California Air Resources Board

21 March 2025

RE: ***Information Solicitation to Inform Implementation of California Climate-Disclosure Legislation: Senate Bills 253 and 261, as amended by SB 219***

To the California Air Resources Board:

GHGMI is a 501(c)(3) non-profit organization with a mission of building and supporting a global community of experts with the highest standards of professional practice in measuring, accounting for, auditing, and managing greenhouse gas (GHG) emissions. Our institute is dedicated to training the ever-growing GHG professional community on the principles, concepts, and methods to manage and credibly account for GHG emissions and removals at the national, corporate, and project levels. This effort is critical to ensuring that the development of market mechanisms, mitigation target setting, the design of GHG-related performance metrics and quality assurance systems, and policy responses to address climate change are effective and credible. GHGMI's research work is guided by scientific inquiry, and we conduct forward-looking independent research and key GHG emissions accounting and management questions.

On behalf of the Greenhouse Gas Management Institute (GHGMI), we welcome the opportunity to provide comments on the state's Climate-Disclosure Legislation implementation. We wish to focus our contribution to this consultation on SB 219: Climate Corporate Accountability to provide CARB with a focus on the ineffectiveness of allowing market-based reporting for scope 2 reporting.

(7) *Entities must measure and report their emissions of greenhouse gases in conformance with the GHG Protocol, which allows for flexibility in some areas (i.e. boundary setting, apportioning emissions in multiple ownerships, GHGs subject to reporting, reporting by sector vs business unit, or others). Are there specific aspects of scopes 1, 2, or 3 reporting that CARB should consider standardizing?*

In the existing GHG Protocol Scope 2 Guidance (2015 edition), scope 2 reporting was updated to include two methods for reporting scope 2 related emissions.

- *Location-based approach*: estimates emissions based on the average GHG intensity of grid-delivered energy.
- *Market-based approach*: attempts to reflect the GHG emissions associated with electricity that end-use customers have procured contractual instruments.

We urge the CARB to **not include the use of the market-based methodology** for scope 2 emissions calculation and reporting pending an ongoing reconsideration as to the scientific credibility and appropriateness of the approach with the GHG Protocol corporate standard update process. For the purpose of corporate GHG emissions reporting, the market-based approach established in the Scope 2 Guidance of the GHG Protocol does not reflect the emissions associated with an organization's physical consumption of grid-delivered electricity or the actual emission intensity of said consumption. That's

because it is physically impossible to track electricity generated by specific power plants through the electric power grid and delivered to a specific end-use customer.

The market-based approach to scope 2 challenges fundamental principles of GHG inventory accounting as it effectively enables the trading of emission factors (EFs) and therefore the redrawing of accounting boundaries based on purely financial and contractual arrangements. The ISO 14064-1 standard has recognized this flaw in the market-based method and demoted it in its 2018 update. There is a large and growing scholarly and peer-reviewed literature addressing the problems with the market-based approach to scope 2. A comprehensive summary of this literature can be accessed here (https://www.bccas.business-school.ed.ac.uk/impact-and-collaboration/renewable-energy-purchasing). The Annex to this letter provides a resource published by GHGMI and Stockholm Environment Institute (SEI) for the scientific evidence base for our comment on this issue.

A corporate GHG inventory is a physical accounting of GHG emissions and removals from specified sources and sinks within a clearly defined accounting boundary. Physical corporate GHG inventories can be useful for setting science-based targets if they provide a clearly defined set of sources/sinks that reporting entities can take responsibility for. However, the existing Scope 2 Guidance conflates two distinct GHG accounting methods – allocational[1] and consequential accounting[2] – resulting in numerous limitations while also distorting emissions reporting primarily due to the possibility of claiming emissions reduction within a GHG inventory substantiated with purely financial contracts for vaguely defined "attributes" resulting in a misleading conveyance of environmental information. Effectively, this allows for reporting entities to reallocate emissions from their physical activities to others based upon purely financial transactions.

CARB should also recognize that derivative market-based approaches for other scope 1 and 3 emission sources are being promoted based on identical arguments that have been used to justify the scope 2 market-based approach. The use of market-based accounting is leading to a proliferation of market-based EF claims for all sources of emissions reported in corporate GHG inventories (e.g., steel production, hydrogen production, coffee farming). Therefore, CARB risks endorsing a precedent for the wide use of attribute certificates for all corporate emissions, leading to a result in which a company can effectively purchase its GHG inventory report that has little relationship to its operational activities.

Therefore, **we recommend that the primary focus be placed on the location-based method for reporting indirect emissions from the consumption of grid-supplied electricity (i.e., scope 2 emissions from purchased electricity) which can be done on the basis of U.S. EPA Emissions & Generation Resource Integrated Database (eGRID) average emission factors by grid region or other more granular average emission factors with higher temporal and geographical resolutions, for emissions sources located physically in the United States.**

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[1] **Allocational accounting**: A physical GHG accounting framework that measures emissions physically released into the atmosphere within a defined boundary and allocates (i.e., assigns responsibility for) those emissions to an entity (e.g., company, organization, nation). Allocational GHG accounting cannot be used to measure the emission consequences that occur outside of the defined boundary.

[2] **Consequential (intervention) accounting**: Estimating the time series of changes in physical quantities (mass) of GHG emissions and removals caused by anthropogenic interventions with comparability between scenarios. Project-level accounting (e.g., offsets) and policy action accounting are examples of consequential accounting.

