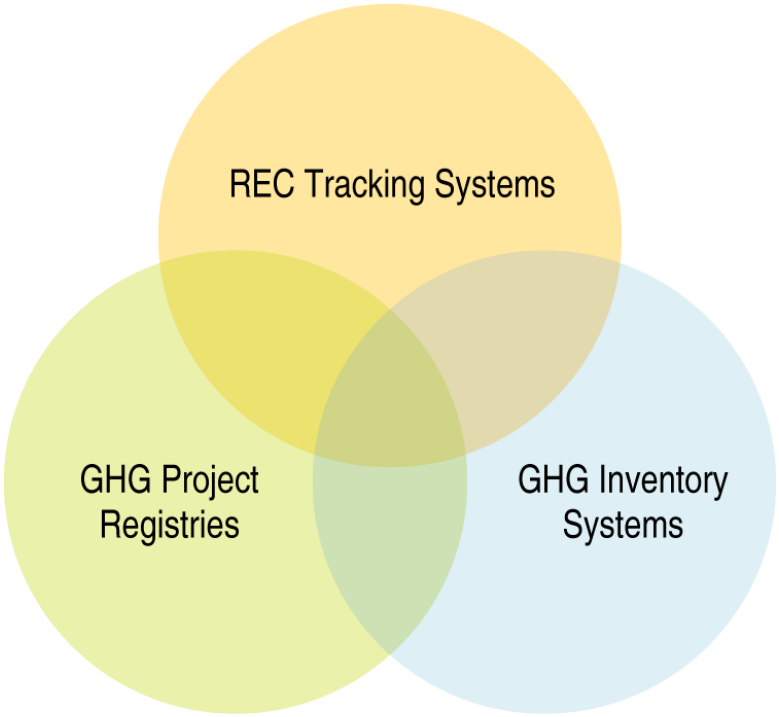
etnna Environmental Tracking Network of North America

The Intersection between Carbon, RECs, and Tracking:
Accounting and Tracking the Carbon Attributes of Renewable Energy



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Introduction

Carbon offsets and renewable energy certificates (RECs) are tradable environmental commodities. A carbon offset represents a specific quantity of greenhouse gas (GHG) emission reductions (i.e. a metric ton of carbon dioxide absorbed or avoided) from a project-based activity. A REC represents proof that one megawatt-hour (MWh) of electricity was generated by an eligible renewable energy resource, and each REC embodies the renewable energy attributes (environmental and social) associated with the generation of power from that resource. As the marketplaces for these commodities grow, it is important to examine how these marketplaces overlap and how to avoid double counting of the carbon benefits or claims that these commodities embody and convey. This paper is focused on the interactions of RECs and carbon-accounting practices in North American registries and tracking systems, and best practices to avoid double counting. Electricity certificate tracking systems, GHG project registries, and GHG inventory systems are examined. This paper also discusses tracking issues related to the avoided carbon from renewable energy generation and recommends best practices to ensure accurate accounting and tracking for both RECs and carbon.

Overview of North American Markets for Renewable Energy and Carbon Offsets

Renewable energy

There are two markets for renewable energy in North America: voluntary and compliance. Together, these markets accounted for over 47 million megawatt hours MWh of renewable energy transactions in 2008.[1] The voluntary market for renewable energy consists of businesses and individuals purchasing renewable energy above and beyond the amounts present in standard utility service or provided through government requirements. In the U.S., the voluntary market for renewable energy and RECs was approximately 24.3 million MWh in 2008, and has shown substantial growth each year. Compliance markets are those where state or other legal mandates require utilities and electricity providers to provide or purchase renewable energy as part of the portfolio offered to their regular customers. In November 2009, 29 states and the District of Columbia in the United States had renewable portfolio standards (RPSs) that require a certain percentage of their electricity to come from renewable sources by a specified date, which varies by state. In 2008, the share of the renewable energy market attributable to RPS demand was 22.9 million MWh.[2]

Carbon offsets

Increasingly, individuals and businesses are calculating and recording their carbon footprints as a first step to reducing their contribution to climate change. One way to do this is to purchase carbon offsets, which can reduce overall emissions. A carbon offset represents a specific quantity of GHG emission reductions (i.e., a metric ton of carbon dioxide absorbed or avoided) from a project-based activity. These offsets are purchased in order to negate or diminish the impact of GHG emissions from a different source, typically the purchaser. When a party (a company or individual) purchases an offset, it alone has the right to all associated claims about the environmental benefits that offset embodies. In 2008, 123.4 million metric tons of carbon

1 Bird, L.; Kreycik, C. and Friedman, B. (2009). Green Power Marketing in the United States: A Status Report (2008 Data), NREL/TP-6A2-46581. Golden, CO: National Renewable Energy Laboratory, September. http://www.nrel.gov/docs/fy09osti/46581.pdf

2 This figure only includes renewable generation from new, post-1997 facilities.

dioxide equivalent ($MtCO_2e$) were transacted in the global voluntary market.[3] Of this, the voluntary market for carbon offsets in North America accounted for 15.0 $MtCO_2e$ of over the counter sales and 18.7 $MtCO_2e$ of sales in the Chicago Climate Exchange (CCX). The market for carbon offsets continues to grow.

The intersection between renewable energy and carbon offsets

While the markets for renewable energy and carbon offsets are different in many ways, there are instances where they intersect—including at the project level, where a renewable energy project could qualify to generate both renewable energy certificates and carbon offsets (but not from the same MWh). A renewable energy generation project could produce both carbon offsets that are certified by a voluntary offset project certification system and tracked in a GHG project registry and RECs that are tracked in a REC tracking system. Similarly, RECs and offsets are accepted by some GHG inventory systems as valid methods to reduce certain types of emissions. The challenge, which is discussed in this paper, is to ensure that the carbon attributes of renewable energy are accurately tracked, and that no double counting or double crediting of the environmental benefits of a particular MWh takes place.

Carbon accounting in cap-and-trade systems

GHG cap-and-trade systems are one way to regulate the total amount of GHG emissions in the sectors of an economy subject to the cap. One regional cap-and-trade system is in place in the northeastern U.S., and several are pending. Federal cap-and-trade program legislation has been proposed in the U.S. Congress, and ETNNA is working towards addressing tracking system issues raised by cap and trade. A federal renewable electricity standard (RES) has also been proposed in the U.S. Congress, which would require electric utilities in *every* state to generate or purchase a certain percentages of total electricity supply from renewable energy sources by a certain date, acting as a RPS at a national level.

This paper will discuss a series of potential interactions between RECs and offsets accounting in registries and tracking systems in order to ensure avoidance of double counting through best practices.

