

24/7 Carbon-Free Coalition

24/7 Carbon-Free Electricity technical criteria and appendices

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24/7 CFE Technical Criteria

Section one: Definitions of terms

CFE	<i>Carbon-free electricity</i>
CFE generator	<i>An entity that owns or operates CFE generation or storage projects.</i>
Project, or facility	<i>The physical plant generating or storing electricity.</i>
Generation	<i>The electricity generated or discharged by a project, or facility.</i>
Corporate buyer	<i>An entity that is procuring CFE for its operations and may be seeking to make claims to its use. 24/7 Carbon-Free Coalition partner companies are corporate buyers.</i>
Supplier, or utility	<i>An entity that supplies electricity to corporate buyers.</i>
Energy attributes	<p><i>The physical characteristics and the environmental benefits of electricity generation determined by those physical characteristics. Energy attributes include, but are not limited to:</i></p> <ul style="list-style-type: none"> • <i>Static information about the generation (technology type, nameplate capacity, location, commissioning date, project name, etc.).</i> • <i>The released CO₂e emissions associated with the generation.</i> • <i>The time and date (vintage, or sometimes a timestamp) of generation.</i>
Energy attribute certificates (EACs)	<i>Standardised, tradable instruments issued to a unit of generation (generally, one MWh) which are used to aggregate and track energy attributes. Depending on the system that issues them and the market where they are used, corporate buyers may purchase them bundled with or unbundled from the underlying generation to secure the property rights to energy attributes. EACs for renewable resources are often referred to as Renewable Energy Certificates (RECs).</i>
Bundled procurement	<i>When energy and energy attributes are procured together, in the same transaction.</i>
Unbundled procurement	<i>When energy and energy attributes are procured separately, in different transactions.</i>

<p>Project-specific procurement</p>	<p><i>Procurement from specified projects. Project-specific supplies always have complete transparency regarding the energy attributes in those supplies. The projects procured from throughout the term of a project-specific contract are stipulated in the contract. Project-specific supplies typically use longer contract lengths.</i></p>
<p>Retail procurement</p>	<p><i>Procurement of an ‘off-the-shelf’, standardised CFE product. Project-specificity is not a requirement for retail procurement. The supplier of a retail supply may vary the projects used in the supply over the term of the contract. Retail supplies may have less transparency regarding the energy attributes in those supplies and use shorter contract lengths.</i></p>

Section two: Introduction

1. Basis of the 24/7 CFE technical criteria

The 24/7 Carbon-Free Electricity (CFE) technical criteria are the rules that partner companies of the [24/7 Carbon-Free Coalition](#) observe when procuring carbon-free electricity and defining their progress towards their 24/7 CFE targets. The technical criteria may also be used by any corporate buyer as a guide for procurement of time- and location-matched CFE and making claims to its use.

The 24/7 CFE technical criteria exist in the absence of a consistent global framework that:

- Defines which energy resources are carbon-free;
- Defines requirements for credible claims to use of CFE, including market boundaries, time of generation, and resource age;
- Outlines appropriate methods for measurement of CFE consumption at hourly granularity, including the role of energy storage;
- Outlines appropriate boundaries for organization-wide targets on CFE consumption;
- Defines material consumption of electricity in pursuit of these targets;
- Calls for third-party verification of consumption of CFE; and
- Specifies impact in procurement of CFE.

The 24/7 CFE technical criteria are set by the 24/7 Carbon-Free Coalition Technical Advisory Group (TAG) in consultation with partner companies, other stakeholders and with the approval of the 24/7 Carbon-Free Coalition Programme Executive. The TAG contributes to the development of the technical criteria, but the entirety of the technical criteria may not reflect each TAG partner’s views.

The technical criteria may be periodically revised for the 24/7 Carbon-Free Coalition to maintain its mission as a global leadership initiative of corporate buyers accelerating the transition to carbon-free grids by 2040. The technical criteria do not exist purely as a reporting standard for corporate claims to use of carbon-free electricity, but also as the principles for corporate buyers

to themselves contribute to the decarbonisation of grids through their direct actions, and through the signals to markets and policymakers that their actions send.

2. What are the 24/7 CFE technical criteria based on?

The 24/7 CFE technical criteria, like the [RE100 technical criteria](#), are **mostly** an interpretation of the current GHG Protocol Corporate Standard [market-based scope 2 accounting guidance](#). They apply principles for market-based greenhouse gas emissions claims to CFE usage claims by recognising that both types of claims are made possible by the same market-based instruments.

The technical criteria, **in all cases**, require a contractual instrument which gives a corporate buyer making a claim to use of CFE the property rights to CFE attributes. The procurement types recognised by the technical criteria are categorisations of different contractual arrangements which convey these attributes to corporate buyers. The 24/7 Carbon-Free Coalition differs from RE100 in its restrictions on attribute vintage, market boundaries, resource type, and resource age.

3. The 24/7 Carbon-Free Coalition formal review process

In recognition of the novelty and ongoing evolution of granular CFE markets and standards, the 24/7 CFE technical criteria will undergo a regular review process, with formal reviews taking place every 6 months within the first two years of the Coalition. This ‘formal review process’ will take into account real-world data gathered from Coalition partners as they begin to measure their 24/7 CFE performance, as well as emerging standards and best practice.

Of particular importance, the TAG notes that the GHG Protocol Corporate Standard is undergoing a [revision process](#) that will occur simultaneously to the formal review process of the 24/7 Carbon-Free Coalition. Recently proposed updates to the GHG Protocol market-based scope 2 accounting guidance describe temporal and spatial granularity requirements similar to those outlined in the 24/7 CFE technical criteria. As it is a core principle of the 24/7 Carbon-Free Coalition that all claims to use of CFE be compatible with accepted principles for market-based greenhouse gas emissions accounting, the TAG anticipates updating the 24/7 CFE technical criteria following the final publication of updated GHG Protocol Corporate Standard market-based scope 2 guidance to ensure compatibility. Partners should therefore review GHG Protocol revision process materials as they are published and should consider the compatibility of actions taken during the formal review process with final revised GHG Protocol market-based scope 2 guidance. The 24/7 Carbon-Free Coalition notes the following as areas where compatibility issues may arise:

- **Market boundaries and deliverability.** Recent proposed updates to the GHG Protocol market-based scope 2 guidance include market boundary and deliverability requirements similar to those described in these technical criteria (see Section 5.1 and Appendix B). It is possible that final market boundary definitions and cross-market deliverability standards in the revised GHG Protocol may differ from those defined in Version 1 of the 24/7 CFE technical criteria, in which case the 24/7 Carbon-Free Coalition anticipates updating deliverability standards where necessary to ensure compatibility of claims. The 24/7 Carbon-Free Coalition therefore encourages partners to consider future compatibility with potential GHG Protocol deliverability requirements when entering into long-term contracts during the formal review process.
- **Standard supply service.** Recent proposed updates to the GHG Protocol market-based scope 2 guidance include novel provisions relating to energy procured through “standard supply service” (SSS). The SSS concept is similar to the procurement type

“Default delivered CFE from the grid, supported by EACs” described in the 24/7 technical criteria (see section 4.5), but refers specifically to resources for which there is a “traceable and mandatory financial relationship” with consumers paying default electricity rates. Generation in the following categories would be considered part of SSS:

- Facilities and/or supply that are subject to regulated cost recovery from a supplier as part of default service in a particular service area and are not part of a resource-specific supplier product (e.g. a green tariff);
- Competitive or regulated suppliers complying with government-mandated clean energy procurement program through the procurement of certificates on behalf of load served. For example, government-mandated clean energy procurement programs in the United States include Renewable Portfolio Standards (RPS), Clean Energy Standards (CES), and nuclear-support programs applicable to serving load within a state; and
- Publicly owned facilities where the majority owner is a government entity supplying load within their home country or region.

Under the proposal, attributes from SSS resources would be allocated by suppliers on a pro-rata basis to all their customers and could not be over-allocated to specific customers in a proportion greater than their share of demand. The 24/7 Carbon-Free Coalition therefore recommends that partners consider the potential impacts of a SSS proportional allocation principle when entering into long-term contracts during the formal review process.

Section three: Recognised carbon-free electricity resources

1. Generation resources (excluding biomass)

The 24/7 Carbon-Free Coalition considers electricity generated from the following energy resources to be fully carbon-free:

- Wind;
- Solar;
- Zero-emissions geothermal;
- Marine (wave and tidal);
- Sustainable hydropower; and
- Nuclear (fission and fusion).

The 24/7 Carbon-Free Coalition classifies electricity resources as carbon-free based on total fuel-cycle greenhouse gas (GHG) emissions. A resource is considered carbon-free if the GHG emissions induced by each additional unit of generation are less than or equal to zero within a tight certainty margin. Embodied emissions from the construction of an electricity resource are not considered in its classification as carbon-free.

