Corporate and Voluntary Renewable Energy in State Greenhouse Gas Policy

An Air Regulator's Guide



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Todd Jones
Senior Manager, Policy and Climate Change Programs

Noah Bucon
Senior Analyst, Policy and Certification Programs

CRS center for resource solutions

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1. Introduction

How will renewable energy reduce greenhouse gas (GHG) emissions and who should pay for what reductions? These are central questions for state air regulators implementing GHG policies or developing regulatory programs to meet climate change goals. They are also central for electricity consumers—both ratepayers paying for state Renewable Portfolio Standard (RPS)[1] programs and customers that choose to purchase renewable energy voluntarily. The answers depend not only on the amount of emissions reductions from renewable energy and who can pay, but also on how those emissions reductions accumulate through different policies and programs and what different consumers are paying for. They depend not only on supply of renewable energy, but also on demand for it. They depend not only on technological and resource limitations, the cost of project development, and incentives to developers and sellers, but also on what the benefits are for buyers and how policy may intentionally or unintentionally support or erode those benefits. In other words, the answers to these questions depend on how renewable energy that is used by different consumers is treated and accounted for under state GHG policies and regulations—specifically, whether new buyers can support more renewable energy, or costs simply shift from one set of buyers to another, and how that cost shifting affects long-term demand for renewable energy.

Renewable energy that is used to meet the RPS requirement and delivered to all ratepayers can support state carbon policies and regulations. By displacing emitting generation and reducing emissions at regulated sources, RPS generation will help achieve compliance with GHG limits for the power sector. The RPS and RPS ratepayers therefore lower the cost of compliance for regulated entities under the GHG program. In this respect, RPS and GHG regulation (e.g. cap-and-trade) are often considered to be complementary policies that reduce emissions in a state, rather than incremental with respect to emissions reductions or distinct with respect to who pays. In this case, renewable energy used to meet the RPS is not directly moving the needle in terms of GHG emissions, beyond GHG regulations. Rather, GHG regulations are moving the needle and the RPS is supporting that policy. In the same respect, GHG emissions limits may not be driving new renewable energy development; the RPS may be doing that and the price on GHG emissions is supporting that.

Voluntary renewable energy—renewable generation that is purchased voluntarily by businesses and individuals to meet their own goals—is no different from RPS generation both in terms of its emissions reducing effect on the grid[2] and how it is affected by GHG regulation. It displaces emitting generation at regulated sources, and once GHG limits are put in place, it helps achieve those limits and lowers the cost of compliance for regulated entities. But voluntary buyers are motivated by, and in fact paying for environmental and economic benefits. They are not typically investing in collective benefits for the state. If voluntary renewable energy cannot affect statewide emissions and voluntarily purchasing or building renewable energy effectively subsidizes compliance for polluters, then voluntary demand for renewable energy may decrease. In this case, not only will GHG emissions be unaffected by voluntary renewable energy, but, to the extent that voluntary demand can drive development, the state may see less renewable energy overall. Companies—in particular, large sophisticated corporate buyers that account for the majority of sales in the voluntary renewable energy market—may choose to invest in other states and sectors that will allow them to create more impact at the same price.

Decisions about how to account for the emissions reductions associated with voluntary renewable energy in cap-and-trade and other state GHG regulations are ultimately decisions about the impact of renewable energy markets and policy on climate change mitigation. They are also about consumer protection and whether customers are getting what they have paid for, particularly where voluntary renewable energy customers may not be aware that GHG regulations are affecting their benefits and would otherwise make a different purchasing decision. To the extent that both state regulators and consumers are interested in more renewable energy to meet climate change goals as well as more private investment in the state, there are simple, fundamental principles that can guide a variety of options for protecting, if not growing, voluntary demand for renewable energy.

This guide evaluates the effect of GHG regulations for the power sector on voluntary renewable energy and vice versa. It includes guidance for states to prevent GHG regulation from removing the grid emissions benefits of voluntary renewable energy and maintain private investment in emissions-reducing renewable energy. It focuses on "mass-based" GHG regulations for the power sector implemented at the state level, which enforce GHG limits in terms of a mass quantity of emissions (e.g. in pounds or tons of CO_2 or CO_2-equivalent [CO_2e][3]), rather than "rate-based" regulations that set limits in terms of mass emissions per unit of electrical output (e.g. tons of CO_2/megawatt-hour [MWh]).[4] The guidance is based on general models of state mass-based GHG regulation, rather than actual state policies or proposals, though certain actual policies are described and evaluated as examples. There may be other

1. Renewable Portfolio Standard is used a general term in this guide to refer to state-level compliance programs and markets for renewable energy in the U.S. The official names of these programs may vary, including Renewable Energy Standard, Clean Energy Standard, Alternative Energy Portfolio Standard, Renewable Resource Standard, and other similar names.