Currently, science-based target setting and reporting are based on allocational GHG accounting methods[3], namely physical value chain corporate GHG inventories (i.e., scope 1, 2, and 3 inventories). Value chain inventories quantify the emissions and removals from the processes (or emission sources) physically within the value chain of the reporting entity. The role of market-based approaches is also being debated within current ISO 14060 and Science Based Targets Initiative (SBTi)`s corporate net zero standard-setting processes.

If CARB allows for a market-based approach reporting scope 2 or other emission scopes, the use of environmental attribute certificates (e.g., renewable energy certificates (RECs), purchase power agreements (PPA)) from sources/sinks that are *not part of* the reporting entity's physical value chain will result in inaccurate information on the emissions/removals from that value chain. Further, the degree to which each of these certificate markets causes emissions to be avoided is insufficiently studied and often inappropriately ignored. It is not clear why companies should be allowed to purchase replacement EFs for their inventory if the underlying market mechanism for these EF certificates cannot show that it is having a beneficial impact in terms of avoiding emissions being released into the atmosphere. In a compliance context (e.g., Renewable Portfolio Standard), such an impact can be assured through the imposition of a scarcity-creating mandate. However, market-based approaches in voluntary corporate GHG reporting have no such mandatory character.

THE ROLE OF MARKET-BASED CLAIMS

The primary and historical intent of the creation and market-based mechanisms was to incentivize the development of climate-friendly technologies and actions and promote corporate responsibility and accountability. Market-based instruments and claims in voluntary corporate GHG reporting…

- *Make regulatory sense for SB219* when there is a clear and direct link between an organization's financial or contractual intervention that results in new generation capacity with consideration of the potential need to retire emissions allowances in capped contexts.
- *Does not make regulatory sense for SB219* when there are no measured reductions in actual emitted GHGs nor does it contribute to additional renewable energy generation capacity.

There is ongoing work within the GHG Protocol update process to consider new accounting approaches that separately report a physical inventory from an intervention impact contribution report using **consequential accounting methods**, which can properly reflect the effectiveness (or ineffectiveness) of market-based actions intended to avoid the release of emissions. Given the critical need for climate action and emissions reductions globally, mandatory GHG accounting should be a credible source of GHG information and should support credible target-setting and reporting, and ultimately effectively incentivize measurable reductions.

The GHG Protocol secretariat is currently undergoing extensive revisions of all of its corporate GHG accounting standards and has established a technical working group on action and market

[3]**Allocational (inventory) GHG accounting:** Regularly estimating and/or measuring physical quantities (mass) of GHG emissions and removals allocated to subjects (e.g., companies) over time with comparability between subjects' estimates, time series consistency, completeness, and additivity to system-wide total emissions from the defined population of subjects. The quantification of GHG emissions for each time period in the time series is a GHG inventory. Referred to as attributional accounting within the life-cycle assessment community.

instruments (in addition to Corporate Standard, Scope 2, Scope 3 working groups). This working group's objective is to advance complete and transparent corporate GHG accounting and reporting by 1) providing clarity on the structure, purpose, and limitations of a corporate GHG report and its various elements; and 2) addressing the appropriate role of actions and market instruments. While the result of the technical working group is not yet final, CARB should expect potential changes to the GHG reporting guidance for scope 2 and other scopes in the next two years.

Sincerely,

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Annex

The following publication is attached:

1. Benchimol, A., Gillenwater, G., and Broekhoff, D. (2022). "Frequently Asked Questions: Green Power Purchasing Claims and Greenhouse Gas Accounting." Greenhouse Gas Management Institute & Stockholm Environment Institute. www.offsetguide.org/green-power-faq

Frequently Asked Questions: Green Power Purchasing Claims and Greenhouse Gas Accounting

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We are grateful to the High Tide Foundation for supporting the development of this guidance and the accompanying web resource. The mission of the High Tide Foundation is to have a significant, measurable impact on climate change mitigation.

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INTRODUCTION & PURPOSE

Many companies make green power purchasing claims with the expectation of reporting lower greenhouse gas (GHG) emissions in their corporate GHG emissions inventories (i.e., their corporate "carbon footprints"). [1] While accelerated policy and financial support for renewable energy deployment is urgently needed to help address climate change, it is also critical to the legitimacy of GHG disclosures that emissions be calculated and reported on the basis of credible assumptions and methods that are a true accounting of environmental outcomes.

This Frequently Asked Questions (FAQ) resource addresses complicated issues in GHG emissions accounting and reporting with respect to green power purchasing claims by electricity end-use consumers. It does so using an evidence-based approach. It especially focuses on Renewable Energy Certificate (REC) and Guarantee of Origin (GO) and their application to corporate (organizational) GHG accounting. These certificates are the dominant instrument used by consumers to make green power purchasing claims and associated zero GHG emission reporting claims (associated with Scope 2 or indirect GHG emissions from the consumption of grid-supplied electricity). The question of the role of Purchase Power Agreements (PPAs) in GHG accounting is, unfortunately, lacking in evidence-based research. Once such research is completed, it will be subject of future updates to this FAQ.

This FAQ addresses voluntary purchasing green power claims. [2] It does not address compliance tracking and reporting by electric utilities (i.e., Load Serving Entities) that employ certificates under a regulatorily mandated clean energy or renewable portfolio standard policy.