Fossil-fired electricity resources with carbon capture and sequestration (CCS) are not considered carbon-free because even with 100% capture efficiency, methane leakage from

fossil fuel supply chains leads to nonnegligible fuel-cycle emissions.¹ Some resources classified as renewable under the RE100 technical criteria are not classified as carbon-free under the 24/7 CFE technical criteria. All forms of geothermal power are classified as renewable, but only those that recirculate 100% of produced geofluid back to the subsurface are considered carbon-free, due to GHG emissions associated with venting of condensed gases. Electricity generated from biomass is given unique treatment in the 24/7 CFE technical criteria, as discussed in the following section.

While it is not classified as renewable under the RE100 technical criteria, the 24/7 Carbon-Free Coalition recognises nuclear power as a source of carbon-free electricity.² The 24/7 Carbon-Free Coalition recommends that partners support continued improvements in sustainability and safety in the nuclear industry, including in fuel supply chains and waste disposal through ongoing engagement with suppliers and governments.

Hydropower can play a role in decarbonisation provided it is generated sustainably. The 24/7 Carbon-Free Coalition **only** counts procurement of CFE generated from hydropower towards a 24/7 CFE target when the corporate buyer has obtained **some form of assurance** that the CFE was generated sustainably. The 24/7 Carbon-Free Coalition recommends that this sustainability assurance is obtained through **third-party certification**.

A non-exhaustive list of standards providing such certification includes:

- ISCC EU certification
- Green-e® Energy certification
- EKOenergy
- The Low Impact Hydropower Institute (LIHI)
- The Hydropower Sustainability Council's Hydropower Sustainability Standard³

The TAG will continue to study the environmental and social sustainability of both currently recognised and non-recognised CFE technologies and may introduce related recommendations and criteria as consensus around best practices develops. The 24/7 Carbon-Free Coalition encourages partners to consider the reputational risks and benefits of procuring power from particular technologies beyond their recognised CFE status.

2. Biomass generation resources

Electricity generated from sustainably sourced biomass is considered renewable under the RE100 technical criteria but cannot be unconditionally classified as carbon-free because of the high potential for nonzero net emissions resulting from fuel harvesting, processing, transportation, disposal, and land use changes. Regarding the role of biomass-based electricity

¹ The IEA estimates that upstream emissions from fossil-fired electricity are equivalent to [16-20% of direct combustion emissions](#) globally, depending on fuel type.

² While the nuclear fuel cycle does result in [nonzero GHG emissions](#), these are considered so small as to be negligible for the purpose of this Coalition. Because nuclear fuel cycle emissions are [largely driven by energy inputs](#), it is likely that they will fall further as global energy systems decarbonize.

³ The Hydropower Sustainability Standard was developed in part from the recommendations made by the World Commission on Dams.

generation in a carbon-free electricity sector, the 24/7 Carbon-Free Coalition recognises the following:^{4,5,6}

- Biomass-based electricity generation can theoretically achieve carbon-free status, particularly when paired with carbon capture and sequestration (CCS) technology;
- Emissions impacts from biomass-based electricity generation can vary significantly between different production pathways and regional contexts, and estimates are sensitive to assumptions;
- Emissions impacts from land use changes due to dedicated biomass cultivation are particularly uncertain and can be very large;
- There is currently no widely accepted international standard for calculation and verification of the lifecycle emissions impacts of biomass-based electricity generation.

In recognition of these complexities, the 24/7 Carbon-Free Coalition adopts a simplified and conservative approach to the crediting of biomass-based electricity generation as carbon-free. Due to the significant potential impacts from direct and indirect land use changes, the 24/7 Carbon-Free Coalition **only** recognises the generation of electricity from waste and residue biomass as carbon-free. The 24/7 Carbon-Free Coalition furthermore **only** counts procurement of CFE generated from biomass towards a 24/7 CFE target when the corporate buyer has obtained **some form of assurance** that the biomass was sourced sustainably and recommends that this assurance is obtained through **third-party certification**. A non-exhaustive list of standards providing such certification includes:

- ISO 13065:2015 (specifies principles, criteria, and indicators for the bioenergy supply chain to facilitate assessment of environmental, social and economic aspects of sustainability)
- ISCC EU certification
- Green-e® Energy certification
- EKOenergy

Unlike the resources listed in the previous section, the 24/7 Carbon-Free Coalition **only** allows partners to claim electricity generated using qualifying biomass as carbon-free following submission of a **project-specific life cycle GHG assessment**, as outlined in Appendix C. If the sum of direct and fuel cycle GHG emissions for a project is found to be greater than 0 gCO_{2e}/kWh, the partner may claim the procured electricity as carbon-free on a fractional basis, as outlined in Appendix C. In recognition of the limited global potential for biomass-based electricity generation,⁷ 24/7 Carbon-Free Coalition partners may claim consumption of CFE derived from biomass up to a maximum of 10% of their global material electricity consumption.

⁴ IEA (2017), *Technology Roadmap - Delivering Sustainable Bioenergy*, Paris, France, <https://www.iea.org/reports/technology-roadmap-delivering-sustainable-bioenergy>

⁵ UK Environment Agency (2009), *Minimising greenhouse gas emissions from biomass energy generation*, London, UK, https://www.globalbioenergy.org/uploads/media/0904_Environment_Agency_-_Minimising_greenhouse_gas_emissions_from_biomass_energy_generation.pdf

⁶ US National Renewable Energy Laboratory (2022), *Lifecycle greenhouse gas emissions from electricity generation: update*, Golden, CO, USA, <https://www.nrel.gov/docs/fy21osti/80580.pdf>

⁷ In the 2024 edition of the IEA's World Energy Outlook, biomass accounts for 9% of final energy consumption in electricity and heating in the Net Zero Emissions by 2050 scenario. <https://www.iea.org/reports/world-energy-outlook-2024>

3. Storage resources

In addition to the direct sources of CFE listed above, the 24/7 Carbon-Free Coalition recognises electricity discharged from an energy storage facility as carbon-free if the storage was charged using qualifying CFE. The CFE status of storage discharge may be demonstrated by tracking a storage facility's charge and discharge records on a granular basis and pairing these records with energy attributes, as outlined in Appendix A. Alternatively, all discharge from a storage device during a reporting period may be claimed as CFE if the storage device was charged exclusively with CFE for the entirety of the same reporting period. CFE used to charge storage is subject to the same vintage and geographic market boundary restrictions as CFE that is directly claimed by 24/7 Carbon-Free Coalition partners.

Section four: Recognised procurement types for carbon-free electricity

The 24/7 Carbon-Free Coalition categorises corporate procurement of CFE into five broad types. They differ in terms of the party being contracted with (directly with a generator⁸ or through a more conventional contract with an electricity supplier), whether the procurement of energy and energy attributes is bundled or unbundled, and active versus passive procurement.

- 1 Self-generation from facilities owned by the company
- 2 Direct procurement (contracts with generators)
 - 2.1 *Physical power purchase agreement (physical PPA)*
 - 2.2 *Financial power purchase agreement (financial/virtual PPA)*
- 3 Contracts with electricity suppliers
 - 3.1 *Project-specific supply contract with electricity supplier*
 - 3.2 *Retail supply contract with electricity supplier*
- 4 Unbundled procurement of energy attribute certificates (EACs)
- 5 Passive procurement

1. Self-generation from facilities owned by the company

Corporate buyers can own their own projects. Projects might be on-site or off-site, on the grid, or entirely off-grid. Corporate buyers must retain energy attributes to claim use of CFE. This means corporate buyers can consume directly from their projects, retain the attributes, and claim use of CFE. It also means corporate buyers can sell energy to the grid, retain the attributes, and claim use of CFE (up to the volume that they purchase from the grid).

⁸ The term "generator" is used as a general descriptor for both generation and storage resources throughout this document. See Section one: Definitions of terms.

2. Direct procurement (contracts with generators)

Direct procurement describes procurement from, and contracting with, generators themselves. It includes two forms of power purchase agreements (PPAs).

2.1 Physical power purchase agreement (physical PPA)

A physical PPA is a contract between a corporate buyer and a generator for the supply of CFE. A physical PPA can characterise purchases from on-site projects owned by third parties, off-site projects to which there is a direct line or off-site grid-connected projects. A physical PPA typically uses a long-term contract.

Physical PPAs do not necessarily need to be bilateral between the corporate buyer and the generator. A bilateral PPA requires the corporate buyer to also take responsibility for the off-take of the power itself, including managing the moving and scheduling of the power to the corporate buyer's load, or into the wholesale power market (if the project is grid-connected). The corporate buyer may need to be licensed to be able to do this. Alternatively, a trilateral PPA can involve an additional party which is responsible for the off-take of the power from the project. This third party is often an electricity supplier. A trilateral PPA may be advertised as a 'retail PPA', 'sleeved PPA', or a 'third-party PPA'.

2.2 Financial power purchase agreement (financial/virtual PPA)

A financial PPA (often called a virtual PPA – VPPA) is a purely financial transaction in which a corporate buyer assumes market risk related to the sale of a generator's electricity and receives energy attributes. This can be done through a contract for difference, where the generator exchanges the risk of selling the project's generation to the wholesale market at a variable rate with a fixed-price cash flow agreed with the corporate buyer. The corporate buyer therefore off-takes market risk the generator would be exposed to by selling power at the fluctuating wholesale energy price, and in return is entitled to the energy attributes.