2. The "grid" is the shared electricity generation, transmission, and distribution network or system.

3. A common unit for greenhouse gases representing the amount of CO_2 that has the equivalent heat trapping ability of quantities of different greenhouse gases.

4. Interactions with and solutions for the voluntary renewable energy market in a rate-based GHG program depend on the requirements and accounting and adjustment mechanisms included in the program. Subsection 8.2 provides brief guidance to states considering rate-based regulations.

important interactions with voluntary renewable energy depending on the details of any individual GHG policy or regulation.

This guide begins with a description of how renewable energy affects GHG emissions. In Section 2, we describe avoided grid emissions due to electricity generation and distinguish them from the direct emissions of generation (the two GHG attributes of electricity generation). We then explain the effect of GHG regulation, first on the direct and avoided emissions associated with renewable energy (Section 3), and then on renewable energy markets. In Section 4, we describe how those attributes are accounted for and transacted in existing markets for delivery and consumption of renewable energy using renewable energy certificates (RECs), and the value that markets place on those attributes. We simplify the dynamics of how the voluntary renewable energy market in particular interacts with regulatory requirements for GHG emissions. In Section 5, we describe a general mechanism used to protect voluntary demand and maintain emissions benefits of voluntary renewable energy under GHG regulations. In Section 6, we describe the environmental benefits of voluntary renewable energy and quantify the avoided grid GHG emissions in the U.S. to estimate the effect of voluntary renewable energy on GHG emissions from the power sector and the importance of maintaining and growing voluntary renewable energy once GHG regulations have been put in place. Section 7 represents a snapshot of GHG regulations in the U.S. and how avoided emissions from voluntary renewable energy are affected. Guidance for states begins in Section 8, which is for states without GHG regulations but that may be considering them. Section 9 includes guidance and recommendations for states with existing GHG regulations, both those with mechanisms to protect the voluntary renewable energy market and those without.

2. Renewable Electricity Generation and GHG Emissions: The Two GHG Attributes of Electricity Generation

Generating electricity can both directly emit an amount of GHGs and cause a net change to GHG emissions from other sources on the grid as generation is displaced (or avoided). We call these the two “attributes” of electricity generation:

1. The direct emissions associated with generation; and
2. The avoided grid emissions due to generation.

Emissions are attributes of generation because they occur at the point of generation, rather than at the point of distribution or consumption, and they characterize the manner of electricity production, along with fuel type, location, and other attributes. Both GHG attributes can be measured in pounds or tons (metric or short) of CO_2e, or expressed as a rate, per unit of electrical output (e.g. MWh). They are each described in Table 1.

While direct emissions can be measured at the point of generation, avoided emissions occur at the location of other generators on the grid and are usually estimated. Avoided emissions are typically calculated as the difference between the direct emissions of the generation that is likely displaced or would otherwise have operated and the direct emissions of the (displacing) generation, per MWh of generation. This is illustrated in Figure 1. Unlike this illustration, the displaced generation is usually estimated as an average mix of generation from many resources rather than generation from any individual generator.

Though avoided emissions occur at the location of other generators on the grid and reflect a change (reduction) in their direct

Table 1. The Two GHG Attributes of Electricity Generation

GHG Attribute of Electricity Generation	Description	Type of Accounting	Value for Renewable Energy Generation
Direct emissions	The direct emissions, emissions profile, or emissions factor associated with the generation.	Attributional, measuring the emissions that can be attributed to the production of electricity.	Zero for wind, solar, and hydropower. Positive for biomass and some geothermal.
Avoided grid emissions	The net change in emissions on the grid due to the generation.	Consequential, measuring the emissions impact or consequences of producing electricity.	The difference between the direct emissions of the generation likely displaced by renewable energy generation (usually generation from marginal or non-baseload resources) and the direct emissions of the renewable energy generation (see above, usually zero). Often estimated as the non-baseload output emissions rate for the region or subregion.

emissions, or the attributes of that generation, that change cannot be attributed to that generation. Rather, avoided emissions are an indirect attribute of the generation that causes the net change to occur.

