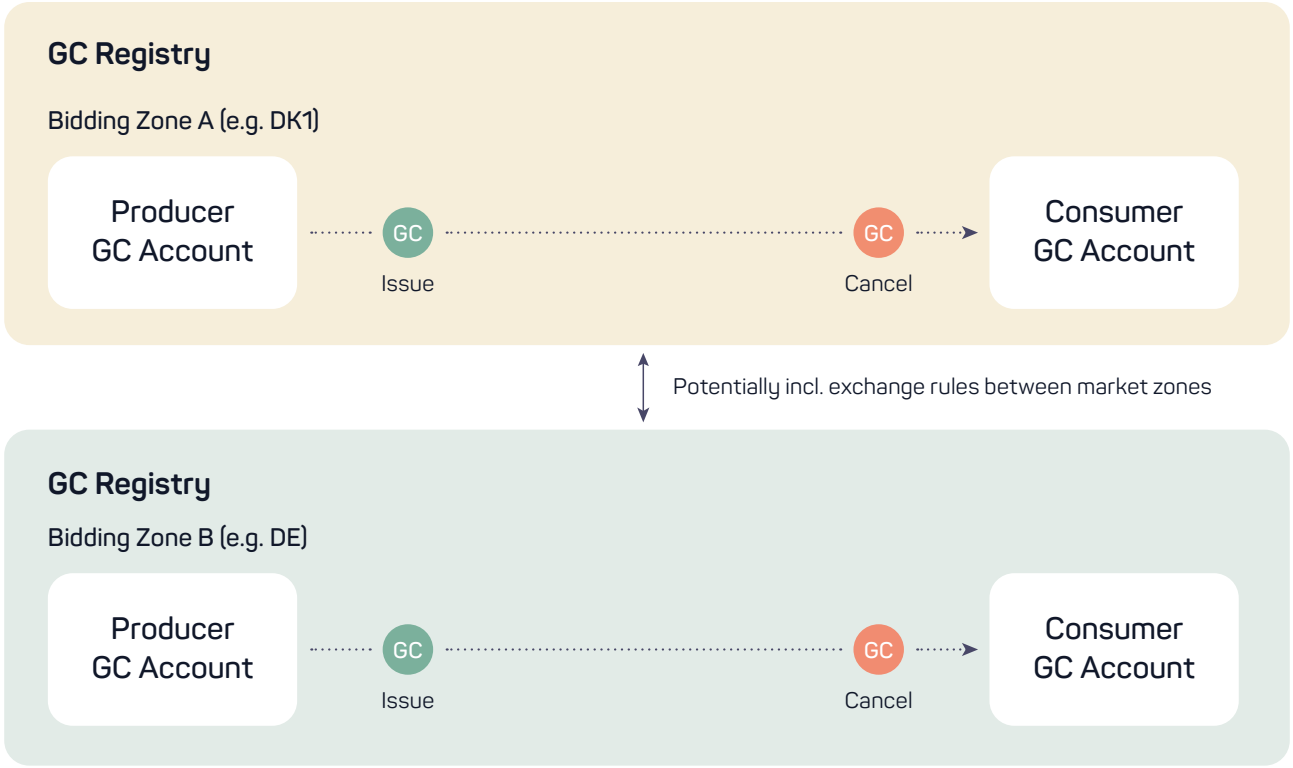
Case 2: Market Zone

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[6] 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 Zone[6] could be defined at the level of:

- 'Single Bidding Zone'[7] (e.g. FR, DK1 in Europe or NYISO-Zone D in the 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 mechanism[8] is in place to ensure that GC flows do not surpass physical energy flows between markets in a given (sub)hourly interval.

[6] *Market zones will change over time, and therefore these definitions may have to be revised going forward.*

[7] *(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.*

[8] *The establishment of such interconnection mechanisms is challenging but there are several organizations working on this. EnergyTag may provide guidelines on this in the future once harmonization 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[9],
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.