1 U.S. EPA. The Benefits and Costs of Green Power. *Guide to Purchasing Green Power*. https://www.epa.gov/sites/default/files/2018-08/documents/guide-purchasing-green-power-3.pdf

2 The fundamentals of GHG accounting discussed in this FAQ applies to other types of voluntary certificates such those for "green gas" or "renewable gas". Additional commentary here: https://earthjustice.org/sites/default/files/files/A1902015_Sierra_Club_Protest_04-05-19.pdf

1. What is a "green power purchase"?

Short answer

Frustratingly, from the perspective of an end-use consumer on an electricity distribution grid, there is no accepted definition. A muddled miscellany of financial and contractual arrangements is commonly referred to as "buying green power," most of which have little bearing on the origins of the electrical energy a buyer physically consumes. This reality presents challenges for representing "green power purchases" in a company's GHG emissions reporting.

Long explanation

In the context of end-use consumers on a utility electricity distribution grid (versus from the perspective of an electric company acting as a Load Serving Entity), the answer here is ambiguous, as the grid is inherently directing and distributing a pool of electrical power. The fact that there is no empirically supported definition should give us pause and raise suspicion regarding green power purchasing and ownership claims. Several widely different types of financial and contractual arrangements are used to make the same sort of renewable energy (electricity) purchasing claims. Except in rare circumstances[3], none of these arrangements or transactions entail the physical and exclusive delivery of electrical energy from a renewable energy generator to a single organization's facilities to power their loads. Yet, as an example, RE100 (2016) defines: "RE usage claims are claims by a specific grid customer or group of customers to be receiving or consuming RE, and/or claims by a supplier or distributor to be delivering or supplying RE to a specific grid customer or group of customers." As a factual matter, electrical energy injected into a transmission and distribution grid by a renewable energy generator becomes part of an undifferentiated pool of electrical potential (not electrons) that all loads on the grid then draw upon in an undifferentiated and undifferentiable manner. So, any purchase and ownership claims have instead been conducted through financial and accounting abstractions (e.g., "renewable attributes") that are cited in contractual instruments such as Renewable Energy Certificates (RECs), Guarantees of Origin (GOs), Power Purchase Agreements (PPAs), as well as a range of electric company-sponsored green power pricing and tariffs. The question, therefore, shifts to: what are these contractual instruments and what does it mean to "purchase" an "attribute"?

2. What is a REC or a GO?

Short answer

A Renewable Energy Certificate (REC) or Guarantee of Origin (GO) is simply a recording of information created to document the fact that one megawatt-hour of electricity is generated and supplied (net) to the shared electrical grid through the use of specified and eligible renewable energy resources. No clear definition exists beyond this fundamental characteristic, although most definitions present some form of broader, yet ambiguous, claim regarding intangible "green" or "renewable" attributes.

[3] For example, in a case where a direct transmission line is installed from a renewable generation source, such as a hydroelectric facility, to a single production plant (e.g., an aluminum production plant).

Some of these certificates may be used for regulatory compliance purposes by electric utilities, while in the United States a large residual is offered for sale to a voluntary market of corporate and other consumers with the marketing message that their purchase is equivalent to "buying green power" (see question #3).

Long explanation

In practice, a wide range of REC and GO definitions exist across green power marketers, regulations, legislation, and non-governmental certification organizations. Many of these definitions make reference to some manner of "attributes" or "benefits", using terms like "green" and "renewable."[4]

Originally, and appropriately, RECs were designed as a tool to track compliance with Renewable Portfolio Standard (RPS) (i.e., electric utility quotas for the supply of a minimum amount of renewable energy to the grid) regulations, while allowing electric utilities (i.e., Load Serving Entities) the flexibility of trading to facilitate more cost-effective industry-wide compliance. RECs used for RPS compliance in the United States must meet definitions and eligibility requirements that differ by jurisdiction, resulting in dozens of different types of compliance certificates. In all regulatory cases, though, RECs (USA) and GOs (Europe) are not used by governments to imply power is being physically transacted, but instead these certificates are used as a tradable regulatory compliance tracking instrument.

Voluntary market RECs and GOs, on the other hand, have been claimed by electricity end users (i.e., companies and individual customers of electric power companies) to represent the purchase of electrical energy from specific renewable energy generators, despite the reality that delivery of renewable energy to the grid is not necessarily contingent on their purchase.

3. What am I receiving if I buy a voluntary REC or GO?

Short Answer

Outside the context of an electric utility's regulatory compliance under an RPS, it is not clear that you are buying anything. Formally, you are paying for a certificate that records the generation of one MWh of electricity from a qualified renewable resource. However, you are not purchasing, taking possession of, or using "electricity" simply by purchasing a REC or GO. Further, you are not buying zero-emissions power, emission reductions, or avoided emissions.

Long explanation

A REC or GO is not a purchase of green power (and you are not buying "electrons" as commonly suggested[5]). RECs and GOs are a form of financial contract that takes place independently of electricity distribution and consumption physics; there is no system that can track (see question #4) the origin of electricity on the consumption side of a pooled electrical transmission and distribution grid.

[4] Gillenwater, M. (2008). Redefining RECs (Part 1): Untangling attributes and offsets. *Energy Policy*.