Avoided emissions have traditionally included emissions reductions (or positive emissions, if the direct emissions are greater than those displaced) that occur on the grid, as opposed to outside of the grid, and those that can be attributed to the generation itself, rather than to the construction or operation of the generation facility. They have not historically included, for example, emissions associated with the manufacturing of generation equipment or emissions associated with additional transmission and distribution infrastructure needed to accommodate the facility.

Renewable electricity generation has these same attributes. The direct emissions associated with renewable energy generation are generally lower than other resources, if not zero for resources like wind, solar, and hydropower. Avoided emissions associated with renewable energy are nearly always positive—the emissions from the facility being displaced are greater than the emissions from the renewable generator. It is nearly always fossil-fuel generation, as opposed to other renewable energy facilities, that is displaced by renewable generation—even where generation occurs in regions

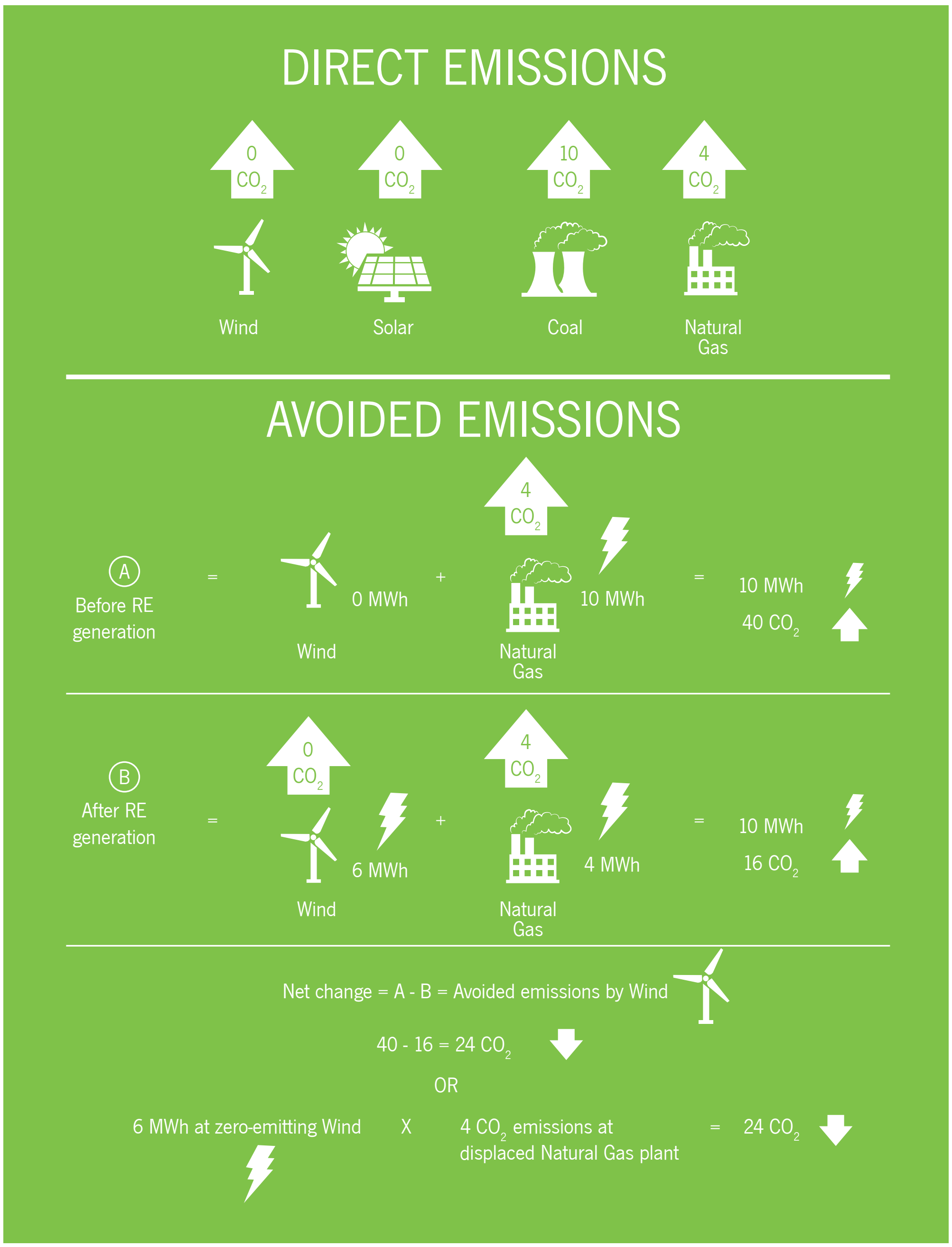


Figure 1.
Illustration of Direct and Avoided Emissions

with high penetration of renewable and other zero-emitting generation sources.[5]

Avoided emissions associated with renewable energy generation are sometimes also calculated to include emissions reductions that occur because the renewable energy generator was built instead of a fossil-fuel plant (called the "build margin"), in addition to emissions avoided on the grid as the renewable generator operates and fossil fuel plants are backed down, as described previously (called the "operating margin"). The build margin is used almost exclusively in the context of carbon offsets that are derived from renewable energy projects. Claims made by producers and consumers of renewable energy related to avoided emissions are typically limited to the operating margin.

Instead of performing expensive and time-intensive grid simulations to pinpoint the emitting units being backed down, it is standard practice to use regional non-baseload (marginal) emission rates to conservatively estimate avoided emissions associated with renewable energy. In the U.S., plant-level data collected by the U.S. Energy Information Administration (EIA), the Federal Energy Regulatory Commission (FERC), and the U.S. Environmental Protection Agency (EPA) is compiled into the EPA's Emissions & Generation Resource Integrated Database (eGRID). eGRID calculates total U.S. electricity average emission rates, fossil-fuel emission rates, and non-baseload emission rates for regions and sub-regions covering the whole country.

3. GHG Regulation and the GHG Attributes of Renewable Electricity Generation