Tracking Systems

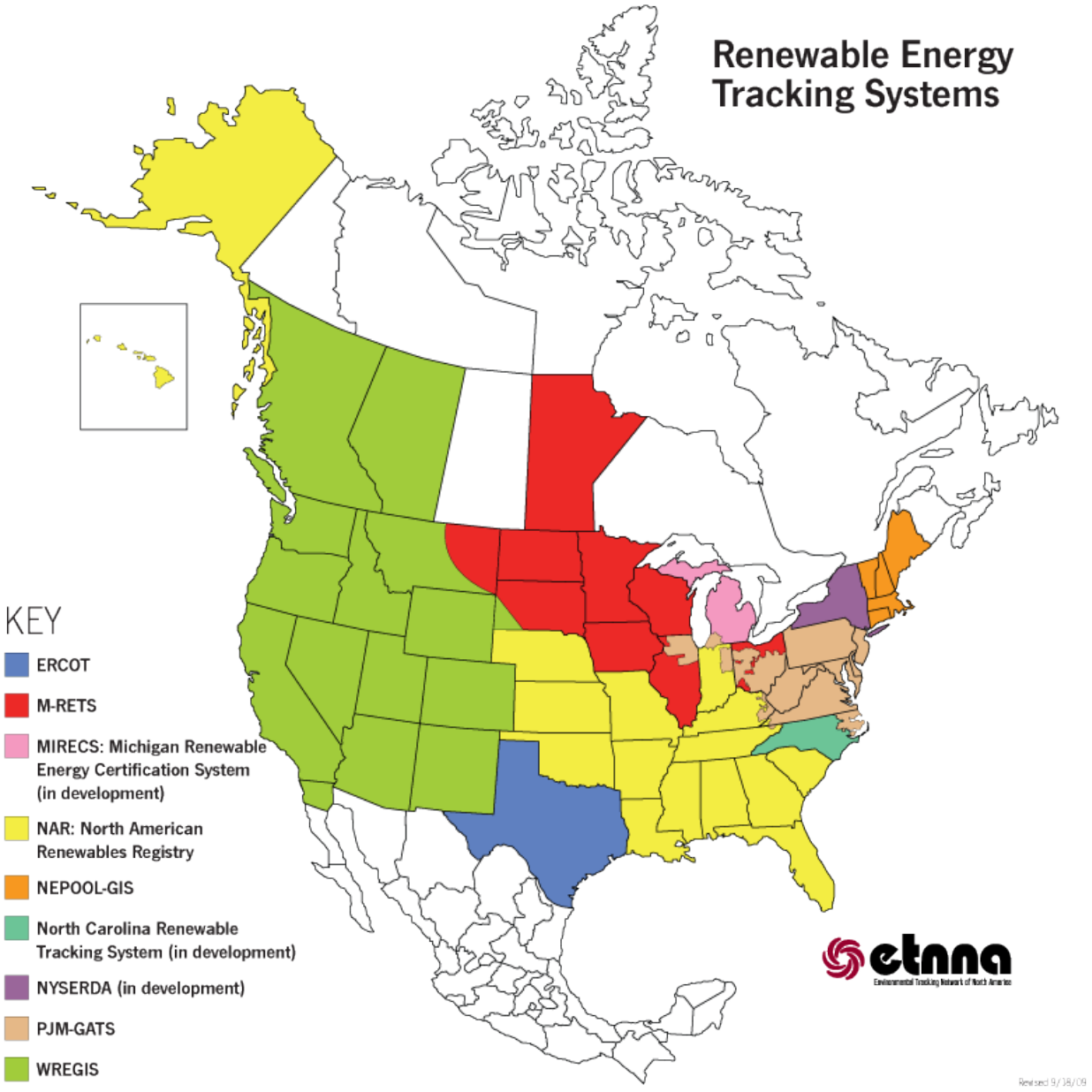
There are three main types of systems in place that track or otherwise account for the carbon attributes of renewable energy: REC tracking systems, GHG project registries and GHG inventory systems. In addition, and depending on how cap and trade is implemented, there may be interactions where allowances are created, credited, or distributed that create carbon accounting issues that impact renewable energy generators and their carbon-related claims. Allowance distribution and tracking issues are not discussed in depth in this paper.

REC tracking systems

The North American certificate tracking systems for electricity are regionally based and were created primarily to provide a mechanism to monitor compliance with state RPS programs. The voluntary market also uses these systems to track the ownership of renewable energy

3 Hamilton, K.; Sjardin, M.; Shapiro, A. and Marcello, T. (2009). Fortifying the Foundation: State of the Voluntary Carbon Markets 2009. A Report by Ecosystem Marketplace & New Carbon Finance, May. http://ecosystemmarketplace.com/documents/cms_documents/StateOfTheVoluntaryCarbonMarkets_2009.pdf

certificates. For the purposes of this paper, we will refer to these systems as REC tracking systems, even though several of the systems track other sources of generation as well. The figure below illustrates the geographic scope of the various REC tracking systems in North America.



The following REC tracking systems are currently in operation:

- WREGIS: Western Renewable Energy Generation Information System
- M-RETS: Midwest Renewable Energy Tracking System
- PJM-GATS: PJM Generation Attribute Tracking System
- ERCOT: Electric Reliability Council of Texas

- NEPOOL-GIS: New England Power Pool/Generation Information System
- NAR: North American Renewables Registry
- MIRECS: Michigan Renewable Energy Certification System

New York and North Carolina are creating their own systems while Missouri is considering whether to create a new system for the state.

All REC tracking systems follow the same basic conventions. For every MWh of renewable energy generated by a participating facility, a REC is created and tracked in a REC tracking system. The REC represents the renewable attributes of the generation and is tracked separately from the electricity. Each certificate has its own unique serial number so that it can be accounted for from creation to retirement. Along with this serial number, additional information about that REC is tracked, including: energy source, generation/conversion technology, project location, and vintage (i.e., when the certificate was created). These characteristics are referred to as the *primary attributes* of the REC. PJM-GATS and NEPOOL-GIS are "all-generation" tracking systems, which means they keep track of both renewable and non-renewable (including fossil-fuel) electricity generation in their regions. Unlike other systems, all-generation tracking systems have the benefit of being able to automatically calculate the residual system emissions that can be assigned to null power, an issue discussed in more detail in Section 3 of this paper.

The *derived or secondary attributes* of a REC include the emissions from fossil fuel facilities that are displaced or avoided by renewable generation. These secondary attributes are currently required to be included in each REC by the operating rules of almost all of the REC tracking systems.[4] However, the amount (in tons) of GHG emission reductions attributed to renewable projects are not explicitly tracked in any of the REC tracking systems with the exception of NAR.

GHG project registries for renewable energy projects in North America

GHG project registries track emission reductions from qualified projects, denominated in metric tons (or tonnes). Depending on the registry, qualified project types may include renewable energy, methane capture and destruction, energy efficiency, and reforestation, among others. Each metric ton is assigned a unique serial number. There are several current, active GHG project registries that track emission reductions from projects in North America:[5]

- CCX: Chicago Climate Exchange
- VCS : Voluntary Carbon Standard (administered by APX, Markit, and Caisse des Dépôts)
- Gold Standard (administered by APX)
- American Carbon Registry
- CAR: Climate Action Reserve (administered by APX)
- Canadian Standards Association's GHG CleanProjects Registry

CCX, VCS, the Gold Standard, and the GHG CleanProjects Registry each include existing or pending renewable energy projects in North America. The America Carbon Registry includes renewable energy projects, but none are currently located in North America. All of these GHG project registries include methane capture and destruction projects, which could also be sources of renewable electricity generation tracked in separate REC tracking systems. In addition to the

4 See ETNNA, "Treatment of Environmental Attributes Across Tracking Systems," November 25, 2008 for an in depth discussion of this issue. http://www.etnna.org/images/PDFs/ETNNA-Environmental-Attribute-Paper-Final.pdf

5 GHG project registries administered by project developers and retail offset providers are not discussed in this paper

GHG project registries listed above, the Clean Development Mechanism (CDM) GHG project registry contains both renewable energy and methane destruction projects located in Mexico.