[5] Gillenwater, M. (2013). Is the way you think about emissions from purchased electricity wrong? Greenhouse Management Institute, February 2013. https://ghginstitute.org/2013/02/26/is-the-way-you-think-about-emissions-from-purchased-electricity-wrong/

Instead, the common marketing language associated with RECs and GOs is that they "represent" environmental, green, or renewable "attributes" or "benefits" associated with renewable energy generation. See question #17 for what is an "attribute". In economics terminology, you are not clearly buying a good or a service. Instead, economically speaking, you are making a financial contribution to a company producing electricity with renewable resources, which then begs the question of whether that donation has a beneficial impact (see question #4).

> Green-e® claims in their Code of Conduct that "Renewable Energy Certificates (REC) do not contain electricity. REC represents the environmental benefits of 1 megawatt hour (MWh) of renewable energy that can be paired with electricity"(Green-e® Code of Conduct, p27, 11 December 2020). Yet, in its marketing materials, Green-e® also states that "RECs are used to demonstrate use of renewable electricity in the U.S." (CRS, 7 March 2016). This type of confusing, and frequently misleading, language is ubiquitous across voluntary green power marketing materials.

4. Does buying a REC or GO mean I am using renewable energy?

Short answer

No. There is no physical traceability of the renewable energy from point of generation to end-use consumption in a pooled grid. Transactions of RECs or GOs do not alter this physical reality. Nor are these certificates a credible proxy for tracking or allocating generator-specific indirect emission factors for purchased electricity.

Long explanation

To put this question more precisely: Am I purchasing and/or consuming electricity from renewable energy generation when I purchase and retire a REC or GO?

Physically, the answer is clearly no. RECs, GOs, or any other contractual arrangements intended to claim "green power" procurement are, at best, an invented proxy for using renewable energy. The question, then, is do these certificates or other contractual instruments provide a technically credible proxy for GHG and other environmental accounting applications, such as conveying an exclusive claim to a generator-specific indirect emission factor (hint, the answer is no).

First, even if you are buying RECs or GOs, for every MWh of your electricity consumption, you are most likely dependent on the availability of other non-renewable generation resources (e.g., fossil and nuclear) to provide your reliable and continuous electricity supply.

Second, these certificates record each MWh of electricity generated (i.e., injected to the shared transmission and distribution grid) from participating renewable generators. But, there is a difference between the quantity of electricity generated and the quantity consumed on a grid. The difference is losses, due mainly to transmission and distribution (e.g., typically 5 to 10% in the USA and Europe, although it can be much larger in some countries). For example, the generation associated with a record of 100 RECs in a certificate registry would correctly only correspond to 90 MWh of electrical load (i.e., with a 10% loss factor).

5. Should RECs or GOs be used for any form of GHG emissions accounting?

Short answer

No, RECs and GOs are not appropriate for either attributional or consequential GHG accounting. For detailed explanation of these terms, see here.

Long explanation

The marketing around RECs and GOs is the source of much confusion and misleading statements. For example, Green-e® offers confusing guidance on whether REC purchases actually reduce emissions:

> "Participants may make statements about avoided grid GHG emissions in association with the renewable energy generation or the supply used for the renewable energy product. However, they must not imply a causal link between the purchase of renewable energy and avoided emissions (i.e. that purchases result in generation or avoided grid emissions. […] To calculate avoided grid GHG emissions in regions without a cap-and-trade program covering the electricity sector, Participants must use the marginal non-baseload emissions rate." (Green-e® Code of Conduct, p29, 11 December 2020).

The fact is that RECs and GOs are neither a sound basis for corporate/organizational GHG emission inventories (i.e., "carbon footprints" as a form of attributional environmental accounting) nor are they in any way an appropriate tool for emission reduction claims, such as those made through GHG emission "offset" credits (i.e., as a form of consequential environmental accounting).[6]

6. Should I use RECs or GOs to calculate my organization's carbon footprint?

Short Answer

RECs and GOs transactions do not entail physical and exclusive delivery of electrical energy from a renewable energy generator to an organization's facilities (see question #1). Therefore, these transactions have no bearing on the emissions physically attributable to an organization's electricity consumption (i.e., its "carbon footprint").

Long explanation

An organization's carbon footprint is an accounting of physically quantifiable GHG emissions (and removals) to and from the atmosphere that result from the entity's activities within defined boundaries. This quantification is a form of attributional environmental accounting. The purchase of RECs, GOs, as well as other green power contractually-based purchase claims, are not appropriate instruments for attributing GHG emissions that physically result from an organization's activities. RECs and GOs are financial instruments and neither change nor represent the physical and exclusive delivery of electrical energy to your organization's facility.

[6] Brander, M. (2021). The most important GHG accounting concept you have never heard of: the attributional-consequential distinction. Seattle, WA. Greenhouse Gas Management Institute, April 2021. https://ghginstitute.org/wp-content/uploads/2021/04/Consequential-and-Attributional-Accounting-April-2021.pdf

Specifically, the use of an indirect (Scope 2) emission factor based on a REC or GO claim is flawed and misleading as part of an organization's carbon footprint.[7]

So, RECs and GOs are not a sound basis for carbon footprinting (attributional accounting).