Because a financial PPA is only a financial instrument, the corporate buyer must still separately procure electricity for its operations. It is therefore a form of unbundled procurement. A financial PPA can serve as a hedge for fluctuating electricity costs, and some corporate buyers may realise a financial benefit from using them. A financial PPA typically uses a long-term contract.

3. Contracts with electricity suppliers

A contract with a supplier describes a conventional supply arrangement with an electricity supplier for the supply of CFE. Energy and energy attributes are bundled together in their delivery to the corporate buyer.

The 24/7 Carbon-Free Coalition recognises two types of contracts with electricity suppliers: project-specific, and retail. Appendix F contains guiding questions for corporate buyers needing to identify whether a particular supply must be characterised as project-specific or retail.

3.1 Project-specific supply contract with electricity supplier

A project-specific contract with a supplier describes an arrangement whereby the supplier procures from specified projects on behalf of the corporate buyer. Often, the supplier holds a power purchase agreement. The contract may be advertised as a 'green tariff', has complete transparency regarding the energy attributes in the supply (meaning the corporate buyer always knows exactly which specific projects they are purchasing from through their electricity supplier), and typically uses a longer contract length.

3.2 Retail supply contract with electricity supplier

A retail contract with a supplier describes an ‘off-the-shelf’ arrangement with an electricity supplier for the supply of CFE. The corporate buyer usually pays a per-kilowatt hour premium through an additional line item on their monthly electricity bill for the CFE. This contract may be advertised as a ‘green electricity product’, may have less transparency regarding the energy attributes in the supply, and typically uses a shorter contract length. The supplier may vary the projects from which energy attributes are sourced throughout the contract.

4. Unbundled procurement of energy attribute certificates (EACs)

Energy attribute certificates (EACs) can be purchased alone, separate from the underlying generation they are issued to, and separate from corporate buyers’ procurement of electricity for their operations.

Corporate buyers can purchase EACs⁹ to pair with their consumption of purchased grid electricity. This permits a claim to having consumed electricity with the attributes conveyed by the EACs¹⁰. The EACs must be issued to generation located in the same market for electricity as the electricity supply being decarbonised by the corporate buyer¹¹. A purchase of CFE generated in one market cannot be equated to its consumption in a different market.

EACs can be procured through short or long-term contracts, with varying degrees of project-specificity. EACs are sometimes procured through brokers and trading platforms, making for transactions that are less complex than those in other procurement types.

Unbundled EACs can only ever present an additional cost on top of corporate buyers’ separate electricity purchases. This is a key point of distinction between long-term contracts for unbundled EACs and financial PPAs, which can sometimes realise a financial benefit.

5. Default delivered CFE from the grid, supported by EACs

This is the CFE in the electricity utility/supplier mix that has not been voluntarily procured by corporate buyers but is delivered by default. Corporate buyers can claim use of default delivered CFE if, and only if, an equivalent amount of EACs with hourly or sub-hourly granularity is retired by the utility/supplier. Corporate buyers wishing to claim use of this CFE must seek relevant information from their utility/supplier to justify their claims.

Default supplies can include CFE supplied under a compliance mandate. However, the existence alone of such a mandate is not justification for corporate buyers to claim use of CFE. Corporate buyers must verify how their utilities/suppliers are complying with the mandate. In the United States, Renewable Portfolio Standards (RPS) and Clean Electricity Standards (CES) require that a specified percentage of the electricity that utilities supply comes from renewable or low-carbon resources, and that utilities/suppliers retire EACs on behalf of their customers for that percentage. In some cases, these programs allow for alternative compliance routes, multipliers, and other mechanisms that do not deliver CFE to corporate buyers. Another

⁹ The EACs purchased must be from EAC systems that enable credible claims, following Section 5 and Appendix A.

¹⁰ Unbundled EACs cannot be used to decarbonise electricity from a non-CFE project (e.g., a CHP system) when the project is owned by the company (therefore, the emissions from it are in scope 1), or when the project is on-site or when there is a direct line to the project (therefore, the electricity is not sourced from the grid).

EACs are scope 2 instruments indicating renewable electricity has been generated and fed into the grid. Using them to decarbonise scope 1 emissions does not align with greenhouse gas emissions accounting practice. Similarly, it is inconsistent to claim that a purchase of EACs from CFE which is fed into the grid can be matched with consumption of electricity from a source other than the grid.

¹¹ See Appendix B for the 24/7 Carbon-Free Coalition’s precise market boundary definitions.

example in Australia is the default supply of CFE by utilities/suppliers retiring Large-scale Generation Certificates (LGCs) under the Renewable Energy Target (RET). Again, corporate buyers must verify that their utilities/suppliers are retiring LGCs rather than using an alternative compliance route such as paying a shortfall charge. This procurement type is not applicable in most markets and corporate buyers wishing to use it must have evidence to support their claims.

For the avoidance of doubt, claims to default delivered CFE, supported by EACs, require an absence of voluntary procurement of CFE. Corporate buyers can only claim default delivered CFE where they have a contract for a supplier's default supply. If a corporate buyer consumes 100 MWh, 60 MWh of which is supplied through a contract for CFE, and 40 MWh of which is supplied through a default supply, the corporate buyer can only claim the default delivered CFE, supported by EACs, present in the 40 MWh conveyed by the default supply.

It is essential that claims to use of default delivered CFE remain unique and exclusive. Some markets place RPS/CES-type compliance mandates on utilities but allow those utilities to also sell that CFE to voluntary corporate buyers actively procuring it (for example, through the Green Premium contracts available in the Republic of Korea). Therefore, the CFE procured by utilities to meet their compliance mandate is not present in a default supply. Claims to default delivered CFE cannot be made using compliance mandates on utilities as a justification in these instances.

Section five: Requirements for procurement

1. Credibility of claims

A credible claim to use of CFE is based on¹²:

- Credible generation and charging data;
- Attribute aggregation;
- Exclusive ownership (no double counting) of attributes;
- Exclusive claims (no double claiming) on attributes;
- Geographic market limitations of claims;
- Temporal limitations of claims; and
- Demonstration of CFE usage in storage charging.

2. Requiring energy attribute certificates (EACs)

CFE procurement must include EAC cancellation in markets where EACs are in common use¹³.

The following procurement is exempt from this requirement:

- Self-generation (procurement type 1)¹⁴.

¹² See Appendix A for general discussion and Appendix B for precise market boundary definitions.

¹³ See Appendix C for markets where EACs are in common use.

¹⁴ These exemptions do not replace local law – many markets have laws requiring generation to be issued with EACs already (e.g. the United States).

- Physical power purchase agreements with on-site projects or off-site projects to which there is a direct line with no grid transfers (a subset of procurement type 2.1)¹⁵.

In markets where EACs exist but are not in common use, EAC cancellation may still support a claim to CFE consumption, though EAC cancellation is not required by the 24/7 Carbon-Free Coalition (unless any are issued to the generation being claimed). Claims made without EAC cancellation (i.e. where EACs are not issued to the generation being claimed) must be based on credible alternative contractual instruments, which the [RE100 credible claims paper](#) serves as a guide for.

EACs must be cancelled by or on behalf of corporate buyers making claims. This permits an intermediary, such as an electricity supplier, broker, or program, to cancel EACs and communicate to the corporate buyer the details of the EACs cancelled on their behalf. Portfolio cancellation approaches, where many EACs are retired on behalf of many corporate buyers without specific EACs being allocated to specific corporate buyers, are also acceptable¹⁵.

3. Impact in procurement of carbon-free electricity

The 24/7 Carbon-Free Coalition's aim is for corporate buyers to accelerate the transition to zero-carbon grids. Corporate buyers can contribute to this transition either directly, through the actions they take to add new CFE capacity, and/or indirectly, through the signals they send to markets and policymakers with their advocacy and demand for voluntarily procured CFE.

3.1 Impactful procurement

The 24/7 Carbon-Free Coalition considers there to be three key features of impactful procurement: (1) long-term, (2) project-specific contracting, with (3) recently commissioned CFE projects. While not all procurement types can display all three features, most can display at least one. A twenty-year power purchase agreement with a new CFE project or a five-year project-specific contract with an electricity supplier with a recently commissioned project are more impactful than a one-time unbundled EAC purchase from an old project. Where corporate buyers make one-time purchases of unbundled EACs, they can make a preference on location, technology, or project to increase the impact of those purchases.

The 24/7 Carbon-Free Coalition also holds that corporate buyers can play a central role in supporting the commercialisation of emerging CFE generation and storage technologies, in addition to continuing the deployment of mature CFE technologies like wind and solar. Procurements targeting technologies that lack current policy support or market uptake can have catalytic long-term impacts beyond the direct benefits of the projects themselves, including via business model and regulatory innovations.

Additional voluntary labels can be sought for EACs which might, for example, guarantee that the EACs are from recently commissioned projects. A non-exhaustive list of these labels includes the Green-e® Energy, EKOenergy, Gold Standard, and GreenPower Renewable Electricity (Australia) labels. They can strengthen the impact and credibility of any procurement type that conveys EACs.