GHG inventory systems in North America

GHG inventory systems provide a platform for their participants to measure and track their own carbon footprints. Current, active GHG inventory tracking systems in North America include:

- U.S. EPA Climate Leaders
- The Climate Registry
- CCX: The Chicago Climate Exchange
- Canadian Standards Association's GHG CleanStart Registry
- Carbon Disclosure Project
- California Climate Action Registry[6]

Individuals and companies measure their greenhouse gas emissions and report them to a GHG inventory system in standardized units called carbon dioxide equivalent, or CO_2e. The systems above differ in their treatment of the purchase and sale of renewable energy. Not all systems make their aggregated reports public. It should be noted that for the purposes of this paper, these types of systems will be referred to as GHG inventory systems, although several of the systems include "registry" as part of their title. The term "inventory system" is used here to distinguish the function of these systems from project registries—GHG inventory systems keep track of users' carbon footprints while GHG project registries track emissions reductions from carbon offset projects.

Section 1: Treatment of environmental commodities in GHG project registries and REC tracking systems

REC tracking systems enable renewable electricity generation facilities across the country to easily count, manage, and sell renewable attributes, which are denominated in MWh of electricity generation. None of the current REC tracking systems, with the exception of the NAR, currently display information on the amount of carbon that has been avoided by the amount of clean generation embodied in a REC. With increased interest in tracking and selling renewable attributes for the purposes of making a carbon-avoidance claim, the issue of how to calculate, track, and display carbon values is becoming a more pressing consideration.[7] This carbon data would be particularly valuable to REC purchasers interested in comparing the relative impacts of using renewables versus fossil-fuel generation sources.

However, for a carbon value data to be useful, certain issues should first be resolved in REC tracking systems. Changes necessary to address the issues of carbon value calculation, disclosure of calculation methodologies, avoidance of double claims, and clarity around what types of projects are considered additional (beyond business as usual) are discussed below.

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6 California Climate Action Registry is in the process of phasing out and transitioning all members to The Climate Registry, http://www.climateregistry.org/join/member-transition.html

7 Retail renewable electricity and REC sales in the voluntary market for renewable energy have increased an average of 41% each year from 2004 to 2008 according to NREL's "Green Power Marketing in the United States" report on 2008 voluntary market sales, available at http://www.nrel.gov/docs/fy09osti/46581.pdf

Note that the issues presented in this section apply primarily to sales in the voluntary renewable energy market. Also, the issues may not apply under a cap-and-trade program, under which renewable generation may not cause a reduction in a purchaser's indirect emissions under the cap unless provisions are written into program rules that cause carbon allowances to be retired proportionately to renewable energy production or use. Such a provision exists for the voluntary renewable energy market in 9 out of 10 Regional Greenhouse Gas Initiative (RGGI) states. In these states, allowances are retired -- removed from the total allowable pool of allowances -- to reflect the carbon avoidance benefits of renewable energy purchases in the voluntary market.

Issue 1: Tracking the carbon equivalency of renewable energy in a REC tracking system

Background

Purchasers of renewable energy are often motivated by a desire to use "net-zero-carbon" electricity, or electricity that is not directly responsible for greenhouse gas emissions. The carbon equivalency value of a MWh of renewable electricity generation is one metric used by renewable energy sellers to communicate the value of clean energy. Typically, this carbon equivalency value is calculated based on the mix of resources used to generate electricity in the region or service territory in which the renewable facility is located.[8] Different REC tracking systems and REC-use programs have different ways of calculating such equivalencies. Currently, only NAR provides GHG emission reduction information for RECs, though other tracking systems could be updated to contain this feature, with varying degrees of difficulty arising from the time, administrative cost, and processes involved in making such programming changes.

For renewable electricity projects that qualify as additional under a carbon-offset project certification program, a carbon value (offset value) indicates the emission reductions per MWh of generation by the facility. Unlike RECs which are typically only used to reduce GHG emissions associated with electricity use, offsets from additional renewable energy projects can be used to reduce (or offset) the GHG emissions associated with any activity.

Discussion

While it is possible to calculate the amount of emissions avoided by renewable electricity generation for any MWh of renewable generation, only generation by projects that are deemed to be additional under an offset project certification program can be used to offset emissions from activities other than electricity use, such as driving, flying, or heating with natural gas. Due to the fact that there are these two distinct uses of renewable energy carbon values, displaying carbon equivalency values for <u>all</u> RECs in REC tracking systems as a default is not recommended. Such a practice could cause confusion among system users and buyers of renewable attributes, since not all RECs in the tracking system would come from projects deemed additional under carbon-offset standards (additionality requirements are different for renewable energy claims than carbon-offset claims). If <u>all</u> RECs had carbon values displayed, it could imply that the projects generating them met the more rigorous carbon offset additionality standards. Certain users of the system might assume that all projects in the REC tracking

8 See Section 3 of this paper for more information on these calculations as they relate to renewable electricity generation and sales. See also the Appendix to this paper for a breakdown of the carbon dioxide calculations for renewable energy used by various offset programs.

system were additional and that renewable attributes from non-additional projects could be retired to allow offsetting claims to be made from the corresponding generation.

There are benefits to displaying the carbon value of renewable energy from qualifying *additional* projects, namely consistency and certainty as to what the retirement of the renewable attributes will convey to the buyer in terms of a carbon offset claim.

Best practice for tracking carbon equivalencies in REC tracking systems

If carbon equivalencies are to be calculated and displayed, it is important to clearly denote which projects qualify as additional under a specific offset project certification program. In this case, if the calculation methodologies from multiple certification programs are available, clearly show which one was used. This information should be apparent on the profile of each project that qualifies as additional, and when viewing RECs in a REC tracking system user's account.

Also important are clear disclosures and descriptions of the calculation methodologies in the REC tracking system's operating rules. These should include the version of the methodology used, and any supplemental sources of information that have factored into the calculation.

For clarity at the time of REC retirement, it is recommended that tracking systems add a "Retirement Reason" option to note that RECs from an additional project are being retired in order to make carbon offsetting claims—the notation could read "retired for carbon offset claims" or "reserved for sale as carbon offset." Other useful pieces of information to display with a retirement reason include the methodology used, and the total metric tons of equivalent CO_2.

NAR provides a real-world example for displaying carbon equivalencies of RECs in its database. When a project is authorized to be marked as additional, carbon-equivalency calculations are made for the MWh from that project based on which offset-project certification it qualifies for: one calculation for the Green-e Climate Protocol for Renewable Energy, and the other for the EPA Climate Leaders program. Each value is labeled and displayed for the user, showing the emission reduction values of a block of RECs from the facility (rather than the per-MWh value). This approach to calculating and displaying carbon equivalency information demonstrates that different methodologies can easily be added, and kept separate and clearly delineated.