7. Should I use RECs or GOs to support my claims of "carbon neutrality" or "net zero"?

Short Answer

No, it has been established that the voluntary markets for RECs and GOs do not influence investments in renewable energy generation capacity, nor do they induce greater energy output from existing renewable generation capacity. They, therefore, cause no emission reductions.[8]

Long explanation

RECs and GOs are not appropriate for tracking or representing physical procurement of energy (or vaguely defined "environmental benefits" (see question #17); they are instead simply a record that generation of electricity occurred which is converted into a tradable instrument for regulatory compliance purposes by electric utilities (not end-use consumers). Claiming to have caused emissions reductions must be based on a consequential GHG accounting analysis.

Confusion and mistakes in the use of RECs and GOs are unfortunately fostered by institutions like the U.S. EPA, which defines these certificates as emission reduction instruments used to lower an organization's market-based Scope 2 emissions while also acknowledging that no consequential (i.e., additionality) analysis is required to support this claim or to report use of green power. This all too common language problematically conflates attributional and consequential GHG accounting.[9]

Companies are not properly considered carbon neutral with respect to their indirect emissions as long as their purchased electricity is supplied in some significant part by GHG emitting generation resources. Green-e® acknowledges that their certificates and other products should not be used for "carbon neutrality" claims:

> "The Green-e® Energy program does not support or endorse claims of carbon neutrality. Carbon-neutral claims may not be made about or in relation to Green-e® certified products […]."Green-e® Code of Conduct, p27 (11 December 2020).

In developing an organization's GHG inventory, it is incorrect to use RECs or GOs as the basis to a claim to zero indirect emissions associated with purchased electricity (see question #5).

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7 Open letter rejecting the use of contractual emission factors in reporting GHG Protocol Scope 2 emissions (2015). Available here: https://scope2openletter.wordpress.com

8 Evidentiary resources and literature available here: https://www.bccas.business-school.ed.ac.uk/impact-and-collaboration/renewable-energy-purchasing/

9 Brander, M. (2021). The most important GHG accounting concept you have never heard of: the attributional-consequential distinction. Seattle, WA. Greenhouse Gas Management Institute, April 2021. https://ghginstitute.org/wp-content/uploads/2021/04/Consequential-and-Attributional-Accounting-April-2021.pdf

Further Questions Related to Attributional Claims

8. Should I use the "location-based" or "market-based" method to estimate my corporate Scope 2 GHG emissions?

Short answer
Location based, not the "market-based".

Long explanation
Leading experts in GHG accounting have rejected the WRI/WBSCD GHG Protocol's "market-based" method for Scope 2 GHG accounting as being fundamentally flawed.[10] [11] This rejection is because this method, at its core, allows an organization to report Scope 2 emissions based upon a financial transaction that does not alter its physical consumption of energy or the emissions physically associated with its operations or assets. Emissions that are physically associated with its electricity consumption, and therefore properly attributed to the organization, are represented by a location-based average grid emission factor because the electrical energy on a grid is undifferentiated and undifferentiable with respect to its origin.

Further, even under a consequential accounting method, the voluntary purchase of RECs and GOs by companies and consumers have been clearly shown to not cause emission reductions (see question #6), and therefore, these transactions do not result in benefits for the environment, which could be claimed by a consumer.

Note that corporate GHG accounting (attributional) Scope 2 estimates that utilize the "market-based method" also ignore line losses (see question #5). This mismatch is one more indication that RECs were not designed for and are not appropriate for GHG accounting purposes.

9. Is purchasing RECs or GOs from a local generator better than from a far-off generator for GHG accounting purposes?

No, because voluntary market RECs or GOs do not influence renewable energy generation or investment, nor are they appropriate instruments for attributional environmental accounting (see question #6). The proximity of the generator does not alter this fact. Certificate labeling rules vary, but in general, the practice of non-local purchasing of certificates is allowed, including by Green-e® and the GHG Protocol's Scope 2 guidance.[12]

10 Open letter rejecting the use of contractual emission factors in reporting GHG Protocol Scope 2 emissions (2015). Available here: https://scope2openletter.wordpress.com

11 Brander, M., Gillenwater, M., and Ascui, F. (2018). Creative accounting: A critical perspective on the market-based method for reporting purchased electricity (scope 2) emissions. *Energy Policy.*

12 For example, a REC purchase associated with a wind farm in Texas may be claimed by a company in Canada or Alaska.

10. Does the use of a "residual mix" grid emission factor solve the problems with RECs and GO for GHG accounting?

No.

"Residual mix" refers to the mix of generation supplying the electrical grid minus the generation from specific generators that are exclusively claimed by individual retail consumer as supplying their electricity. The mix of generation after these exclusive claims are removed is referred to as a residual. A residual mix average emission factor can be calculated based on the assigned generation.

The practice of utilizing RECs or GOs to estimate Scope 2 emissions for an entity, even when done in combination with a "residual mix" grid emission factors, is a practice of shifting allocation of emissions among entities (i.e., reallocating the indirect emissions from fossil fuel-fired generation on the grid to other entities). This reallocation misrepresents the actual upstream indirect emissions associated with an entity's physical consumption of electricity, and thereby undermines credibility and purpose of attributional GHG emission inventories.[13]

Note, even the available residual mix emission factors in the United States, such as those published by Green-e®, only factor out Green-e® registered RECs, and therefore does not account for all other renewable energy purchasing claims by consumers on the grid.