¹⁵ 24/7 Carbon-Free Coalition companies have reporting requirements that demand detailed information about what CFE is being procured, including, but not limited to, the countries/areas of location, technologies, and commissioning years of the projects from which CFE is procured. Portfolio cancellation approaches (especially in the context of retail contracts with suppliers) can involve an intermediary giving very little of this information to the end-user, which may only be told it has been supplied with 'carbon-free' electricity. It is still possible for an intermediary to give end-users specific information, since the information has been tracked by the retired certificates. Being able to disclose on this information is a requirement for 24/7 Carbon-Free Coalition companies, and directly impacts the achievement of 24/7 CFE targets, especially with regards to the commissioning or re-powering date limit (see Section Five: 3.2).

The 24/7 Carbon-Free Coalition recognises that impactful procurement is not always possible in all markets. Corporate buyers should engage with suppliers and policymakers to remove barriers to impactful procurement and otherwise procure CFE with the highest impact possible where they operate.

3.2 Fifteen-year commissioning or re-powering date limit and exemptions

Beyond certain market-specific and global thresholds described below, the 24/7 CFE technical criteria require corporate buyers' procurement of CFE to observe a fifteen-year¹⁶ commissioning or re-powering¹⁷ date limit, or to be one of the following:

- Self-generation (procurement type 1)
- Physical power purchase agreements with on-site projects or off-site projects to which there is a direct line with no grid transfers (a subset of procurement type 2.1)
- Long-term project-specific contracts the corporate buyer has entered into **as the original off-taker from the project(s)**, and extensions of those contracts, **even if they exceed fifteen years in length**, including:
 - Physical power purchase agreements with off-site grid-connected projects (a subset of procurement type 2.1)
 - Financial power purchase agreements (procurement type 2.2)
 - Project-specific contracts with electricity suppliers (procurement type 3.1)
 - Project-specific contracts for unbundled EACs (a subset of procurement type 4)

In each market, corporate buyers may exempt procurement of CFE up to a baseline threshold volume determined by the market's current CFE share from the above resource age restrictions.

For each market where a corporate buyer consumes electricity, the corporate buyer may exempt a volume of CFE procurement equal to a percentage of its local material electricity consumption from any resource age restrictions. This percentage is determined by the current share of CFE in the market's generation mix, and reflects a baseline for the market on which corporate buyers are expected to build through procurement of CFE from newer facilities.

If both material electricity consumption and generation mix data for the local market are available for the current reporting period at hourly granularity, the corporate buyer should use the hourly share of CFE from all sources in the local generation mix as the threshold for baseline CFE procurement exempted from any resource age restrictions. For example, if 50% of the total electricity generation in a market was supplied by CFE resources in the hour for which a claim to use of CFE is made, the corporate buyer may exempt a volume of procured CFE equal to 50% of its total material electricity consumption in that same market and hour from resource age restrictions.

If generation mix or material electricity consumption data for the local market is not available for the current reporting period at hourly granularity, the corporate buyer may instead use a flat hourly baseline threshold equal to the average share of 'firm' CFE – defined as resources listed in Section Three excluding wind, solar, and marine power – in the market's generation mix in

¹⁶ 'Fifteen years' is defined as on or after 1 January of the year fifteen years prior to the claim to use of CFE. For example, a claim to use of CFE over January-December 2025 must be based on procurement from projects commissioned or re-powered on or after 1 January 2010.

¹⁷ See Appendix E for guidance on re-powering of projects.

the most recent calendar year for which data is available, multiplied by the corporate buyer's average local material electricity consumption across all hours in that year. For example, if 50% of the total electricity generation in a market was supplied by firm CFE resources in a given calendar year and the corporate buyer's local material electricity consumption was 8760 GWh in that same year, the corporate buyer would be able to exempt 0.5 GWh of local CFE procurement from resource age restrictions in each hour of the following year.

This baseline CFE threshold may be applied only in markets where sufficiently credible generation mix data is available from governments, regulators, grid operators, or third-party aggregators of data from such sources¹⁸, and where a corporate buyer is able to report its full annual material electricity consumption.

In addition to market-specific baselines, corporate buyers may exempt procurement of CFE from the above resource age restrictions up to a global threshold equal to 15% of their global material electricity consumption.

If a corporate buyer's material electricity consumption data is available globally at hourly granularity, the corporate buyer should calculate this threshold at hourly granularity. That is, in every hour, the corporate buyer may exempt an amount of procured CFE equal to as much as 15% of its global material electricity consumption in the same hour from any resource age restrictions. Corporate buyers may choose in which markets to use the procurement types subject to this 15% threshold and may apply this threshold in addition to any market-specific baseline threshold(s) in the market(s) of their choosing.

If a corporate buyer's material electricity consumption data is not available globally at hourly granularity, the corporate buyer may instead use a flat hourly threshold equal to 15% of its average global material electricity consumption across all hours in the previous calendar year. For example, if a corporate buyer's global material electricity consumption was 8760 GWh in a given calendar year, the corporate buyer would be able to exempt up to 0.15 GWh of CFE procurement across all of the markets in which it operates from any resource age restrictions in each hours of the following year, in addition to any market-specific baseline exemptions.

In the interest of maximising impact, the 24/7 Carbon-Free Coalition recommends that corporate buyers voluntarily phase-out their use of the 15% global threshold as quickly as possible. Additionally, corporate buyers should aim to apply exemptions made under this threshold to existing CFE resources that they consider to be most at risk of early retirement.

The 24/7 CFE technical criteria do not recognise procurement of CFE from projects that do not meet the above resource age restrictions beyond the combined market-specific baselines and global 15% threshold. For example, if a company's market-specific baseline for exempted CFE in a given market and hour is 50% and the company has already allocated its full 15% global exemption threshold to other markets in the same hour, the 50% market-specific baseline becomes the total limit on CFE that the company may exempt from resource age restrictions and count toward their reported CFE matching score in the market and hour in question.

3.2.1 Approaches to reporting on commissioning or re-powering dates

For some procurement, it can be difficult to establish precisely which projects renewable attributes are being sourced from. This may especially be the case with retail contracts with suppliers which have low transparency regarding the energy attributes in those supplies. Corporate buyers should insist that their suppliers improve the transparency of such products

¹⁸ Examples of such data sources include the US EPA's [eGRID Power Profiler](#), the [ENTSO-E Transparency Platform](#), and [Electricity Maps](#)

so that they can use commissioning or re-powering dates as a selection criterion when choosing which suppliers to contract with.

Some supplies may be transparent with respect to commissioning or re-powering dates, but include many projects (even when the supplies are project-specific). In these cases, it may be burdensome to individually report each project and the volume of CFE procured from it. The 24/7 Carbon-Free Coalition recommends its partners report in as much detail as possible. Where partners cannot or do not wish to disaggregate their reporting by commissioning or re-powering date, they must report the commissioning or re-powering date of the oldest project in a given supply.

If a commissioning or re-powering date is unknown or not reported, the procurement must be counted toward either the market-specific baseline or the global 15% threshold that are exempt from a commissioning or re-powering date limit.

3.2.2 Additional, voluntary labels (ecolabels) that include a fifteen-year commissioning or re-powering date limit

The 24/7 Carbon-Free Coalition is aware of some ecolabels that include a fifteen-year commissioning or re-powering date limit. These labels simplify a corporate buyer's efforts to know that it has purchased renewable electricity that meets the 24/7 Carbon-Free Coalition commissioning or re-powering date limit, without having to determine and disclose a commissioning or re-powering year.

These labels include:

- Green-e® Energy purchased in the United States, Canada, Chile, Singapore and Taiwan, China.
- GreenPower Renewable Electricity, an ecolabel available in Australia.

3.2.3 Understanding the exemption for long-term, project-specific procurement done as the original off-taker

The purpose of the exemption for long-term, project-specific procurement done as the original off-taker from the commissioning or re-powering date limit is to recognize that some corporate buyers sign long-term agreements extending past fifteen years with new projects that are necessary for the project to receive financing. The 24/7 Carbon-Free Coalition recognizes claims made through these arrangements as contributing to an 24/7 CFE target even once the project passes fifteen years in age.

Differing local contexts create questions for how to qualify a corporate buyer as the 'original off-taker'. In principle, the original off-taker is the corporate buyer to buy and use the first MWhs of renewable electricity generated by a project upon its commissioning or re-powering. In some markets, it may be possible for a corporate buyer to off-take from a project immediately upon its commissioning or re-powering. In others, there may be cases where a corporate buyer cannot, due to regulation, off-take immediately upon commissioning, but off-takes at a later point in time known as the 'commercial operations date'. The delay may be due to a required test period or a delay in approving off-take agreements: For the avoidance of doubt, a delay between commissioning and corporate off-take created by commercial considerations (e.g. the project developer finding it attractive to sell electricity and EACs at near-term market rates) lessens any claim to impact the corporate buyer has when its off-take starts. The 24/7 Carbon-Free Coalition is not aware of any markets in which any required delay between commissioning and commercial operations exceeds one year. **24/7 Carbon-Free Coalition companies seeking exemption from the commissioning or re-powering date limit for their project-specific off-take agreements from new projects may only accept a delay between commissioning and off-take due to regulatory reasons, and no longer than one year.**

Section six: Additional provisions

1. Organisational boundaries for electricity consumption

An organisation-wide target to increase CFE consumption must define a boundary for the organisation's use of electricity. The 24/7 CFE technical criteria rely on greenhouse gas emissions accounting guidance for this definition.