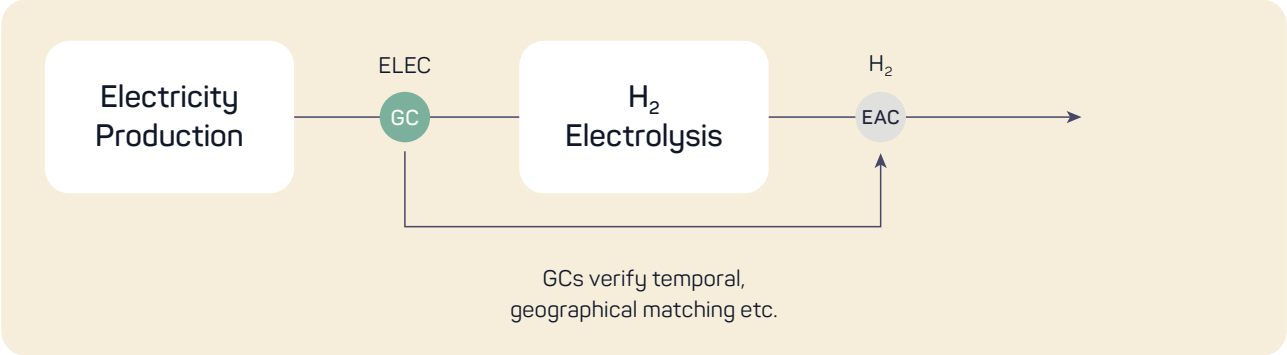
Guidelines

- Market zones *shall* be named following local electricity market definitions where available (e.g. EU Bidding Zones),
- 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 energy[10] 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.

[9] *or in connected BZ with credible allocation and proof or corresponding physical energy flows once these exist.*

[10] *Such 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.*

Sector Coupling PtX Example with GC Transfer



1.3 Sector Coupling

Context and Definitions

The purpose of this chapter is to ensure that these Guidelines can be used for Sector Coupled[11] 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 projects.[12]

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)[13] indicates that in order to be eligible for the renewable transport fuel target, there could be a requirement for:

1. Temporal correlation (e.g. 15 minutes or hourly matching),
2. Geographical correlation (e.g. same Bidding Zone/ demonstrate absence of grid congestion), and
3. 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 EACs[14] looking for a robust way to ensure electricity Attribute criteria are documented in a credible way for certification schemes, and helping to facilitate regulatory compliance. EnergyTag proposes some initial guidelines around the GC Attributes required for sector coupling Use Cases and calls on organizations working on this value chain to contribute further.

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

[12] *Namely, Air Liquide's Hydrogen electrolyser in Denmark, and Eneco's steam boiler in the Netherlands.*

[13] *https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32018L2001&from=EN.*

[14] *e.g. the CertifHy initiative in Europe*

Guidelines

GCs:

As stated in the 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 (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,
- the Commercial Operating Date of the consumption device (to help demonstrate additionality).
- Name of the generator,
- unique ID assigned to the generator by the tracking system,
- the year generator first put the electricity onto the grid,
- fuel or resource type(s), and
- grid or transmission distribution company.

(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 organizations 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 Canceled in time for Temporal Matching is a critical concern, as the annual reporting or electricity sourcing claims of the consumer[15] may be negatively impacted by an inability to utilize 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:

1. GC expires. 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.
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.

[15] *As reporting standards organizations do not currently recognise hourly emissions reporting, maintaining annual emissions is critical for consumers.*

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

EnergyTag acknowledges that Use Cases for storage 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.