GHG Regulations, as used here, legally limit GHG emissions from electricity generation, whether at the level of individual generating facilities (plant level) or the combined group of generating facilities (sector level). Where GHG Regulations are implemented for an area that is smaller than a self-contained electricity grid[6], for example, where they are implemented by a single state or group of states, GHG Regulations can also include emissions associated with imported power.

Regulating emissions from electricity generation does not affect the direct emissions (the first GHG attribute) of zero-emitting renewable electricity generation. The direct emissions associated with most renewable energy remain the same under GHG Regulations. Emissions from non-zero emitting renewable energy generation could be regulated (e.g. for biomass or some geothermal), in which case GHG Regulations may cause direct emissions associated with that generation to decrease. If they are not directly regulated, or if there is a sector-wide emissions "cap," emissions from these emitting renewable resources may increase as production shifts to low-emissions and unregulated sources.

Regarding the second GHG attribute, GHG Regulations effectively remove avoided grid emissions that occur at regulated emitting facilities. This is the primary effect of GHG Regulations on renewable electricity generation, and it has implications for different renewable energy markets (which are described in detail further on). Under GHG Regulations, avoided emissions due to renewable energy generation will be automatically counted and reported by regulated entities, and since the regulation or cap determines and fixes the level of emissions (at a plant or from the sector), there is no net change to emissions at regulated sources due to renewable energy generation. Where the majority of emissions in the sector are regulated, GHG Regulations remove the majority of the total avoided grid emissions associated with renewable electricity generation.

Under GHG Regulations, regulated emitting facilities whose generation has been displaced by renewable energy generation report lower emissions due to that generation. Those emissions reductions due to renewable energy (the effect of renewable energy on the grid) are being automatically counted toward compliance by the regulated entities. Renewable energy generation effectively makes it easier for regulated entities to comply with GHG Regulations. At the same time, there is no net change to emissions due to the regulations. While renewable energy generation reduces emissions at regulated units (or from the sector), it does not affect the level of emissions from these units that is allowed by regulation (e.g. the cap). Emissions cannot exceed this level and emissions reduced below it can be reversed or made up elsewhere. Renewable energy simply frees up room under the cap for more emissions. As a result, the avoided emissions at regulated units associated with renewable energy generation are equal to zero under GHG emissions limits.