11. Why have RECs and GOs been widely accepted and used in corporate carbon footprints?

Currently, most guidance and protocols for corporate GHG inventories permit the use of RECs and GOs in the calculation of an organization's carbon footprints. This attributional accounting practice is typically, and improperly, based on a consequential accounting argument—that eventually, if demand for these instruments grows sufficiently large, a higher price will cause an increase in renewable energy generation and therefore prevent fossil fuel-fired generation. Not only is the argument logically flawed (it is not presented as a credible method of *attributing* grid-wide emissions), but the factual justification has been disproved[14] (i.e., voluntary certificates do not, and under feasible economic conditions, will not, influence renewable energy investment or generation) (see question #14).[15]

In economic terms, RECs and GOs are intangible co-products of electricity production that are costless themselves to produce (i.e., they are simply records in a database). Existing renewable energy generation is vastly higher than the voluntary demand for RECs and GOs, so no scarcity is created by the voluntary purchase of them, which is reflected in the consistently low price. The fact that their price is not zero simply demonstrates that there is a cost of marketing and transacting them.

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13 Brander, M., Gillenwater, M., and Ascui, F. (2018). Creative accounting: A critical perspective on the market-based method for reporting purchased electricity (scope 2) emissions. *Energy Policy*.

14 For additional literature on the topic, visit: https://www.bccas.business-school.ed.ac.uk/impact-and-collaboration/renewable-energy-purchasing/

15 Open letter rejecting the use of contractual emission factors in reporting GHG Protocol Scope 2 emissions (2015). Available here: https://scope2openletter.wordpress.com

> "Energy products that are advertised as having climate benefits but do not actually function to reduce greenhouse gas emissions mislead customers, foster customer complacency with the continued combustion of fossil fuels, and detract from urgently needed efforts to enact real solutions." (Sierra Club, 2019)

For a detailed discussion of the origins of this collective mistake in the environmental community, see:

Brander, M., Gillenwater, M., and Ascui, F. (2018). Creative accounting: A critical perspective on the market-based method for reporting purchased electricity (scope 2) emissions. *Energy Policy*.

Further Questions Related to Consequential Claims

12. Does my RECs or GO purchase influence how much renewable energy is generated?

No. There is ample evidence that neither the voluntary REC market in the USA nor the GO market in Europe has an influence on RE generation or investment. And there is no empirical evidence indicating that it does.[16]

13. Doesn't the exclusion of legacy RE and hydropower generation from the voluntary REC market address GHG accounting problems?

Short answer

Simply put, no. This exclusion does not address the fact that the voluntary market for RECs has no significant influence on renewable energy investment or generation.

Long explanation

The exclusion of legacy renewable and hydro facilities from the REC market implies that the certifications are intended to support claims that these certificates *cause* more RE investment and generation because they are restricted to more recently built generation in order to reduce the supply and create a scarcity. However, we know that the voluntary REC (and GO) markets do not and are highly unlikely to influence (i.e., cause) more renewable energy investment or generation (see question #14).

16 For additional literature on the topic, visit: https://www.bccas.business-school.ed.ac.uk/impact-and-collaboration/renewable-energy-purchasing/.

14. If more companies purchase RECs and GOs, then won't this increased demand eventually cause more renewable energy investment and generation?

Short Answer

Highly unlikely. Research has shown that supply of RECs and GOs from existing generation vastly exceeds demand. The long-running low price for these certificates plainly exposes this oversupply.

Long explanation

There are currently no expectations of a near- or long-term scarcity in voluntary REC or GO markets. Therefore, the financial influence of these voluntary certificate markets on investments in renewable energy generation capacity is negligible.[17] It has been shown empirically that the existing (baseline) supply of RECs and GOs for voluntary purchases exceeds both existing and projected demand (i.e., there is no expectation of future scarcity).[18] If voluntary certificate market scarcity were to emerge – for example, through the imposition of a national renewable energy portfolio standard on electric utilities in the USA that removed certificate supply from the voluntary market – then it would clearly be reflected in a significant increase in REC or GO prices (including forward price curves). For example, we see no supply of voluntary market RECs coming from jurisdictions in the USA with aggressive RPS mandates on electric utilities.

15. What is the difference between a REC/GO and a carbon offset credit?

A carbon offset credit is a transferrable verified and certified tradable instrument representing an emission reduction (or removal enhancement) equivalent to one metric tonne of CO_2. In contrast, voluntary RECs and GOs are a tradable instrument recording the generation of one megawatt-hour of electricity (net) that has been delivered to the grid. RECs/GOs cannot validly be used as carbon offsets because they do not correspond to GHG reductions (see questions #16 and #17). For a detailed discussion on instrument options, their environmental integrity, and how to properly claim emission reductions, see: www.offsetguide.org/understanding-carbon-offsets/other-instruments-for-claiming-emission-reductions/.

16. Is "additionality" relevant or necessary for RECs and GOs to be used in consequential GHG accounting?

Short answer

Yes, additionality is relevant in cases where a consequential GHG reduction or impact claim is being made or implied by a company or other consumer. However, neither the certification nor issuance process for RECs and GOs involves any kind of meaningful additionality assessment.

Long explanation

RECs and GOs are sometimes explicitly or implicitly claimed as serving the same function as GHG emission offset credits (consequential accounting impact claim). However, there is no evidence of

17 For additional literature on the topic, visit: https://www.bccas.business-school.ed.ac.uk/impact-and-collaboration/renewable-energy-purchasing/.