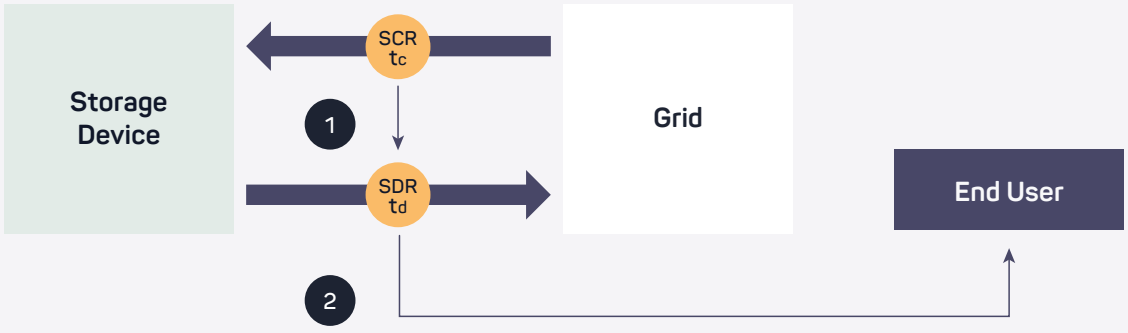
To complement the concepts of Measuring Storage Losses and allocation of storage input to output attributes which are in the Standard in relation with time-shifting over storage, this chapter covers another topic that could be considered in implementing a storage based Use Case, namely Avoided Emissions.

Definitions and Guidelines

The following set up guidelines apply where the Avoided Emissions Use Case is being considered for energy storage. Note that this Use Case does not entitle one to make a claim on the primary source of energy or an avoided emissions claim under EnergyTag at this stage. It is here for consideration and discussion.

- 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



Key Definitions

SCR	**Storage Charge Record** Registry record of energy charged to storage in a time period	SDR	**Storage Discharge Record** Registry record of energy discharged from storage in a time period
t_c	**Storage Charging Time Interval**	t_d	**Storage Discharge Time Interval**

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. Subsequently, these records become unavailable for other purposes.
- 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 estimate the avoided emissions of energy storage:

  i. The energy amount represented by SCRs is multiplied by the emissions rate during the corresponding time intervals, where short-run, average or long-run marginal emission data is available on a near real time basis from standardized public sources. This is the estimated emissions increase of the Storage Device.

  ii. The energy amount represented by the SDRs is multiplied by the emissions rate during the corresponding time intervals, where short-run, average or long-run marginal emission data is available on a near real time basis from standardized public sources. This is the estimated emissions decrease of the Storage Device.

  iii. The estimated emissions "increase" (i) are subtracted from the estimated emissions decrease (ii) caused to estimate the net emissions effect.

  iv. Note that before any avoided emissions claims could be made they would have to follow a methodology that 1) follows internationally accepted standards (i.e ISO, IEC, CEN in EU) for calculation of emissions, and 2) ensures no double-counting of claims of avoided emissions.

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

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 residual[16]) *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.

Further developing plant level operating Emission Factors and standardized granular grid Emission

[16] *Note that granular/hourly residual mix factors are optimal for granular attributional accounting.*

Factors could help in developing a harmonized, universally applicable methodology for granular emissions reporting. EnergyTag encourages organizations 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 organization'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 optimization

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 optimize 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 shifting.[17] 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 factor.[18]

[17] *Note that while Production GCs cannot be used for load shifting, Storage Discharge GCs/ Storage Records could serve this purpose.*
[18] *EnergyTag acknowledges that the method for calculating marginal emission factors is not standardized.*

Call to Cooperation

While marginal emissions should be used for calculating Avoided Emissions, due to the lack of data access and standardization of methodologies, consumers are still using different Emission Factors to calculate their Avoided Emissions (i.e. short-run or long-run marginal Emission Factors, or even average Emission 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 Canceled Granular Certificates or other EACs. Its exact scope and definition depends on the boundaries of the relevant regulatory framework.[19] 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, while not undermining the annual RM that may be in use in the related EAC Domain.
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.[20]

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

[20] *It is noted that organizations (e.g. LF Energy Carbon Data Specification) are developing technical data standards to facilitate better data access.*

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
- 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:

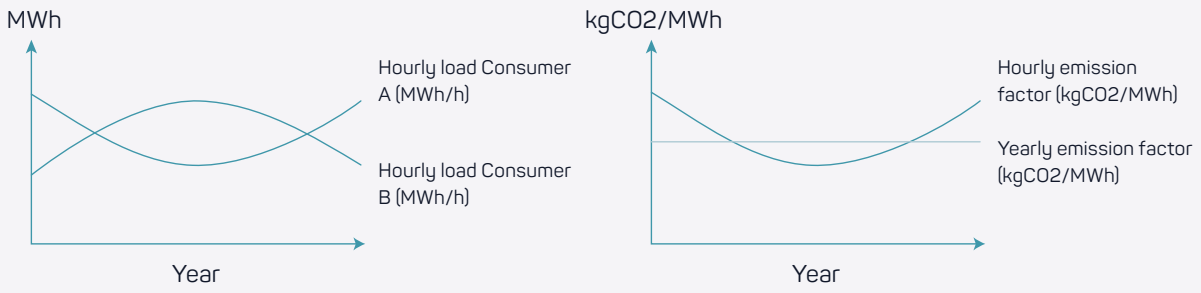
> *gCO2/kWh factor for RM of the hour = (Hourly total emissions / (Hourly total generation - GCs and EACs Issued for the hour)).*

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).

The coexistence of RMs based on annual and hourly emission factors 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.

Hourly vs Annual Residual Mix Scenario



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.
- Where the regulatory framework foresees in a residual mix that is determined at a larger than hourly time interval any calculation of an hourly residual mix, shall ensure to refine but not undermine the regulatory installed residual mix. An hourly residual mix shall not cause double counting of environmentally friendly Attributes compared to a regulatory imposed residual mix.

Chapter 3
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 on a Certificate 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	To remove a Certificate from an Account, either 1. as proof of the Attributes (source, production time, etc.), to prevent it from being used again for this purpose, and to prevent it from being Transferred to another Account, or 2. to Reserve it for transitioning into another Certificate system. *Note: where Cancellation of Certificates relates to claims of the Attributes of supplied energy, In Europe, the term Cancellation for Disclosure is used, while in the US "Retire" is normally used, while the I-REC Standard uses "Redeem.*
Cancellation Statement	A non-transferable or printed receipt for providing evidence of the Attributes at the time of Cancellation of Certificates acquired by an Account Holder.
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.

Claim Verifier (or GC Claim Verifier)	An organization checking that Granular Certificates (GCs) are Canceled against the energy consumption measured at one or a group of multiple Consumption Points in compliance with the Matching rules in this Standard and the guidelines in the GC Use Case Guidelines.
Config3 GC Issuer	A GC Issuer who issues GCs within the restrictions of Configuration #3 as set out in GC Scheme Standard in 1.2 Scheme Configurations.
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 Claim Verifier has responsibility for verifying that Granular Certificates (GCs) have been Canceled against consumption.
Delegated GC Administrator	Entity, approved by EnergyTag, to which the GC Issuer may delegate the responsibility to administer GCs and the registration of the GC ownership throughout their lifetime.
Disclosure	Provision of information regarding a quantity of consumed or supplied energy as having specific Attributes.
Domain	The geographic area and/or market sector containing the Production Devices for which an EAC Issuing Body and/or a GC Issuer has responsibility for a Certificate system.
Double Counting	See detailed definition in 1.2 Scheme Configurations of the GC Scheme Standard.
EAC Issuing Body	An organization 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 Consumption Verifier	A party charged with the responsibility of verifying that the correct amount and type of EACs are adequately Canceled for claims of the Attributes of consumed/supplied energy in a specific Domain. Such parties may be assigned by a government, the consumer or any other stakeholder.

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 may 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	The organization that administers the EnergyTag Standard: EnergyTag Ltd being a non-profit entity registered in the United Kingdom.
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.
Export	Transfer of Certificates from an Account Holder in one Registry to an Account Holder in another Registry. Consequently, the Attributes of the energy represented by the respective Certificates are no longer in the Exporting Registry and are uniquely represented in the receiving Registry.
Face Value	Specific quantity of energy production represented by a certificate.
Geographical Matching (or GC 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 Canceled. For example, Geographical Matching may take place within physically interconnected zone(s) or Bidding Zone(s).