This is true whether the GHG Regulations only cover the electricity sector or cover multiple sectors including the electricity sector. Emissions reductions due to renewable energy either free up emissions at the plant, in the sector, or, if it is a multi-sector cap, the overall emissions for the sector (on the grid) may stay reduced but those emissions (or allowances) may be used in other sectors. In all cases, there is no net change in emissions covered by regulation. California explains how this works for its multi-sector cap:

> "Before the Cap-and-Trade Program was in place, it was reasonable to assume that voluntary generation of renewable electricity would reduce emissions because it would replace electricity power purchased from a utility. With the

5. A sample of multiple studies and grid simulations conducted for various regions across the U.S includes: Final Report - 2006 Minnesota Wind Integration Study, Volume 1, EnerNex Corporation in collaboration with the Midwest Independent System Operator for the Minnesota Public Utilities Commission, November 2006; Estimated Marginal Fuel Displacement by Wind Generation in PJM, Monitoring Analytics, 2009; and Power System Marginal CO_2 Production Factors. Northwest Power and Conservation Council. April 2006.

6. A grid is self-contained where it is not interconnected with other grids and there are no transfers or transmissions of power outside the grid.

economy-wide emissions cap under the Program, substitution of voluntary renewable electricity for power purchased from a utility results in emissions reductions only for the electric sector, but statewide emissions are not necessarily reduced. Instead, when the electric sector requires fewer allowances for compliance, allowances are freed up for use to meet compliance obligations in other sectors, and statewide emissions remain at the level of the cap."[7]

It is important to note that GHG Regulations have this same effect on avoided emissions associated with energy efficiency, non-renewable (including emitting) power generation, and any other activity that reduces generation or emissions at regulated units.

4. GHG Regulation and Renewable Energy Markets

The effect of GHG Regulation on the GHG attributes of renewable electricity generation described in Sections 2 and 3 helps determine how GHG Regulation will affect renewable energy markets. But this also depends on how these attributes are accounted for and transacted in existing markets, and the value that the markets place on those attributes to sustain demand. In this section, we consider how the GHG attributes of renewable electricity generation are accounted for and the market mechanisms used to track and transact those attributes for different purposes, i.e. for accounting, reporting, and claims related to either production or consumption of renewable energy and associated GHG emissions.

4.1 Production vs. Consumption GHG Claims

As shown in Table 2, the GHG attributes of electricity generation relate to electricity producers and consumers differently. The direct emissions associated with generation are emitted by the generator or producer and also consumed by the consumer. They are at once the direct emissions of the generator or producer and the indirect emissions (i.e. also part of the "carbon footprint") of the consumer. There is no inherent conflict between production and consumption claims on these attributes. Direct emissions can be reported by generators to regulators (for compliance with production-based emissions reporting requirements or regulations) or voluntarily. They can also be reported by suppliers or consumers as emissions delivered or consumed (again, either voluntarily or for compliance with delivery- or consumption-based emissions reporting requirements, such as power source and emissions disclosure rules).

Likewise, a single MWh of electricity generation can have a single producer and a single consumer. In the case of renewable energy generation, a generator can claim to be producing zero-emissions power, an offtaking utility/supplier can claim to be delivering that zero-emissions power, and a consumer can claim receipt or use of that power. There is no double counting between these entities in this case. The GHG Protocol[8], a joint initiative of the World Resources Institute (WRI) and the World Business Council for Sustainable Development (WBCSD) that creates international standards for GHG accounting and reporting, has created different emissions categories, or "Scopes" of emissions, to clarify this distinction. Scope 1 emissions are the direct emissions of electricity generators, and Scope 2 emissions are the indirect emissions of electricity consumers.[9] They are the same emissions. All Scope 2 emissions are the Scope 1 emissions of someone else, and the grand total of Scope 1 emissions represent the grand total of all emissions. Scope 2 and other indirect emissions (Scope 3) are reported by consumers of products and services so that they can be managed from a demand-side perspective. There is no double counting between Scope 1 and Scope 2 emissions.

The avoided emissions associated with generation are also at once the emissions effect or impact of the generation for the generator and the emissions effect of delivered or consumed generation for the consumer.