An organisation's total electricity consumption is defined as the electricity consumption that underlies:

- All scope 2 emissions associated with purchased electricity; and
- All scope 1 emissions associated with the generation of electricity by the organisation, for the organisation's consumption (this excludes use of fossil fuels for transport, the production of heat, or other uses not involving electricity production).

The activities with emissions in the above scopes are identified following the application of a GHG boundary-setting approach. The GHG Protocol Corporate Standard provides guidance for:

- An operational control approach;
- A financial control approach; and
- An equity share approach.

Organisations must choose an emissions boundary-setting approach, either prescribed by the GHG Protocol or another, to identify the activities under their direct control and thus the underlying electricity consumption in the scope of a 24/7 CFE target.

2. Material consumption of electricity

24/7 Carbon-Free Coalition partners make a commitment to make progress toward 24/7 CFE usage in service of advancing decarbonisation of electricity grids in markets where they operate.

Nevertheless, some partners have small operations in some markets that have negligible impact on local demand. In markets where it is not technically feasible to source CFE (for example, because the load is small or because of landlord-tenant issues), such loads can have a disproportionate impact on a partner's ability to meet their 24/7 CFE target.

In recognition of this, the 24/7 Carbon-Free Coalition has elected to set a maximum allowable threshold of electricity consumption that may be excluded from the 24/7 CFE target coverage.

24/7 Carbon-Free Coalition partner companies:

- Can exclude small loads (small offices, retail outlets, etc.) of up to 100 MWh/year¹⁹, per market, from the 24/7 CFE target boundary; and

¹⁹ The size of the excludable load is identical to the value used in the RE100 campaign, which was determined using modelling of energy consumption for a small office, commercial building, or retail space as well as loads reported by RE100 partners.

- Can claim global exclusions²⁰ up to 500 MWh/year (no more than 100 MWh/year per market).

Decisions to exclude demand from 24/7 CFE target coverage must be made at the meter level. That is, a 24/7 Carbon-Free Coalition partner must either include all or none of the electricity demand associated with each metered point of consumption in their 24/7 CFE performance measurement and reporting. Participants should not include metered demand from some hours in target coverage while excluding demand from the same meter(s) in other hours.

3. Participating consumption

24/7 Carbon-Free Coalition partners are initially required to measure and report progress toward global 24/7 CFE goals for only a portion of their organisation-wide material electricity consumption, defined here as their 'participating consumption.' Similarly to material electricity consumption exemptions, decisions to qualify consumption as participating consumption must be made at the meter level. Participants should not qualify metered consumption in some hours as participating consumption while excluding consumption from the same meter(s) in other hours.

4. Third-party verification of consumption of carbon-free electricity

Consumption of CFE must be verified by a third party, following the 24/7 CFE Performance Measurement Guidelines. If CFE is being self-generated, it may be necessary for generation of CFE to also be verified. The 24/7 Carbon-Free Coalition is not aware of any global standards for verifying consumption of CFE. The 24/7 Carbon-Free Coalition considers a GHG auditor's report that verifies scope 1 and market-based scope 2 emissions, and considers the additional requirements outlined in these technical criteria, to act as a proxy for a verification of consumption of CFE. This is because the instruments and evidence used to prepare a GHG inventory are, according to the 24/7 CFE technical criteria, the same instruments and evidence that are used to make credible claims to use of CFE.

²⁰ All claimed exclusions must still be reported to the 24/7 Carbon-Free Coalition via the annual reporting process.

Appendices

Appendix A: Credible claims to use of carbon-free electricity

A claim to use of carbon-free electricity (CFE) must be unique and exclusive. Corporate buyers must be able to demonstrate that they have such claims. This means securing property rights to CFE attributes. Energy attribute certificates are recommended as the best method for tracking and establishing ownership of energy attributes. However, it is possible for a contract alone to perform the same tracking function as EACs and ensure no other entity may claim use of the same CFE.

The following seven principles more completely define the features of a credible claim to use of CFE:

- Credible generation and charging data;
- Attribute aggregation;
- Exclusive ownership (no double counting) of attributes;
- Exclusive claims (no double claiming) on attributes;
- Geographic market limitations of claims²¹;
- Temporal limitations of claims; and
- Demonstration of CFE usage in storage charging.

These points are expanded upon below.

1. Credible generation and charging data

Accurate generation data (as well as charging data, in the case of storage) is critical as the basis for any CFE usage claims. Static data (e.g., fuel type, location, date of first operation, etc.) should be third-party verified, a common practice of attribute tracking systems. Dynamic data (quantity of generation or charging) is best when metered using a “revenue-grade meter” and independently used as the basis for determining the quantity of attributes and certificate issuance.

Companies should avoid making claims where static data cannot be verified by third parties and/or generation or charging data is not metered.

2. Attribute aggregation

A CFE usage claim is not supported by any individual attribute, but rather by all attributes that define the generation being claimed. Therefore, making a credible CFE usage claim requires ownership of all environmental and social attributes associated with the generation that can be owned, and that none of these attributes have been sold off, transferred, or claimed elsewhere.

The conditions of attribute aggregation vary by country and legal/regulatory framework for the electricity sector. Where a single multi-attribute instrument, such as a U.S. REC exists,

²¹ See Appendix B for precise 24/7 Carbon-Free Coalition market boundary definitions and deliverability criteria.

assurance of all relevant attribute aggregation is simplified. If separate instruments have already been created for different attributes of power generation (e.g., carbon attributes), attribute aggregation can be achieved by bringing these instruments together – by demonstrating ownership and retirement of all instruments that make up a CFE usage claim. Where there is not an existing market for CFE, or where electricity is not typically differentiated, attribute aggregation may require engagement with local electricity suppliers. Companies should also take account of the in-country policy context of the generation (existing practices, policies, and legal frameworks that determine how electricity and CFE is or can be transacted in different markets).

Where certain attributes (e.g. GHG emissions), cannot be owned or are equivalent to zero due to policy (e.g. the effect of a GHG cap-and-trade program on the avoided grid emissions attribute), and where attributes are not sold off separately, a CFE usage claim may nevertheless be possible, provided that the CFE purchaser owns all other generation attributes and that the remaining owned attributes are sufficient to define use of the resource according to market development, consumer expectation, and stakeholder feedback.

Companies should disclose any attributes that are not included in the instrument or transaction. In addition, different standards and certifications (e.g., Green-e) may have different or additional requirements for a “fully aggregated” instrument or group of instruments. Companies should also abide by any local laws and regulations pertaining to claims (e.g., the U.S. Federal Trade Commission’s “Green Guides” in the U.S.).

3. Exclusive ownership

Exclusive ownership of CFE attributes consists of legal enforceability, tracking (exclusive issuance, trading, and retirement), and exclusive sales and delivery.

3.1 Property rights

Legally enforceable contractual instruments must include “property rights” to environmental attributes of generation – that is, there must be a legally enforceable contract in place to back the exchange of attributes as property rights. Legal enforceability does not necessarily require governmental programs or legislation to create or recognise a market or energy attribute certificate, only that the mechanism for definition and conveyance/transfer of the attributes (e.g., contract, energy attribute certificate in a tracking system, etc.) is legally enforceable.

3.2 Tracking

Claims must be substantiated by attributes that have been reliably tracked from a generator to a consumer. Where attributes are transacted without energy attribute certificates, the transfer of attributes must be clearly articulated in a legally enforceable contract or series of contracts that link the generator to the end user, and claims must be based on the permanent end-use ownership or final use of those attributes, which also must be specified in a contract. Where energy attribute certificates are used, the certificates must be reliably tracked. This, again, can be done using contracts. However, the most sophisticated mechanism for tracking energy attribute certificates is an electronic attribute “tracking system”, in which certificates are electronically serialised and issued to generators with accounts on the system, tracked between account holders in the system where they are traded, and ultimately permanently retired or cancelled electronically by the entity making the claim or on behalf of an end-user making a claim. Attribute tracking systems provide exclusive issuance, trading, and retirement of attributes to markets for CFE to support credible claims. Where tracking systems exist, transactions outside of the tracking system are usually limited to special cases (e.g., where participation in the tracking system is too costly for very small generation units).

While tracking systems have developed independently of each other in different jurisdictions around the globe, there are a few elements that all credible tracking systems compatible with 24/7 CFE usage claims have in common. These include:

Standardised certificate information: Compatible tracking systems issue certificates in MWh, and include the same basic information on each certificate:

- Resource/Fuel Type (e.g., wind, solar, etc.)
- Serial ID
- Generator ID
- Generator Name
- Generator Location
- Generator Commercial Operating Date
- Vintage (time of generation, hourly or sub-hourly granularity)
- Issuance Date

The EnergyTag Granular Certificate Scheme Standard contains guidelines for implementation of a temporally granular certificate scheme compatible with these technical criteria.²²

Certificates are issued for all CFE generated by registered generators: Certificates are issued to the CFE generator. Some tracking systems require that certificates be issued for all production that is put onto the grid by registered generators. In others, such as those in Europe, registered generators have the right to request certificates issuance for selected production, in which case the attributes associated with production that is not issued certificates are allocated to the residual mix. In both cases, no energy attribute certificates from registered generators should be traded outside of the tracking system, in order to avoid potential double counting.