Geographical Matching Granularity Level	The three levels of Geographical Matching granularity, starting with the highest level of granularity moving to the lowest: • Single Bidding Zone Level, • Aggregated Bidding Zone Level, • Interconnected Zone Level.
GC Matcher (or GC-Consumption Matcher) (or Matcher)	An organization who matches the Attributes of Canceled GCs to a specific quantity of energy consumption of a specific Consumer/Supplier, with a view to determine the content of a GC Matching Claim.
GC Matching (or Granular Matching or Matching)	Allocating Attributes of Canceled GCs to a corresponding quantity of consumed energy, for well-specified Matching Features.
GC Matching Claim (or Matching Claim)	A statement by a Consumer or Supplier of energy regarding the proportion of their consumption being matched to GCs, and the resulting Attributes allocated to this consumption.
GC Scheme Protocol	A document that sets out all procedures and liabilities in relation with the operation of a GC Scheme.
Granular Certificate (GC)	A Granular Certificate compliant with EnergyTag is a Certificate relating to the Attributes 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 Canceled to prove the Attributes of their energy consumption.
Granular Certificate Issuer (GC Issuer)	A Granular Certificate Issuer is an organization 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 may buy, Cancel and make claims using GCs.
Guidelines	Refers to the EnergyTag GC Use Case Guidelines.
Import	Receipt of Certificates by an Account Holder in one Registry from an Account Holder in another Registry. Consequently, the Attributes of the energy represented by the respective Certificates are in the Importing Registry and no longer in the Exporting Registry.
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 could be a single bidding/price zone or potentially an aggregation of contiguous bidding zones.
Matcher (or GC-Consumption Matcher)	See GC-Consumption Matcher.
Matching	See GC Matching or Granular Matching.
Matching Framework	A set of parameters for the various Matching Features as laid out in 1.2 Matching GCs with Energy Consumption of the GC Matching Standard.
Measurement Body	An organization responsible for measuring the energy produced by or input to a Production Device, and/or the energy consumed at a Consumption Point.
Price Node	Location identifier in a wholesale electricity price formation mechanism in which the price paid in a particular zone is calculated by the zone's physical node. The Price Node can be an actual location where transmission lines converge, or it could simply mean the last point in the grid where supply and demand are balanced; this is typically at the consumer level.
Producer	The owner of a Production Device which is valid for GC Issuance.
Product Verifier (PV)	An optional Role (similar to a Claim Verifier) describing an organization that verifies products based on Granular Certificates.

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.
Production Registrar	An organization responsible for assessing applications to register Production Devices for the purposes of issuing the relevant Certificates, reporting to the Issuer.
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.
Reserve	Certificate disposition without claiming the represented Attributes. The result is that the Certificates end their life in a Reserved status. A Reserve transaction has the objective of transitioning the respective Certificates into another Certificate system. Reserved Certificates cannot be unreserved, or transfered.
Reservoir	Refers to the Storage System'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.
Residual Mix	The (sub)hourly or temporal Residual Mix (RM) is the mix of Attributes for energy consumption that is not covered by Canceled Granular Certificates or other EACs.
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.
Round Trip Efficiency	The ratio of the net total output energy in the discharging process to the net total input energy in the charging process.

Standard	Refers to the EnergyTag GC Scheme Standard.
Storage Charge Record (SCR)	Registry record of energy charged to storage in a time interval.
Storage Efficiency Factor or Efficiency Factor:	Factor that quantifies storage losses based on round-trip efficiency, being the efficiency of a full cycle of charging and discharging.
Storage System (or Energy Storage System)	Separately measured system for storing energy where the energy carrier of the input into storage is of the same type as the energy carrier for the output of storage.
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 (or GC 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 Canceled 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 "YYYY-MM-DDThh:mm:ssZ" e.g. "2023-10-03T00:00:00Z").
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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