Issue 2: Tracking RECs and carbon offsets from the same renewable energy project to ensure there is no double counting of carbon attributes

Background

REC tracking systems are designed to prevent multiple retirements and reservations of renewable attributes. However, the possibility exists for a renewable energy facility to be registered both in a GHG registry to track its carbon offsets and in a REC tracking system to track its renewable electricity production. In such cases, there is the possibility that retirement of a facility's renewable attributes in the REC tracking system (which embody all carbon reduction attributes, according to the operating rules of all REC tracking systems other than NEPOOL-GIS and ERCOT, and unless a state's rules specify otherwise) will not cause retirement of the facility's offsets in the GHG project registry or vice versa, thereby creating the opportunity for a double claim or double use of the same carbon reduction attributes.

Discussion

One way to avoid double counting is to allow only one type of commodity (e.g. RECs) from a renewable electricity facility to be created and tracked. This way, RECs from such facilities can be retired to make carbon claims as needed.

An alternative method of tracking generation and calculating the carbon value of generation is to track a REC in a REC tracking system and a commensurate number of tons of carbon from the same generation in a GHG project registry as separate commodities. The retirement of one commodity would cause the automatic retirement of the other. However, this could make the REC tracking system more complicated and require a lot of coordination between the REC tracking systems and GHG project registries.

A third option is to coordinate the creation of carbon offsets from renewable energy facilities with the retirement or reservation of corresponding RECs in a tracking system. In this way, the carbon reduction attributes of the renewable MWh would only exist in one tracking system/registry at a time.

Best Practice

If preventing the carbon benefits of a single MWh of generation from existing in more than one place at a time is a goal, demonstrating that a REC from an additional facility has been retired in a REC tracking system before carbon offsets from that generation can be minted in a GHG registry is a best practice method to achieve this goal. It is important to note that use of REC tracking systems is considered best practice for tracking renewable electricity generation and the resulting RECs. Because of this, it is also advisable, but not necessary, that renewable electricity facilities receiving carbon offsets for their generation also register in REC tracking systems. In this way, generation data from renewable generators will be tracked, quantified, and verified consistently, reducing some amount of uncertainty and burden from the GHG registry that is minting offsets from renewable electricity generation. It also adds a layer of protection against double selling the carbon value of renewable electricity generation. For clarity, it is also advisable for the REC tracking system to display the name of the GHG project registry in which the facility is registered, and vice versa, and also a means to track the serial numbers of any RECs that were retired in a tracking system in order to mint the offsets.

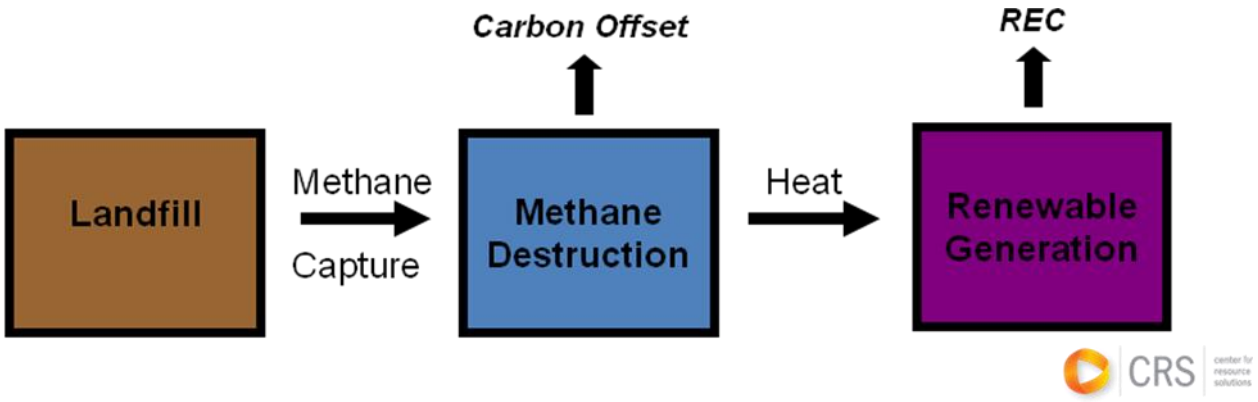
However, not all additional renewable energy facilities currently follow the practice of registering in a REC tracking system and retiring RECs specifically to mint carbon offsets. Because of this, GHG registries should check if facilities are registered in other registries or REC tracking systems in order to prevent minting offsets for generation that is already tracked elsewhere prior to minting offsets from renewable electricity generation. The Voluntary Carbon Standard (VCS) can provide a good example. In order to allow competition among GHG registries, carbon offset projects using VCS protocols can register in one of three registries in order to track and be credited with offsets (called Voluntary Carbon Units or VCUs in the VCS system). To ensure that a single project only is credited with VCUs in one system, and not receiving double or triple VCUs by registering in more than one registry, all projects registered in any of the three registries are also tracked in (but not credited by) a central project listing. When a new project registers with one of the three registries, the project's data are reported back to the central body, and the central body searches through all registered projects based on latitude and longitude of the new and existing projects. Also, APX recently launched a product called Project

Track that presents publicly available information on facilities registered in a GHG registry, allowing for simplified crosschecks.

Issue 3: Tracking offsets from methane destruction and RECs from renewable energy generation from the same project to ensure there is no double counting

Background

In a few specific instances, certain projects that generate renewable electricity can create both carbon offsets and RECs from different portions of their activities. For example, electricity generation using digester methane and electricity generation from landfill gas projects that meet additionality requirements can be credited with carbon reductions for the methane destruction and separately credited with RECs for renewable electricity generation. This ability stems from the combustion of biogenic methane—a gas with a global warming potential twenty times higher than that of carbon dioxide—earning the facility carbon offsets, and then the project using the heat from combustion to create electricity can qualify to generate RECs. Biogenic methane destruction raises a particular issue for such facilities' registration in REC tracking systems: how can the carbon offsets be counted and tracked separately from the RECs?



Discussion

REC tracking systems have no means of tracking offsets from activities other than renewable power generation, even if such systems are able to calculate and display the carbon value of renewable attributes. On the other hand, GHG project registries may lump the carbon value of the RECs into the carbon avoidance value of all activities at the facility and track only carbon offsets without recognizing that some of the carbon value arose from renewable generation and is also tracked in a REC tracking system. Because of this, there is a potential for double counting if the GHG emission reduction value of electricity generation from a methane destruction and renewable electricity generation project is tracked in both a REC tracking system and a GHG project registry.

Further integrating REC tracking systems and GHG registries to track all attributes of generation in one place is one approach to preventing double counting of the benefits of biogenic methane destruction and electricity generation. This solution could take a long time to implement, and is

unlikely, given the trajectory of tracking system and GHG registry development. An alternative is to build off of the recommendations in the previous section, tracking offsets and RECs in separate systems.

Best Practice

To address this potential for double counting, a biogenic methane facility could track its metered electricity generation in a REC tracking system and the offsets from methane destruction in a GHG registry. In the case that the carbon quantification methodology used in the GHG registry incorporates the carbon value of renewable electricity generation, the registry could require proof that the RECs were retired specifically toward the registry's calculation and minting of offsets for the project. Of course, registration in a REC tracking system is not absolutely necessary, especially in the case that the carbon calculation counts the carbon benefits of renewable electricity generation, but it can be advantageous to register all commodity generation in the appropriate tracking system or registry and be able to show how RECs are being allocated to overall carbon offset value. Moreover, should a Federal RES be approved by Congress, the registration of renewable generation in a REC tracking system will be necessary for participation.