Defined geographical footprint: To prevent double registration and issuance of certificates, tracking systems must be clear on the geographic boundaries within which generators have access to the tracking system, and ensure, through cooperation with other tracking systems, that generation facilities register in only one tracking system for certificate issuance.

Independence and transparency: Independence and transparency of tracking systems help to maintain the integrity of the attribute market. Best practices include:

- The tracking system operator does not act as a market player trading, selling or redeeming certificates;
- Tracking systems should have transparent and non-discriminatory issuance criteria and operating rules;
- Tracking system operators should follow defined procedures to identify and prevent conflicts of interest;
- The tracking system should provide access to regulators and system auditors and allow for independent consumer claim verifications. To the extent possible, full disclosure of unit attributes and status should be made public;

²² <https://energytag.org/standards/>

- Frequent independent third-party audit of the tracking system should be conducted by a credible and competent organization, verifying the factual static and dynamic data contained within the tracking system, and preferably made public;
- The system should be open and accessible to new participants.

3.3 Claims made using temporally non-granular attributes

Some tracking systems may not support EACs containing vintage data at sufficient temporal granularity to enable credible claims to use of CFE (see Appendix A Section 6: Vintage limitations). Such EACs may be used to support credible claims to use of CFE if and only if the following conditions are met:

- EACs are verifiably paired with hourly or sub-hourly granularity metering data sharing the same generator ID;
- The proportion of a generator's metered hourly or sub-hourly output claimed by the corporate buyer in each hour during an EAC issuance period²³ is equal to the proportion of total EACs issued by the generator in the same EAC issuance period that have been procured and retired by the same corporate buyer; and
- The generator transfers the corporate buyer the exclusive right to make the above granular claims based on its metered output and the proportion of EACs transferred, as clearly articulated in a legally enforceable contract.

The above criteria enforce the principle of 'shape preservation,' such that procurement of a temporally non-granular EAC allows a corporate buyer to claim exclusive ownership of a fixed percentage of a project's temporally granular metered output during the period covered by the EAC's reported vintage. For example, if a corporate buyer procures EACs representing 50% of the output of a CFE project over a month-long period, it may claim exclusive ownership of exactly 50% of the metered output of the project during each hour in the same month.

4. Exclusive claims

To the extent that tracking systems prevent double issuance and other forms of double counting, tracking systems alone will not necessarily ensure exclusive claims, i.e., that there are no other claims being made on either the attributes (including emissions) or electricity as CFE. Where energy attribute certificates can be sold separately from electricity, the electricity buyer does not have an exclusive CFE use claim unless they own and retire the certificates, and likewise the certificate buyer does not have an exclusive usage claim where the electricity is also being claimed/reported as CFE or individual attributes are being claimed/transacted in another way. This requires that all CFE instruments or instruments representing individual generation attributes (e.g., carbon offsets issued for CFE energy generation) have been retired by or on behalf of the same entity and that there are no other usage claims being made on the generation or attributes, for example, by the electricity supplier to meet a CFE delivery target or in marketing that CFE is being delivered to customers.

5. Geographic market boundaries

The 24/7 Carbon-Free Coalition recognises claims to use of CFE if and only if the generating facility and the point of consumption are part of the same interconnected electricity system.²⁴ Where this condition is met, attributes (and certificates) must furthermore be sourced and

²³ 'EAC issuance period' is defined here as the vintage granularity of the EAC in question, e.g. one month.

²⁴ An interconnected electricity system is defined as a continuous network of electricity transmission and distribution infrastructure, including both AC and DC connections.

purchased from within the same defined geographic region that constitutes a “market” for the purpose of transacting and claiming attributes, or must be otherwise demonstrated as deliverable to the location where they are claimed. Ideally a “market boundary” would be clearly defined on the basis of physical network characteristics, but in general it refers to an area which is internally well-connected by a synchronous electric grid and within which power can be reasonably assumed to be physically deliverable from one internal point to another.

Geographic boundaries between internally well-connected grid regions are often, but not always, correlated with energy market, regulatory or national boundaries. In general, geographically tighter market boundaries increase the credibility of claims to physical use of CFE, while more relaxed market boundaries reduce barriers to procurement of diverse carbon-free resources and reduce administrative burdens.

Appendix B contains definitions of market boundaries that 24/7 Carbon-Free Coalition partners must observe, as well as descriptions of alternative pathways to demonstrating deliverability. Beyond these basic requirements for claims to use of CFE, the 24/7 Carbon-Free Coalition expects partners to pursue and, if possible, demonstrate maximal deliverability of claimed CFE via contractual arrangements and analysis of current and future grid congestion and expansion.

6. Vintage limitations

To make a credible CFE usage claim, the vintage of the attributes (and certificates) – that is, when the generation occurred – must fall within the same hour as the electricity consumption to which they are applied. Both attributes and electricity consumption may be metered at sub-hourly granularity and may be aggregated on an hourly basis in this case.

7. Demonstration of CFE usage in storage charging

To make a credible CFE usage claim using electricity discharged from a storage facility, a corporate buyer must credibly demonstrate that the electricity was originally sourced from a carbon-free generator. The 24/7 Carbon-Free Coalition allows this condition to be met through procurement of EACs or similar contractual instruments from storage facilities following the EnergyTag Granular Certificate Scheme Standard “First In First Out” allocation method or a similar CFE tracking and allocation approach. Any CFE tracking and allocation approach used to justify claims to use of stored CFE must meet the following criteria:

- The storage operator must provide storage facility charge and discharge (or net charge/discharge) records at hourly or sub-hourly granularity;
- Attributes associated with distinct units of energy consumed by a storage facility must be assigned to distinct units of energy held in storage at the same facility, and all attributes held in storage must be tracked alongside the energy to which they are assigned until discharged;
- Any electricity discharged from the storage facility must draw down the oldest CFE attribute held in storage at the time of discharge;
- Storage losses must be allocated in equal proportion to energy from all sources, and each final EAC or similar contractual instrument issued in association with storage discharge must reflect an amount of energy inclusive of such losses; and
- A storage facility may not hold attributes representing more energy than its estimated state of charge at any point in time.

Alternatively, a corporate buyer may claim storage discharge as CFE by demonstrating that the storage facility was charged exclusively using CFE during the same reporting period. To do so,

hourly charging data from the storage facility for each hour in the reporting period must be matched with EACs or similar contractual instruments procured and retired by the corporate buyer or storage facility, and representing an identical or greater amount of CFE generation in those same hours.

CFE used to charge storage is subject to the same principles for credible claims to use as CFE that is directly consumed by the participant. Attributes used by a corporate buyer to support claims of CFE storage charging must be cancelled and may not also be used to support claims to direct use of the same CFE.

Appendix B: Market boundaries

1. What are markets for carbon-free electricity?

Claims to use of CFE must be based on generation occurring in both the same interconnected electricity system and the same market for CFE in which its use is claimed, or on demonstration of CFE deliverability across market boundaries.

A market for CFE refers to an area in which:

- A single well-interconnected electric grid enables high levels of physical deliverability of power between internal points;
- The laws and regulatory framework governing the electricity sector are consistent between the areas of production and consumption; and
- Utilities and suppliers recognise each other's energy attributes and account for them in their trade of energy and energy attributes.

While market boundaries are described geographically for convenience, they are defined fundamentally on the basis of electricity system topology. The 24/7 Carbon-Free Coalition holds that an electricity generating or consuming facility is located within the same geographic market boundary as its first point of interconnection to a meshed transmission network, which may not necessarily be the same as the market boundary within which the facility itself is physically located.

2. Markets for CFE recognised by the 24/7 Carbon-Free Coalition

2.1 Geographic market boundaries

The 24/7 Carbon-Free Coalition recognises the following as distinct geographic markets for 24/7 CFE:

- Bidding zones in electricity markets that employ a zonal pricing structure, including:
 - Australia's [National Electricity Market](#);
 - The electricity market operated by Brazil's [Chamber of Electric Energy Commercialization](#); and
 - The electricity market operated the [European Network of Transmission System Operators for Electricity](#) (ENTSO-E).²⁵

²⁵ Any ENTSO-E offshore bidding zone directly interconnected to a given market boundary is to be considered as within that boundary.

- Government-defined grid regions used for electricity sector regulation or emissions reporting in large countries that do not employ zonal electricity pricing, including:
 - For Canada, [provincial and territorial electricity grids](#) defined by the Canada Electricity Regulator;
 - For mainland China, the territories of the Inner Mongolia Power Company, the [six branches of the State Grid Corporation of China](#), and the [China Southern Power Grid](#); and
 - For the United States, [grid regions](#) defined by the US federal government for verification of CFE consumption by hydrogen producers.
- For all other countries and territories, country-level boundaries apply.