The distinction between production and consumption means that GHG Regulations that affect the GHG attributes of generation will affect both renewable energy producers and consumers. This distinction is also important because it is reflected in a difference between production- and consumption-based accounting and markets for electricity and emissions. Accounting for the emissions associated with consumed or delivered electricity is different than accounting for the emissions associated with electricity production. GHG Regulations will have a different effect on renewable energy producers and consumers in part based on how the GHG attributes of renewable energy generation are tracked and accounted for in each case.

4.2 Production- vs. Consumption-based GHG Accounting

How one accounts for GHG emissions from the power sector depends on what one is measuring or regulating. If one is regulating emissions from production or generation sources, then the GHG accounting is very simple. Simply measure emissions at the

7. State of California Air Resources Board (CARB). Staff Report: Initial Statement of Reasons (ISOR). August 2, 2016. Public Hearing to Consider the Proposed Amendments to the California Cap on Greenhouse Gas Emissions and Market-based Compliance Mechanisms. Pg. 53. www.arb.ca.gov/regact/2016/capandtrade16/isor.pdf

8. For more information, visit: www.ghgprotocol.org.

9. Scopes are defined in the GHG Protocol's Corporate Standard, available here: www.ghgprotocol.org/corporate-standard.

Table 2. **The Two GHG Attributes of Electricity Generation and How They Relate to Producers and Consumers**

GHG Attribute	Description	Producers/Generators: How it is related to producers/ generators	Producers/Generators: Producer/ generator uses	Consumers (Delivery and consumption of generation attributes can only be contractually determined or verified. For renewable energy, it is determined and verified via the REC.): How it is related to suppliers and consumers	Consumers: Supplier and consumer uses	Consumers: Supplier Claims	Consumers: Consumer Claims
Direct emissions	The direct emissions, emissions profile, or emissions factor associated with the generation.	Direct emissions at point of generation. The direct (Scope 1) emissions of the generation owner.	Emissions reporting to regulators. Compliance with source-based (or production- or generation-based) emissions regulations.	Delivered and consumed emissions. The indirect (Scope 2) emissions (part of the carbon footprint) of the consumer.	Emissions disclosure to customers. Scope 2 emissions (carbon footprint) accounting/ reporting by consumers. Supplier-specific emissions factor calculations by suppliers. Tracking emissions for imported electricity.	"The emissions associated with our electricity supply, product or retail sales are X." "The emissions associated with this electricity import are X." "You are receiving/we are delivering zero-emissions electricity."	"By purchasing renewable energy, I've reduced my carbon footprint by X tons of CO2e." "I buy 100% zero-emissions energy."
Avoided grid emissions	The net change in emissions on the grid due to the generation.	The grid emissions effect of generation.	Impact statements primarily by low- or zero-emitting sources. Generating RE-derived carbon offsets (where permitted and in regions without carbon regulations for the power sector).	The grid emissions effect of delivered and consumed generation. The grid GHG emissions impact of the generation of the consumer's electricity.	Calculating the GHG reduction benefits of RE. Voluntary RE set-aside calculations. Impact statements by suppliers and consumers. Characterizing the impact of RE policies. Designing policies to create impact in terms of emissions.	"You are receiving/we are delivering electricity that avoids X tons of CO2e." "Our renewable energy facilities avoid X tons of CO2e annually."	"The renewable energy I purchase avoids X tons of CO2e annually." "The renewable energy I use has a GHG benefit equivalent to taking X cars off the road for one year."

smokestack, directly at the source, and those emissions are assigned to that source and can be evaluated against a compliance obligation for that source. There is no need for a specific accounting or tracking instrument to determine who is responsible for which emissions.[10] This is how all current GHG regulations in the U.S. and most around the world work, including direct regulation of stationary GHG sources (e.g. in Washington State) and cap-and-trade or emissions trading schemes (ETS) (e.g. in California and the Regional Greenhouse Gas Initiative [RGGI]). They are "production-based" (also called source-based or generation-based) regulations and accounting protocols. This is also how we define and use GHG Regulations generally in this guide—to refer to production-based regulations (see Section 3). As explained previously, production-based accounting systems do not determine delivery or consumption of the GHG emissions associated with electricity generation, which may be by different entities than those producing those emissions and that are reporting and regulated under a production-based scheme.