Section 2: Treatment of renewable energy and RECs in GHG inventories

A GHG inventory (sometimes referred to as registry or footprinting inventory) provides the guidance and infrastructure necessary for organizations to measure and document their GHG emissions. These organizations could include a variety of member types, such as businesses, cities, nonprofits, universities, local, state, and federal government agencies, electric power utilities, municipalities, and many others. Companies join GHG inventories as a way to show their climate commitments, quantify and manage their emissions, and track their progress toward their emission-reduction goals. The major GHG inventories in North America include the U.S. EPA's Climate Leaders program, the Climate Registry, the Chicago Climate Exchange (CCX), the Carbon Disclosure Project, and the Canadian Standards Association's (CSA) GHG CleanStart Registry. Each GHG inventory has its own standards and rules for participants, as well as separate infrastructure for recording and tracking emissions. Each GHG inventory also has different guidance regarding the methodologies for accounting for the emissions from various sources and calculating participants' emissions.

All current GHG inventories follow the same general structure recommended by the World Resources Institute (WRI)'s GHG Protocol.[9] This involves breaking down an entity's total emissions into different categories, or "Scopes." Scope 1 emissions include any direct emissions that occur from sources owned by the company (such as onsite combustion of fossil fuels, or tailpipe emissions from vehicles owned by the company). Scope 2 emissions are the indirect emissions that occur due to the consumption of electricity that is generated by a project(s) not owned by the reporting entity. Scope 3 emissions are all remaining indirect

9 *The Greenhouse Gas Protocol, A Corporate Accounting and Reporting Standard, Revised Edition*. The World Business Council for Sustainable Development and the World Resources Institute. www.wri.org/publication/greenhouse-gas-protocol-corporate-accounting-and-reporting-standard-revised-edition

emissions not covered by Scope 1 or Scope 2, which can include emissions resulting from activities such as employee air travel or employee commute.

The emissions from a company-owned electricity generation plant are reported as Scope 1 emissions by a party participating in a GHG inventory system. The purchase of electricity by a party participating in a GHG inventory is accounted for in that entity's Scope 2 emissions. Oftentimes, RECs are sold separately from the underlying electricity. When a GHG inventory allows REC purchasers to report a reduction in Scope 2 emissions for those purchases, certain steps should be taken to minimize the risk of double counting. For the sale of RECs by entities reporting to a GHG inventory, there are currently discrepancies in recommended accounting practices. Both of these issues will be discussed in this section.

Issue 4: Accounting for REC purchases by an entity participating in a GHG inventory

Background

Commercial customers accounted for the overwhelming majority of all voluntary renewable energy sales in 2008.[10] This group of purchasers largely comprised businesses that wanted to show their renewable energy commitments to their customers and reduce their overall carbon footprint. Many of these large purchasers are the same businesses reporting their GHG emissions in a GHG inventory, and a majority of these renewable energy purchases are REC purchases, where the customer is buying the environmental attributes of renewable energy generation without buying the underlying electricity.

Consistent with guidance published by the World Resources Institute, some GHG inventories recommend that the participating entity should count their REC purchase as a reduction in their overall Scope 2 emissions. One example of this is the Climate Leaders program which allows REC purchases to reduce an entity's Scope 2 emissions as long as the purchase comes from an eligible facility.[11] However, a potential for double counting exists if no check is performed to ensure that the REC purchaser actually had ownership over the environmental benefits.

Accurate accounting of REC purchases in Scope 2 emissions

Due to the way the electric grid works and supported by the existing infrastructure of REC tracking and accounting systems, the purchase of a REC has the same impact on GHG emissions as purchasing renewable electricity directly from a renewable energy facility, or hosting a grid-connected solar PV installation on one's roof. As such, it is accurate in terms of the environmental impact of the activity to count a REC purchase as decreasing an entity's Scope 2 emissions liability in a GHG inventory.

This adjustment in Scope 2 emissions is not only a correct reflection of the way the electricity grid operates, but also of the motivation of the purchaser. A major driver of REC purchases by

10 Bird, L.; Kreycik, C. and Friedman, B. (2009). Green Power Marketing in the United States: A Status Report (2008 Data), NREL/TP-6A2-46581. Golden, CO: National Renewable Energy Laboratory, September. http://www.nrel.gov/docs/fy09osti/46581.pdf

11 Climate Leaders Greenhouse Gas Inventory Protocol, Optional Modules Methodology for Green Power and Renewable Energy Certificates (RECs), Climate Protection Partnerships Division, Office of Atmospheric Programs, Version 2.1, U.S. Environmental Protection Agency, November 2008.

businesses is the ability to reduce GHG emissions, as well as to demonstrate these actions to customers. As a GHG inventory is another avenue for a business to show their climate commitments, allowing the purchase of RECs to reduce an entity's Scope 2 emissions helps facilitate this claim.

It should be noted that if there is a cap and trade on emissions covering the electricity sector, the ability of REC purchasers to make claims about reducing GHG emissions could be in jeopardy. This is because under a cap and trade, the overall level of emissions in a region is set by the level of the cap. When renewable energy is generated--while this causes a fossil fuel facility to back down--it does not necessarily reduce the overall emissions in a region unless the number of allowances in circulation is also reduced. If there is a mechanism, such as a set aside and retirement of allowances, to reduce the number of allowances in circulation on behalf of renewable energy sales, then emission reduction claims by REC purchasers can be made. However, absent such a mechanism, a REC purchaser cannot claim to reduce net GHG emissions.

There is also the potential that under certain circumstances, the REC purchaser's environmental claims might be invalidated if they are not the sole owner of the environmental attributes. This could be because the company selling the REC might sell the same REC to multiple parties, or because the utility that owns the underlying electricity might also claim the benefits.[12] Without a proper check to ensure that the environmental attributes of the RECs are not already being claimed by another party, a potential issue exists if the purchaser of the RECs adjusts the GHG emissions in the Scope 2 portion of its GHG inventory.

Best Practices

If an entity participating in a GHG Inventory is purchasing RECs and wants to count them as a deduction in their Scope 2 emissions, it should be assured that those RECs were retired on behalf of the purchaser and that multiple parties are not claiming ownership of the REC. There are a number of potential ways this can be done:

- the purchaser of the REC that is participating in a GHG Inventory can show proof of its REC purchase and that a third-party renewable energy certification program, such as Green-e Energy, certified the transaction
- the GHG inventory can check for proof of retirement of the RECs on behalf of the purchaser in the REC seller's REC tracking system account
- the purchaser of the REC that is participating in a GHG Inventory can have an account in a REC tracking system, and show proof of retirement in its own REC tracking system account to the GHG Inventory program administrator

Ideally, there would be a way for REC tracking system accountholders to transfer RECs to participants in GHG inventories and have the GHG inventory automatically verify the ownership of the REC and deduct a commensurate amount of GHG emissions from that entity's Scope 2 emissions. This would greatly reduce the potential for double counting or double claiming of the environmental attributes of RECs.

Issue 5: The sale of RECs by an entity participating in a GHG inventory

12 These types of double selling can be prevented through the use of tracking systems and third-party certification

Background

Many utilities, municipalities, electric service providers, and generation owners have begun to voluntarily report their emissions in GHG inventories. These types of participants oftentimes own renewable energy facilities in addition to fossil fuel plants. Electric generation owners participating in a GHG inventory report the emissions from the electricity generation at the facilities they own as Scope 1 emissions.