2.2 Recognition of CFE imports across geographic market boundaries

Campaign partners may also make claims to use of CFE imported into a relevant geographic market boundary if the CFE is generated within a geographic market boundary that is physically interconnected via some transmission pathway to the geographic market boundary where it is claimed, and either of the following conditions are met:

- a. The corporate buyer demonstrates the existence of exclusive rights allocating to itself or its energy provider the transmission capacity necessary to deliver power bundled with associated energy attributes from the point of generation to the point of consumption. These rights may be allocated via regulatory practice, contracts, or market instruments, and must be recognized by the transmission operators of all markets through which power is delivered. Energy attribute tracking systems and standards used to support claims must also be mutually compatible and recognized within all markets through which power is delivered. Delivery of power and attributes must be demonstrated on an hourly or more frequent basis with no direct counterbalancing reverse transactions.
- b. In cases where hourly nodal or zonal electricity prices are published in both markets and the exporting market is topologically adjacent to the importing market, the corporate buyer demonstrates that the average price at the point of consumption is less than 1.05 times the average price at the point of generation in the hour for which a claim is made.

2.3 Market boundary updates and grandfathering

The 24/7 Carbon-Free Coalition recognises that geographic market boundaries are a necessary but imperfect proxy for physical deliverability of CFE and that boundaries must be defined subjectively following multiple criteria and informed by the best information available at the time. The 24/7 Carbon-Free Coalition therefore commits to continually reevaluating market boundary and cross-boundary deliverability definitions in response to new analysis, emerging global standards and best practices, and ongoing changes to the physical and regulatory structure of electricity systems. To minimise uncertainty for 24/7 Carbon-Free Coalition campaign partners, all CFE procured via self-ownership or long-term contracts will be considered deliverable in perpetuity to within whatever market boundaries it was assigned at the time it was first included in a campaign partner's 24/7 CFE reporting, provided that this grandfathering is also compatible with Greenhouse Gas Protocol scope 2 emissions reporting guidance.

Appendix C: Crediting of biomass-based electricity generation

The 24/7 Carbon-Free Coalition does not recognise biomass-based electricity generation as carbon-free if any portion of the biomass fuel is not sourced from wastes or residues. For sustainable biomass derived from other sources, electricity generation may be credited as CFE on the basis of a project-specific consequential life cycle GHG assessment submitted by a 24/7 Carbon-Free Coalition partner. This life cycle assessment must be conducted in accordance with ISO 14040 and 14044 standards, and must include the following processes in its scope:

- Biomass growth, harvesting, transportation, and processing
- Electricity generation
- Carbon capture and sequestration (CCS), if applicable
- Waste disposal

When waste biomethane from any source is used as a feedstock, the life cycle assessment must adopt proper disposal of this methane via flaring as the assumed counterfactual fate. If CCS is used in the biomass electricity generation process, all captured CO₂ must be permanently sequestered and cannot be utilised in any way, including for enhanced oil recovery.

24/7 Carbon-Free Coalition partners must report the total fuel-cycle GHG emissions associated with any procured biomass-based electricity production to the Climate Group, in units of gCO_{2e}/kWh. If net fuel-cycle emissions are less than or equal to 0 gCO_{2e}/kWh, the partner may claim 100% of the procured electricity as CFE for the purpose of reporting. If net fuel-cycle emissions are greater than 0 gCO_{2e}/kWh, the partner may claim a fraction f of the procured electricity as CFE. This fraction shall be calculated as:

$$f = \frac{(g-p)}{g},$$

where p is the net emission rate for the project as reported by the partner and g is the global average fuel-cycle emission rate of natural gas-based electricity production, equal to 498 gCO_{2e}/kWh.²⁶ For example, if a biomass-based project has a reported net emission rate of 150 gCO_{2e}/kWh, the partner would be able to claim 70% $((498-150)/498 * 100\%)$ of the electricity procured from this project as consumed CFE.

A facility-specific life cycle GHG assessment must be conducted and submitted in the reporting period in which a 24/7 Carbon-Free Coalition partner first claims use of energy from a biomass-based generation facility. The same life cycle assessment may be resubmitted in subsequent reporting periods to support ongoing claims to use of biomass-based electricity generation from the same facility, provided no material modifications have been made to the facility or its fuel cycle. If modifications have been made, a new life cycle assessment must be submitted in the first reporting period in which the company claims use of CFE generated by the modified facility or fuel cycle.

²⁶ [IEA \(2024\), Life cycle upstream emission factors 2024, Paris, France, https://iea.blob.core.windows.net/assets/3ff59090-1420-4e74-9069-a90602e56bf3/IEAupstreamlifecycleemissionfactors_2024.pdf](https://iea.blob.core.windows.net/assets/3ff59090-1420-4e74-9069-a90602e56bf3/IEAupstreamlifecycleemissionfactors_2024.pdf)

Appendix D: Markets where EACs are in common use

In the following markets, the 24/7 Carbon-Free Coalition requires CFE procurement to include EAC cancellation (see Section Five for details of exempted procurement). Corporate buyers may prefer to use a system shown to be in common use in the market, but are not required to choose a specific system.

An EAC system is considered by the 24/7 Carbon-Free Coalition to be in common use in a market once at least ten companies have made renewable electricity or CFE use claims in the market using the system and have had their market-based scope 2 inventory total verified by a third party. This list is derived from nearly 2,200 companies reporting on their renewable electricity purchasing and GHG inventory verification to CDP in 2023. This list should not be interpreted as 24/7 Carbon-Free Coalition endorsement of particular EAC systems or as proof that the systems are without flaws, but solely as recognition that they are in common use by companies who have had their scope 2 inventories verified by third parties.

Market	EAC system(s) in common use	Other EAC system(s) not in common use
Argentina	I-REC	
Australian Markets (see Appendix B)	LGC; I-REC	STC
Brazilian Markets (see Appendix B)	I-REC	TIGR
Bulgaria	National GO	
Chile	I-REC	
Chinese Markets (see Appendix B)	GEC (China)	TIGR
Colombia	I-REC	Ecogox
Costa Rica	I-REC	
Cyprus	EECS GO	
Egypt	I-REC	
European markets (see Appendix B)	EECS GO	
Guatemala	I-REC	
Iceland	EECS GO	
India	Indian REC; I-REC; TIGR	

Market	EAC system(s) in common use	Other EAC system(s) not in common use
Indonesia	I-REC; TIGR	
Ireland	EECS GO	
Israel	I-REC	
Japan	NFC; GEC (Japan); J-Credit (Renewable)	I-REC
Malaysia	I-REC; TIGR	
Mexico	I-REC	CEL
Morocco	I-REC	
New Zealand	NZECS	
North American markets (see Appendix B)	US-REC	EFEC; ZEC
Panama	I-REC	
Peru	I-REC	
Philippines	I-REC	TIGR
Poland	National GO	
Republic of Korea	Korean REC/CREU ²⁷	TIGR
Romania	National GO	
Serbia	EECS GO	
Singapore	I-REC; TIGR	
South Africa	I-REC	RECSEA
Taiwan, China	I-REC; T-REC	TIGR
Thailand	I-REC	TIGR
Turkey	I-REC	YEK-G
United Arab Emirates	I-REC	

²⁷ The Korean REC is issued to renewable electricity generation using multipliers to incentivize different technologies. Corporate buyers are issued with a Confirmation of Renewable Energy Use (CREU) document that removes these multipliers. PPAs in Korea do not include a Korean REC, but do include a CREU.

Market	EAC system(s) in common use	Other EAC system(s) not in common use
United Kingdom	REGO	
Vietnam	I-REC	TIGR

1. Markets where EACs are not in common use

2023 CDP data include claims from EAC systems in some markets where the threshold for ‘common use’ of these systems has not yet been reached. 24/7 Carbon-Free Coalition companies can use this information to help anticipate new markets coming onto the list of markets where EAC cancellation will be required in reporting. Wherever EACs are not yet in common use, the 24/7 Carbon-Free Coalition still recommends that partners use them for their claims as a matter of best practice.

Market	EAC system(s) not in common use
Azerbaijan	I-REC
Bahrain	I-REC
Bangladesh	I-REC
Belarus	I-REC
Burkina Faso	I-REC
Cambodia	I-REC
Colombia	I-REC
Cayman Islands	I-REC
Dominican Republic	I-REC
Ecuador	I-REC
El Salvador	I-REC
Honduras	I-REC
Jordan	I-REC
Kazakhstan	I-REC
Kenya	I-REC
Kuwait	I-REC

Market	EAC system(s) not in common use
Lao People's Democratic Republic	I-REC
Mauritius	I-REC
Myanmar	I-REC
Nigeria	I-REC
Oman	I-REC
Pakistan	I-REC
Qatar	I-REC
Saudi Arabia	I-REC
Sri Lanka	I-REC
Tunisia	I-REC
Uganda	I-REC
Uruguay	I-REC
Zambia	I-REC
Zimbabwe	I-REC

24/7 Carbon-Free Coalition companies may also consider [the list of countries where I-RECs are issued](#) for a more up-to-date idea of where EACs exist than what 2023 CDP data show.