18 Gillenwater, M. (2013). Probabilistic decision model of wind power investment and influence of green power market. *Energy Policy.*

additionality in voluntary REC and GO markets – they have not empirically induced greater renewable energy generation nor is the issuance of a REC or GO subject to any kind of meaningful additionality assessment. Instead, RECs and GOs are issued for generation arising from any qualifying resource, regardless of whether that resource would have been built and/or operated in the absence of REC or GO markets. Offsetting claims associated with RECs and GOs are therefore invalid.

In some instances, quasi-consequential arguments have been used to justify the use of RECs and GOs in attributional accounting (i.e., corporate GHG emission inventories). However, if you are preparing a corporate GHG inventory, the question of additionality should not enter the discussion. Any claim of additionality that is used to justify an estimation method or assumption for a corporate inventory is categorically flawed.[19]

Further Questions Related To RECs & GOs

17. What are the "environmental benefits" or "attributes" associated with RECs and GOs?

Short answer

There's little consistency in the definitions of what the terms "benefit" or "attribute" are in the context of RECs and GOs (see question #2). Yet, evidence clearly shows that the voluntary market for these certificates does not result in any environmental benefit. These certificates only serve as a record that a unit amount of electricity was generated from a qualified renewable energy resource (typically grid-connected) for the purpose of electric utility compliance tracking for renewable energy regulatory quotas (i.e., RPS or clean energy standard).

Long explanation

RECs and GOs typically claim to be or represent "environmental benefits." The same concept of benefits is alternatively referred to by some as "environmental attributes." In the context of environmental accounting and reporting, the meaning of this term is ambiguous and misleading. For carbon offset projects, GHG benefits are clearly defined. For an offset credit, the benefit is a substantiated assertion of a quantified reduction in GHG emissions that were *caused* by the offset credit market's intervention.[20]

RECs and GOs do record that electricity from RE resources was generated. But, they do not substantiate nor represent, in any way, that the REC or GO market had any influence on whether this renewable energy was generated or that any emissions were reduced as a consequence. For instance, RECs are denoted in MWh and not in tons of a specific GHG or other pollutants. In contrast, we have clear evidence[21] proving that the voluntary market for RECs and GOs do not influence renewable energy generation or investment, and therefore neither the REC nor GO market create any GHG or other environmental benefits.

19 Brander, M. (2021). The most important GHG accounting concept you have never heard of: the attributional-consequential distinction. Seattle, WA. Greenhouse Gas Management Institute, April 2021. https://ghginstitute.org/wp-content/uploads/2021/04/Consequential-and-Attributional-Accounting-April-2021.pdf

20 i.e., the intervention is in the form of an offset credit price signal to project developers.

21 For literature on the topic, visit: https://www.bccas.business-school.ed.ac.uk/impact-and-collaboration/renewable-energy-purchasing/.

A certificate cannot represent something that does not exist.[22] [23] Separately, simply labeling a financial payment as a purchase of "attributes" does not make it a credible instrument for allocating indirect emissions for attributional GHG accounting.

18. Why are RECs and GOs typically so inexpensive?

Short answer

Because they represent little or nothing more than transaction and marketing costs.

Long explanation

In the United States, voluntary RECs are predominantly supplied from jurisdictions where they are not eligible to be sold to electric utilities for RPS compliance. Here, RECs sales are considered a small source of income (e.g., subsidy) to electricity generators, yet have been shown to not provide a sufficient incentive to alter renewable energy generation investment decisions (i.e., lack of additionality). The difference between the retail price of voluntary RECs versus lower wholesale prices reflects added transaction and marketing costs.[24] The simple answer is that supply of these certificates vastly exceeds demand (see question #14).

In the United States, the wind Production Tax Credit (PTC) and solar Investment Tax Credit (ITC) have been shown to meaningfully influence RE investment.[25] Also, RPS compliance REC prices have also been shown, in jurisdictions with ambitious quotas, to meaningfully influence investment and generation. [26] Recently in the United States, new renewable energy generating investments are accounting for most new generating capacity and becoming least-cost new capacity, in part due to government subsidies and mandates.[27] This market trend will likely keep voluntary REC and GO prices low, absent of a nation-wide (federal) RPS or clean energy standard.

19. Does verification or certification of my REC or GOs assure its impact and environmental integrity?

Short answer

No. The verification and certification processes for RECs and GOs, such as those required by Green-e® or the I-REC Standard, only confirm that two RECs are not registered for a single MWh of generation from a renewable energy generator (i.e., no double issuance).

22 Gillenwater, M. (2008). Redefining RECs (Part 1): Untangling attributes and offsets. *Energy Policy*.

23 Gillenwater, M. (2008). Redefining RECs (Part 2): Untangling certificates and emission markets. *Energy Policy*.

24 U.S. EPA. The Benefits and Costs of Green Power. *Guide to Purchasing Green Power.* https://www.epa.gov/sites/default/files/2018-08/documents/guide-purchasing-green-power-3.pdf

25 National Renewable Energy Laboratory (2014). Implications of a PTC Extension on U.S. Wind Deployment. https://www.nrel.gov/docs/fy14osti/61663.pdf

26 National Renewable Energy Laboratory. Renewable Portfolio Standards: Understanding Costs and Benefits. https://www.nrel.gov/analysis/rps.html

27 U.S. EIA. 2021. Renewables account for most new U.S. electricity generating capacity in 2021. https://www.eia.gov/todayinenergy/detail.php?id=46416

Long explanation

None of the substantive criteria that are standard for environmental accounting or impact verification in the context of a consequential environmental accounting or GHG emission reduction projects and offset credits occur in the case of REC or GO certifications. For instance, verification of a REC will confirm that 1 MWh was generated from a qualified resource and that the certificate was only claimed once. But, the certification does not provide credible assurance that a certificate meets other environmental integrity principles.[28]

20. Could hourly RECs or GOs make them appropriate for GHG accounting?

Short answer

No, at least not without other structural changes.