When the owner of a renewable energy facility sells the RECs from the facility to another party (such as a utility purchasing the RECs to meet a renewable portfolio standard, or to a business that uses this to make a renewable energy claim), it is selling off the renewable attributes of the generation. Different GHG inventories use different methodologies and have varying recommended guidance on how facility owners should account for the carbon associated with the sale of their RECs.

The U.S. EPA Climate Leaders program currently requires participants with an on-site green power system to account for the RECs that are sold to another party by reporting indirect emissions for the electricity associated with the RECs sold.[13] The Climate Leaders program prescribes an emission rate for the underlying electricity that has been stripped of the RECs. Other GHG inventories do not require any adjustment to be made.[14]

Discussion of requiring an upward adjustment in emissions for REC sales

As the environmental benefits, including the carbon benefits, of renewable energy generation are embodied in the REC,[15] assigning an emissions value to the underlying electricity when the RECs are stripped off is a more accurate reflection of the way REC markets work. The purchaser is buying the REC in order to make an environmental claim; so some believe the seller of the commodity should no longer be able to claim the benefits or use of the product that has been sold. The use of REC tracking systems can provide a clear way to track these REC sales and help ensure accuracy within the GHG inventory.

If the REC purchaser is counting the emission reduction benefit of the REC in their own GHG inventory's Scope 2 emissions, this could be considered a double counting of GHG benefits if the REC seller does not adjust their emissions inventory upward. Furthermore, if the REC originates from an additional facility that is certified by an offset certification program, the renewable energy could be sold as an offset. In this instance, if the offset is used to reduce the purchaser's Scope 1 emissions, then a double counting would occur within the same Scope.

Best Practices

Requiring an upward adjustment in Scope 1 emissions for the sale of RECs accurately represents the way electricity markets work. If the goal of a GHG inventory is to not allow the zero-emissions attributes of renewable energy to count in the renewable energy facility owner's Scope 1 emissions as well as the emission reduction benefit to exist in the REC purchaser's Scope 2 emissions, then the GHG Inventory should require an adjustment in Scope 1 emissions

13 Climate Leaders Greenhouse Gas Inventory Protocol, Optional Modules Methodology for Green Power and Renewable Energy Certificates (RECs), Climate Protection Partnerships Division, Office of Atmospheric Programs, Version 2.1, U.S. Environmental Protection Agency, November 2008.

14 The Chicago Climate Exchange's methodology is not readily available to non-members; The CSA's GHG CleanStart Registry follows ISO 14064-1 standards which do not provide clear guidance on how to account for REC sales; The Carbon Disclosure Project follows ISO 14064 and WRI standards, which do not provide clear guidance on how to account for REC sales.

15 This holds true if there is not a cap on CO_2 emissions in the region in which the generator is located. If there is a cap on CO_2 emissions, the REC may or may not include the carbon benefits, depending on the implementing rules of the regulation.

for the sale of RECs. The GHG Inventory should develop a methodology to calculate the emissions value of the underlying electricity so that there are clear and consistent emission rates used by all members.

Regardless of whether a GHG Inventory allows the environmental attributes of the REC to count in both the renewable energy facility owner's inventory and the REC purchaser's inventory, GHG inventories should also have clear guidance on how participants should account for REC sales. Providing flexibility to members on accounting methods will cause the perverse incentive for entities to not report REC sales in order to have lower Scope 1 emissions.

Modifications to GHG inventories for consistency in recognizing and accounting for renewable energy purchases and sales can help increase the accuracy of GHG footprints by registry members and avoid double counting, as well as account for the null power when RECs are sold separately from the electricity. For both issues presented in this section, increased communication between GHG inventories, as well as between GHG inventories and REC tracking systems is recommended to prevent double counting.

Section 3: Accounting for Emission Characteristics of System Mix

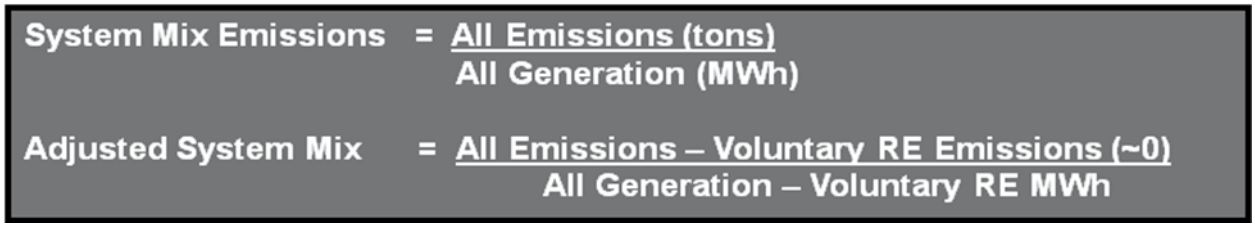
Issue 6: Accounting for Emission Characteristics of System Mix

Background

By default, a utility's customers receive "system mix" electricity, which comes from the mix of electricity resources that are owned or purchased by the utility on behalf of its pool of customers (but not sold in a specific sale such as in a sale to a wholesale electricity buyer or a sale to a voluntary green pricing customer). For example, if a utility buys a mix of coal, natural gas, and wind electricity but sells the wind electricity to voluntary-market customers, then the rest of its customers will by default receive electricity derived from coal and natural gas. Typically, electricity that has been stripped of the attributes that identify it as having come from a particular facility (RECs in the case of renewables) is called "null power" and would be assigned the resource characteristics of system mix electricity in order for resource accounting to balance out.

The typical method of calculating regional system mix emissions is dividing all emissions due to regional generation by the total number of MWh generated in the region. Sales of renewable energy/RECs to specific voluntary market customers, such as through a voluntary green pricing program, are not typically netted out of the calculation. Failure to net out voluntary renewable energy sales has the consequence that the calculated emission rate is artificially lower than the emissions would be if specific renewable energy sales were factored out. Using the most recent date available on the U.S. voluntary renewable energy market and U.S. electricity sector emissions, this error is less than one half of one percent, based on eGRID data. Nonetheless, as voluntary purchases of renewable generation continue to grow, users of such system average emissions calculations, most importantly GHG registries, should adjust their system average calculations to more accurately reflect the fact that some of the renewable energy in the U.S. electricity grid has specific claims against it and must not be incorporated into general system mix calculations.

The following provides a comparison for calculating the emissions associated with system mix (RE stands for “renewable energy” in the graphic):



REC tracking systems can be used to help calculate the resources contributing to system mix electricity, though different REC tracking systems have different capabilities to this end.

Discussion

PJM-GATS and NEPOOL-GIS track generation from all generators in their footprints, and thus can calculate their respective region’s system mix accurately. Each MWh reported to these systems causes the facility owner to receive a transferable certificate showing the attributes of generation of that MWh. Utilities purchase these certificates to substantiate use of electricity from the facility specified on the certificate. At the end of each reporting period the certificates in a utility’s account are tallied to determine the mix of resources that utility used for the year. Any electricity used by a utility in the region in excess of the number of certificates held by all utilities is assigned an average emissions figure, which is based on the total number and type of certificates that are left un-purchased by load serving entities. Regional system mix calculations can then be applied to any MWh purchased by a utility that do not have the attributes of generation associated with them, allowing the utility to factor the regional system mix into their particular overall system mix along with MWh from identifiable facilities (i.e. MWh that do have their generation attributes associated with them and specifically bought by the utility).