Appendix E: Re-powering of projects²⁸

Local re-powering rules defined by regulatory entities should be referred to where they exist. Where no local re-powering definitions exist, the 24/7 Carbon-Free Coalition considers projects which have met one of the following conditions in the last fifteen years²⁹ as re-powered:

1. The facility has been re-powered such that 80 percent of the fair market value of the project stems from new generation equipment installed as part of the re-powering.
2. The facility did not generate energy for a continuous period of at least one year prior to the repowering date.

²⁸ 24/7 Carbon-Free Coalition re-powering guidance is adapted from the United States Environmental Protection Agency (EPA) Green Power Partnership's (GPP) guidance: https://www.epa.gov/sites/default/files/2016-01/documents/gpp_partnership_regs.pdf#page=10

²⁹ 'Fifteen years' is defined as on or after 1 January of the year fifteen years prior to the claim of use of CFE. For example, a claim to use of CFE electricity over January-December 2025 must be based on procurement from projects commissioned or re-powered on or after 1 January 2010.

3. Eligible hydropower facility improvements that increase electrical energy output due to efficiency improvements may include:
 - Rewinding of existing turbine generator(s)
 - Replacement with new turbine generator(s)
 - New turbine generator additions to an existing impoundment

Improvements may not as a consequence increase the water storage capacity or the head of an existing water impoundment, or otherwise change the run of the river flow of the resource. Qualifying “new” incremental hydropower output will be credited using the following quantification and accounting criteria. The incremental generating capacity (in nameplate MW) is divided by the total uprated generating capacity (in nameplate MW) and then multiplied by generation output (in MWh) from the uprated generator. For example, if a hydroelectric power plant expands generating nameplate capacity from 100 MW to 125 MW and generation output increased to 1,000 MWh, then 200 MWh $((25 \text{ MW}/125 \text{ MW}) * 1,000 \text{ MWh})$ would be eligible for use by corporate buyers, regardless of the overall level of generation of the project during the period. Note that the overall generation from the uprated hydroelectric power plant may be higher or lower than generation levels that occurred at the plant prior to the capacity uprate.

To verify the “new” incremental output, the 24/7 Carbon-Free Coalition reserves the right to request that corporate buyers present an independent third-party report demonstrating that the increased annual output of electrical energy is a result of the “new” incremental improvements.

Improvements that increase electrical energy output due to routine maintenance (i.e., output would be increased compared to original design) do not count.

4. A separable improvement to or a complete improvement of an existing operating facility provides incremental generation that is separately metered from the existing generation at the facility.

Appendix F: Select studies in identifying procurement types

1. Project-specific versus retail supply contracts for renewable electricity

The following questions aid in identifying whether a given contract with a supplier must be characterised as ‘retail’ and not as ‘project-specific’.

- Is it known at the time a contract is signed exactly which projects will be used in the supply at all times?

If the answer to this question is ‘no’, the supply is not project-specific and must be characterised as a retail supply of CFE.

- Can the supplier vary the projects used in the supply without the corporate buyer’s consent, or is the variation of the projects used in the supply not an explicit clause in the supply contract?

If the answer to this question is ‘yes’, the supply is not project-specific and must be characterised as a retail supply of CFE.

2. EAC arbitrage

2.1 What is EAC arbitrage?

EAC arbitrage describes swapping EACs for other EACs, often for the purpose of reducing renewable electricity procurement costs. A corporate buyer holding a PPA with a new project may receive a supply of EACs with a high market value. The corporate buyer may exchange these EACs for cheaper EACs (from older or less desirable projects). The corporate buyer still off-takes the market risk from (and therefore supports) the new project and may realise a financial benefit by trading the EACs from the new project.

2.2 What procurement types must be reported when EAC arbitrage is happening?

EAC arbitrage takes away the corporate buyer's ability to claim it has used CFE with the new generator's attributes. The corporate buyer can only claim to have used CFE with the attributes conveyed by the lower-value EACs it has acquired.

The corporate buyer can report procuring attributes from a new generator through a PPA to convey a potential support claim for new CFE capacity but cannot make use claims with those attributes. **In reporting to the 24/7 Carbon-Free Coalition, if partner companies report arbitrated PPAs as PPAs, they must note in a comment where they have arbitrated their PPAs with an unbundled EAC purchase and include details of the replacement EACs.** In this way, claims to have CFE generation and to have used CFE generation are separate and distinct.

The 24/7 Carbon-Free Coalition will consider evolving its reporting infrastructure in the future to better study EAC arbitrage if the practice is understood to be associated with a significant amount of corporate procurement of CFE.

3. M2L contracts in China

Large energy consumers in China currently procure in mid-to-long-term (M2L) markets from electricity exchanges. They can procure from specific projects on the exchanges.

Corporate buyers sourcing renewable electricity through M2L contracts are not contracting with generators themselves. They must report their procurement as project-specific contracts with electricity suppliers. The procurement must not be reported as a form of power purchase agreement, because there is no direct contracting with generators.

4. Long term EAC contracts in the Republic of Korea and Japan

The Republic of Korea and Japan both offer long-term unbundled EAC contracts from new projects. The contracts may be advertised as financial (virtual) power purchase agreements. However, the contracts do not involve contract-for-difference mechanisms which allow for the off-take of market risk by the corporate buyer, and are only for the projects' unbundled EACs. The extent to which the corporate buyer off-takes any wholesale electricity price risk from new projects by providing an EAC revenue stream to the generator is unclear.

In Japan, a feed-in-premium (FIP) is paid to some projects. The level of the premium is dependent on the average prices of electricity and EACs in the wholesale market. In theory, the

premium will be higher when the average electricity prices and EAC prices at the wholesale market are lower, and vice versa or zero in case of negative. This might make long-term EAC contracts with high EAC prices similar in impact to virtual power purchase agreements, without involving contracting-for-difference mechanisms or direct contracting with generators.

The 24/7 Carbon-Free Coalition's view is that these contracts must be reported as unbundled procurement of EACs.

5. Green Premium contracts in the Republic of Korea

The Republic of Korea Renewable Portfolio Standard (RPS) legislation places a requirement on utilities to supply a certain percentage of renewable electricity to their customers. Compliance with the RPS is met through suppliers' cancellations of EACs. However, the RPS is not evidence that 'default delivered renewable electricity from the grid, supported by EACs' can be claimed in Korea. This is because utilities offer Green Premium contracts that offer this renewable electricity to corporate buyers willing to pay for it. Therefore, only those corporate buyers actively choosing Green Premium contracts can claim to be using the renewable electricity from the RPS. **This means Green Premium contracts should be classified as retail contracts with suppliers (they are not project-specific).**

The RPS also incentivizes some renewable technologies differently than others by issuing differing multiples EACs for the same unit of generation. For example, 1 MWh of electricity produced by solar or offshore wind is eligible to receive more EACs than 1 MWh produced by other renewable electricity technologies. Corporate buyers must be aware of these multipliers when making claims to avoid double counting. Renewable electricity offered through Green Premium contracts includes a Confirmation of Renewable Energy Use (CREU) document that accounts for these multipliers.

6. GreenPower products in Australia

GreenPower is a government-run renewable energy accreditation program operating in Australia offering a range of accredited renewable electricity products through energy providers and EAC brokers. There are a range of GreenPower products that correspond with 24/7 Carbon-Free Coalition procurement type definitions, including:

Consumption-based (bundled) GreenPower purchased through a retailer generally corresponds with the 24/7 Carbon-Free Coalition definition of a retail contract with supplier, though some consumption-based GreenPower products may fit the project-specific contract with supplier definition.

Decoupled (unbundled) GreenPower purchases correspond with the 24/7 Carbon-Free Coalition definition of unbundled EAC purchases. Some Decoupled GreenPower purchases may be project-specific.

GreenPower Corporate Direct includes arrangements corresponding with 24/7 Carbon-Free Coalition definitions of physical or financial power purchase agreements (PPAs) and unbundled EAC purchases. Refer to 24/7 Carbon-Free Coalition definitions and choose the best fit for your specific arrangement if you purchase through a Corporate Direct product.

GreenPower Connect generally corresponds with 24/7 Carbon-Free Coalition definitions of physical or financial power purchase agreements (PPAs).

Appendix G: 24/7 Carbon-Free Coalition Technical Advisory Group

About the Technical Advisory Group

The 24/7 Carbon-Free Coalition Technical Advisory Group (TAG) is an expert group responsible for developing the 24/7 CFE technical criteria and proposing amendments to these criteria on an ongoing basis. It is made up of TAG partner organisations and their nominated representatives (collectively referred to as “TAG partners”). These include technical partners, corporate clean-energy buyers with technical expertise, utility companies and academics.

The TAG aims to ensure that the 24/7 CFE technical criteria are comprehensive, robust and credible. The TAG provides guidance and information to enable 24/7 Carbon-Free Coalition partner companies to understand what credible options are for making progress toward their global goals and gives credibility to 24/7 CFE reporting.

The TAG contributes to the development of the technical criteria, but the entirety of the technical criteria may not reflect each TAG partner’s views.

For more information, please contact 247team@climategroup.org.