Long explanation

RECs and GOs are recorded according to the year they were issued. A new type of certificate that is recorded on an hourly basis could *mostly* address one problem with annually denoted RECs and GOs —of claiming a generator-specific indirect emissions factor that is mismatched in time with an organization's actual electricity consumption. (RECs and GOs are in some cases not even associated with generation that occurred in the same year as they are claimed for use by a company, e.g., a 2018 vintage REC is claimed to be "used" by a company for its electricity consumption in 2020.)

In theory, if the following criteria were met, then certificates could be an appropriate allocation instrument for attributional GHG accounting by companies:

- the electricity consumer and REC/GO purchasing organization as well as the renewable energy generator are on the same distribution or transmission grid,
- if certificates were used and allocated for all generation (not only renewable), and
- if GHG accounting of Scope 2 emissions was performed by all organizations using certificates (i.e., the attributional concept that the sum of all parts equals a while).

Currently, renewable energy purchasing claims are incompletely allocated, partly double counted, as well as mismatched in both time and geography (space). Better matching certificates in time with a company's load does not address all the other disqualifying characteristics of RECs and GOs for GHG accounting.

[28] See https://www.offsetguide.org/high-quality-offsets/

Further Questions Related To PPAs & Other Options

21. Am I purchasing green power through a PPA?

Short Answer

Not for the purpose of GHG accounting. The reality is that a PPA is simply a financial contract that can take a variety of forms (e.g., a price hedge), and so a PPA is a malleable financial arrangement that is not intended or designed for attributional GHG accounting.

Long explanation

Given that RECs and other voluntary types of contractual arrangements or instruments (such as PPAs) are typically used to make GHG emission reporting claims, this question reduces to being about whether PPAs are a proper basis for assigning indirect emissions for GHG accounting. Although evidence is currently lacking as to the impact PPAs have on renewable energy investment and generation, it is unambiguous that the wide range of different contracting and financing provisions that fall under the "PPA" label in different legal and power market contexts is not a sound instrument for attributional GHG accounting (see questions #4, #17, and #23).

22. Can I use my electric utility's green pricing or green tariff program for my GHG accounting?

Short answer

You should not. Most of these programs are tied back to RECs, GOs, or PPAs. See question #8.

Long explanation

Utility green pricing programs take a variety of forms in how they are financially structured. Many are built upon REC and GO transactions and entail simply allocating claims to existing renewable energy generation to these premium paying customers. Some programs report to use the revenue from the tariff premium to invest in new RE capacity; however, in these cases, utilities are also inappropriately mixing consequential and attributional GHG accounting applications and concepts.

23. What does it mean for an electricity generator to "deliver" electricity"?

The concept of "delivering" electricity is related to wholesale power transactions between generators and transmission/distribution utilities (i.e., an LSE's distribution system). It typically refers to the injection of electricity by a generator into a specific wholesale electricity market footprint, such as an ISO or RTO in the USA, or to the distribution system of an LSE.

PPAs can include requirements that address where (and when) power is injected by a generator, but they cannot guarantee delivery of power to a specific end-use consumer.

24. Should companies not even attempt to "purchase" green power?

Short answer

Companies and other organizations *should* make decisions that produce positive change in the world and for the climate. Their financial decisions regarding their purchase of electrical energy services may be able to affect change for the better. Quantifying such impacts should be done through the application of an environmental impact analysis using a consequential GHG accounting method (e.g., a project-based methodology). Specific guidance on other procurement options for achieving more credible emission reductions impacts can be found here.

Long explanation

Based on evidence, purchasing voluntary market RECs and GOs does not result in positive change for the environment. It is possible that other financial arrangements like PPAs, under certain conditions, may produce a desired change (e.g., influence how much renewable energy is generated), but we lack evidence of under what conditions and whether this is the case. For the purpose of quantifying an organization's GHG emissions, the application of green power purchasing claims (entailing an exclusive transfer of energy) is inappropriate. Companies should use consequential accounting methods to evaluate and report on the impact of their decisions and investments.[29]

[29] See https://www.wri.org/research/guidelines-quantifying-ghg-reductions-grid-connected-electricity-projects

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We welcome any feedback you may have about this FAQ. Please visit www.offsetguide.org/green-power-FAQ for an updated FAQ.

You may email GHGMI at info@ghginstitute.org.

- 26 May 2022: Substantive sentence revision on Question #11 from "Existing renewable energy generation is lower than the voluntary demand for RECs and GOs [...]", to "Existing renewable energy generation is vastly higher than the voluntary demand for RECs and GOs [...]".
- 26 May 2022: Sentence edit on Question #11 from "reduce greenhouse gas the missions", to "reduce greenhouse gas emissions".
- 26 May 2022: Formatting edits on pages 10 and 12-15, and typo correction on page 14.