PJM-GATS and NEPOOL-GIS, being all generation tracking systems, contain data that is more current than eGRID data, which typically lags by two years in its reporting. They can therefore provide even more accurate emissions and claims data than the current method of calculating system mix and its emissions. However, in systems other than PJM-GATS and NEPOOL-GIS, converting to track all generation in order to be able to provide this level of information could be difficult, expensive, and is unlikely to happen.

Best Practice

GHG Registries that use system mix emissions, as well as utilities and other entities calculating system mix, should use a system mix that is adjusted based on tracking system reporting and REC retirements. Renewable generation allocated to voluntary green pricing programs, voluntary REC sales and uses other than delivery to default utility customers should be factored out of system mix calculations. PJM-GATS and NEPOOL-GIS calculation methods described above can still be useful to other REC tracking systems to provide information for calculating system mix. Tracking system reporting provides proof that the generation of certain facilities registered in the tracking system has been claimed for uses outside of a utility’s system mix, allowing accurate deduction of such MWh from system mix calculations.

Conclusion

In summary, employing best practices for avoiding double counting of the carbon attributes of RECs and carbon reduction projects leads to clarification in the marketplace, strengthening of purchasers' environmental claims, and increased consumer confidence. Although there is currently limited interaction between REC tracking systems, GHG project registries, and GHG inventory systems, there is a need for more collaboration between these systems, especially as carbon and REC markets grow. A potential next step for the ideas presented in this paper is to work on developing protocols between systems related to the best practices outlined in the summary table on the following page. A committee of representatives and stakeholders from REC tracking systems, GHG project registries, and GHG inventory systems could be formed by ETNNA to investigate and facilitate interactions between the systems.

Issues	Best Practices		
	REC Tracking Systems	GHG Project Registries	GHG Inventory Systems
1. How to track the carbon equivalencies of renewable energy in a voluntary renewable energy tracking system	• Clearly differentiate or mark facilities that meet offset programs' additionality criteria • Specify carbon calculation methodology used • Add a Retirement Reason option for use as offset • Do not separate the carbon attributes from the REC as a separate commodity • Do not by default list carbon values for all facilities		
2. How to track RECs and carbon offsets from the same renewable energy project to ensure there is no double counting of carbon offsets (offsets only from renewable energy generation)	• Track RECs for MWh of electricity generation • System may provide carbon equivalency information, but not necessary • If the additional facility is also in a GHG project registry, this should be noted on facility's profile • For offsets to be minted from RE generation, REC tracking system should provide proof to GHG project registry that REC reservation in	• If offsets are transferred from a REC tracking system to a GHG project registry, the GHG project registry should require proof that REC reservation in the REC tracking system was for creation of offsets in registry • Facility profile in GHG project registry should state which REC tracking system the facility is registered in • RECs and offsets from the same MWh of	

	REC tracking system was for creation of offsets in a GHG project registry • RECs and offsets from the same MWh of generation should not exist simultaneously in separate [generic] tracking systems	generation should not exist simultaneously in separate [generic] tracking systems	
3. How to track carbon offsets from methane destruction and RECs from renewable energy generation from the same project to ensure there is no double counting	• Track renewable energy in REC tracking system if emission reductions from renewable energy not already tracked in a GHG project registry • GHG Registry should require proof of REC reservation in REC tracking system if GHG registry includes RE generation's carbon benefits toward overall facility carbon offsets • GHG registry tracking offsets of methane destruction should be noted on facility's profile in REC tracking system	• If offsets from renewable energy are transferred from a REC tracking system to a GHG project registry, the GHG project registry should require proof that REC reservation in the REC tracking system was for creation of offsets in the registry • The GHG Registry should require proof of REC reservation in the REC tracking system if the GHG registry includes RE generation's carbon benefits toward overall facility carbon offsets • Specify whether emissions reductions from RE generation are included • Facility profile in GHG project registry should state which REC tracking system	

		the facility is registered in	
4. The purchase of RECs by an entity participating in a GHG inventory	• Retire RECs on behalf of the purchaser • Coordinate information between REC tracking systems and GHG inventory systems		• Check to make sure RECs are fully aggregated and retired by the purchaser or on behalf of the purchaser • Coordinate between REC tracking systems and GHG inventory systems
5. The sale of RECs by owners of renewable energy facilities participating in a GHG inventory	• Retire RECs on behalf of the purchaser		• Adjust upward Scope 1 emissions of facility if goal is no double counting in Scope 1 and Scope 2 emissions • More clarity on guidance by GHG inventory systems • More consistent rules between GHG inventory systems
6. Accounting for emission characteristics of system mix	• Use an adjusted system mix calculation • Do not include generation from claimed renewable energy		• For utilities: use adjusted system mix calculations that don't include generation from renewable energy

Acronym List

CAR	Climate Action Reserve
CCX	Chicago Climate Exchange
CDM	Clean Development Mechanism
CO_2	carbon dioxide
CSA	Canadian Standards Association
EPA	Environmental Protection Agency
ERCOT	Electric Reliability Council of Texas
ETNNA	Environmental Tracking Network of North America
GHG	greenhouse gas
ISO	International Organization for Standardization
kWh	kilowatt-hour
M-RETS	Midwest Renewable Energy Tracking System
MIRECS	Michigan Renewable Energy Certification System
MWh	megawatt-hour
$MtCO_2e$	million metric tons carbon dioxide equivalent
NAR	North American Renewables Registry
NEPOOL-GIS	New England Power Pool/Generation Information System
NYSERDA	New York State Energy Research and Development Authority
PJM-GATS	PJM Generation Attribute Tracking System
PV	photovoltaic
REC	renewable energy certificate
RES	renewable electricity standard
RGGI	Regional Greenhouse Gas Initiative
RPS	renewable portfolio standard
VCS	Voluntary Carbon Standard
VCU	Voluntary Carbon Unit
WREGIS	Western Renewable Energy Generation Information System
WRI	World Resources Institute

Glossary of Terms

Build Margin
The build margin represents the emission reductions that occur because a renewable energy facility is built instead of a business-as-usual facility; Baseload technologies include biomass, geothermal, ocean thermal and hydro.

Carbon Offset
A carbon offset represents a specific quantity of greenhouse gas (GHG) emission reductions (i.e. a ton of carbon dioxide absorbed or avoided) from a project-based activity, which is purchased in order to negate or diminish the impact of the recipient's GHG emissions. When you purchase an offset, you alone have the right to all associated claims about the environmental benefits it embodies. An offset is to be regarded as real environmental commodity, not a donation or investment in a future project. The purchase of a Certified offset helps stimulate market demand for emission-reduction projects that can help mitigate the effect of climate change.

Combined Margin
The combined margin is the average of the build margin and the non-baseload output emission rate; Non-baseload technologies include wind, solar, wave, and tidal.

Environmental Attributes
An environmental attribute is an instrument used to represent the environmental costs or benefits associated with a fixed amount of electricity generation, usually from a specific generating plant. For renewable facilities, environmental attributes represent the general environmental benefits of renewable generation such as air pollution avoidance. The exact quantity of the environmental benefit (e.g. pounds of emission reductions of a given pollutant) is not indicated by an environmental attribute, though it can be quantified separately in pollution trading markets and through engineering estimates. The environmental attribute represents all environmental benefits, whether or not trading markets for such pollutants or benefits exist.

Greenhouse Gas (GHG)
Greenhouse gases are gases in the Earth’s atmosphere that produce the greenhouse effect. Changes in the concentration of certain greenhouse gases, due to human activity such as fossil fuel burning, increase the risk of global climate change. Greenhouse gases include water vapor, carbon dioxide, methane, nitrous oxide, halogenated fluorocarbons, ozone, perfluorinated carbons, and hydrofluorocarbons.

Greenhouse Gas (GHG) Inventory System
GHG inventory systems account for the carbon footprints of their participants. Individuals and companies measure their carbon dioxide equivalent emissions in metric tons using accepted methodologies and report them to an inventory system.

Greenhouse Gas (GHG) Project Registry
Emissions registries track carbon offsets. Most registries are automated, contain specific information about each carbon offset, and are accessible to market participants over the internet. Like tracking systems, GHG project registries are databases, typically electronic, with basic information about each metric ton of CO_2 equivalent. Electronic emissions registries for carbon offsets allow the offsets to be transferred among account holders much as in online

banking. Most registries assign a unique identification number for each metric ton of emissions reductions. The database tracks static information for each metric ton, including project location, project type, project developer, the year the project began, and the vintage (date) of the emissions reduction. Since each metric ton has a unique identification number and can only be in one account at any time, this reduces ownership disputes.

Kilowatt-Hour
A kilowatt-hour (kWh) is the standard unit of measure for electricity. One kilowatt-hour is equal to 1,000 watt-hours. The total number of kilowatt-hours charged to your bill is determined by your electricity use. For example, if you used a 100-watt light bulb for 10 hours, you would be billed for one kilowatt-hour (100 watts x 10 hours= 1,000 watt-hours). The average home in the United States uses 750 kWh/ month.

Megawatt
One thousand kilowatts, or 1 million watts; standard measure of electric power plant generating capacity.

Megawatt-hour
One thousand kilowatt-hours or 1 million watt-hours.

Null Power
Electricity that is stripped of its attributes and undifferentiated. No specific rights to claim fuel source or environmental impacts are allowed for null electricity. Also referred to as commodity or system electricity.

Power Pool
An association of interconnected electric systems in a region, often having an agreement to coordinate operations and plans for reliability improvements.

Renewable Energy Certificate (REC)
A Renewable Energy Certificate (REC), also known as a Green Tag, Renewable Energy Credit, or Tradable Renewable Energy Certificate (TREC), is a tradable environmental commodity used in North America to represent proof that one megawatt-hour (MWh) of electricity was generated by an “eligible” renewable energy resource and each REC embodies the renewable energy attributes (environmental and social) associated with the generation of power from that resource.

When a renewable energy facility operates, it creates electricity that is delivered into a vast network of transmission wires, often referred to as “the grid.” The grid is segmented into regional power networks called pools. To help facilitate the sale of renewable electricity nationally, a system was established that separates renewable electricity generation into two parts: the electricity or electrical energy produced by a renewable generator and the renewable “attributes” of that generation. (These attributes include the metric tons of greenhouse gas that were avoided by generating electricity from renewable resources instead of conventional fuels, such as coal or gas.) The electrical energy associated with a REC may be sold separately and used by another party or it may be kept bundled with the REC. If it is kept bundled then it is called renewable electricity. These renewable (“green”) attributes can also be sold separately as RECs. One REC is issued for each megawatt-hour (MWh) unit of renewable electricity produced. The electricity that was split from the REC is no longer considered "renewable" and cannot be counted as renewable or zero-emissions by whoever buys it.

REC Tracking System
An electronic system that accounts for renewable energy. Also referred to as an electricity certificate tracking system. Certificate tracking systems for electricity are regionally-based and were created to provide a mechanism to account for state renewable portfolio standard programs. The voluntary market also uses these tracking systems. For every MWh of renewable generation, a certificate is created. Each certificate has its own unique serial number. Other information that is tracked with the certificate includes: energy source, generation/conversion technology, plant location, and vintage (i.e., when the certificate was created).

Renewable Electricity Standard
A state or federal level policy that requires that a minimum amount (usually a percentage) of electricity supply provided by each supply company is to come from renewable energy. Also known as a Renewable Portfolio Standard.

Renewable Energy
A resource is called renewable if it can be naturally replenished in a reasonable period of time. Renewable sources of electricity can include solar electric, solar thermal electric, wind, geothermal, biomass, low-impact hydroelectric, wave and tidal power. In general, renewables have lower negative environmental impacts than non-renewables. Non-renewable resources refer to fuels of which the Earth is endowed with fixed stocks; once the stocks are depleted no more will be available on any practical timescale. The primary examples of non-renewable resources include fossil fuels (e.g. coal, petroleum, natural gas, tar sands and oil shales) and nuclear fuels.

Renewable Portfolio Standard
See *Renewable Electricity Standard*.

Scope Emissions
The World Resources Institute has developed guidelines for determining the boundaries of direct and indirect greenhouse gas emissions when developing a carbon inventory (the calculation of how much carbon you or your company, for example, are responsible for). That is, what emissions do you produce, and which do you cause to be produced. For example, an electricity generator at your office is a source of direct emissions. Indirect emissions include commuting to work. They are organized according to "scope:"

- **Scope 1** emissions are direct greenhouse gas emissions from sources owned or controlled by the entity.
- **Scope 2** emissions are indirect, and associated with the generation of electricity, heating/cooling, or steam purchased for the entity's own consumption.
- **Scope 3** are other indirect emissions not covered in Scope 2, including employee business travel; transportation of products, materials, and waste; outsourced activities; and production of imported materials.

Appendix: Comparison of Carbon Dioxide Calculations for Renewable Energy

Program	REC / Offset	Carbon Value Methodology	Carbon equivalency[16]
Green-e Energy	REC	Non-baseload output emission rate by NERC region	2092.64 lbs/MWh
Green-e Climate Protocol for Renewable Energy	Offset	Build margin for baseload technologies[17] Combined build and operating margin for non-baseload technologies[18] by NERC region	1813 lbs/MWh
U.S. EPA Climate Leaders Program	REC (allowable scope 2 offset)	Non-baseload output emission rate by eGrid sub-region	2158.79 lbs/MWh
The Voluntary Carbon Standard	Offset	Determined on a project-by-project basis	Methodology is project specific
The Gold Standard	Offset	Determined on a project-by-project basis	Methodology is project specific

16 Carbon equivalency values will vary based on region of generation. For the purposes of illustrating the differences in equivalencies between various programs, carbon equivalencies are shown above based on a sample facility in Minnesota, which is located in the MRO (Midwest Reliability Organization) NERC Region and the MRO West eGrid sub-region.
17 The build margin represents the emission reductions that occur because a renewable energy facility is built instead of a business-as-usual facility; Baseload technologies include biomass, geothermal, ocean thermal and hydro.
18 The combined margin is the average of the build margin and the non-baseload output emission rate; Non-baseload technologies include wind, solar, wave, and tidal.