On the other hand, if one is regulating or measuring emissions in the power sector at the point of the supplier of power (e.g. utilities) or the consumer of power (e.g. large commercial and industrial consumers), then it becomes necessary to create an accounting mechanism or tracking instrument for generation attributes, to assign or allocate emissions that occur at the point of generation to suppliers and consumers on the grid. This is due to the nature of electricity and the shared grid: there is and can be no physical or "actual" delivery of specified generation, fuel type or emissions to grid customers. Whereas one can measure emissions and determine fuel type at the point of production, one cannot measure emissions or determine fuel type at the distribution substation or outlet, or indeed once electricity has been injected to the grid. Delivery and consumption of specified (e.g. renewable) power and associated emissions can only be determined contractually.

This means that accounting protocols for production-based GHG Regulations (e.g. cap-and-trade programs), such as the California Air Resource Board's (CARB's) Mandatory Reporting Regulation (MRR) for the state's cap-and-trade program, are accurate for determining who produces which emissions. But they are not accurate for determining who consumes those emissions in the state or the distribution of different sources of power among suppliers and consumers.

To account for the emissions associated with delivered or consumed electricity—that is, to determine the distribution of fuel type and emissions to electricity deliverers or customers on the grid (for example, in order to regulate them or in order to manage one's own demand-side impact or carbon footprint)—you can either embed generation emissions in electrons and use contracts for physical power as a proxy for delivery of specified generation emissions, or you can record generation attributes in a separate contractual accounting instrument or "certificate" and track those. Certificates represent a contractual instrument that embodies the emissions attributes of the power and can be used to convey those emissions (or in the case of most renewable generation, zero emissions and positive avoided emissions) to the owner of the certificate, allowing for a verifiable claim to delivery or use of those emissions.

The same is true for other generation attributes, including fuel type and location. Fuel type and location can be determined at the point of generation. They cannot be determined at the point of delivery or consumption. So, regulations regarding the fuel type used for electricity production that regulate generators would not require an accounting or tracking mechanism to verify the fuel type. But regulations that require that a certain amount of electricity generation from a certain fuel type be delivered or sold to customers (as opposed to generated)—i.e. regulations for utilities and other retail electricity suppliers—do require an accounting or compliance mechanism to demonstrate procurement and delivery of specified, renewable power on the grid. This includes nearly all of state RPS programs in the U.S. Of the 29 state RPS programs in the U.S. (plus Washington DC), all but two are this kind of "consumption-based" regulation, meaning they require that a certain percentage of electricity sales, or delivered or consumed electricity, is met or supplied with renewable resources.[11]

Apart from what is regulated, consumers that want to purchase and suppliers that want to sell specified, renewable power (i.e. power with renewable generation attributes), and/or customers that want to voluntarily measure and report what kind of power they use or consume and the emissions associated with the production of that power (e.g. for carbon footprinting purposes), also need an accounting or tracking instrument to verify their delivery and consumption claims.

4.3 The Role of RECs for Delivery and Consumption of Renewable Energy

Purchasing, delivering or selling green or renewable power means differentiating electricity based on how it was generated or the attributes of generation—that is, allocating the renewable attributes of generation to specific customers. Again, these attributes and specified generation are not physically delivered and are separate from physical electricity. Generation attributes cannot be tracked to suppliers or consumers with physical electricity. Electricity is indistinguishable based on how it was produced and untraceable on the grid. Nevertheless, differentiated electricity products, and specifically renewable energy products, are bought and sold in the U.S., both wholesale and retail. Specified electricity is transacted using contracts, and in the case of renewable electricity using

10. GHG Regulations may include allowances (permits) and/or credits, where trading is permitted. These instruments are not used to measure or verify emissions, determine baseline emissions, or establish compliance obligations.

11. Iowa and Texas have "capacity-based" RPS programs, which specify quotas in terms of megawatts (MW) of capacity. See dsireusa.org.

contractual instruments called renewable energy certificates (RECs)[12].

RECs are the only way to deliver or consume renewable energy in the U.S. They represent property rights to the fully-aggregated non-power generation attributes of renewable electricity generation. They are the essential accounting and tracking tool used to allocate renewable generation to specific customers and to purchase green power, either to demonstrate RPS compliance or meet voluntary demand. Each REC represents the generation attributes of one MWh of renewable electricity that has been added to the grid. These attributes include the renewable fuel type, location, and in almost all cases both GHG attributes described previously—the direct GHG emissions and the avoided grid emissions associated with generation—as well as all other environmental and social impacts and benefits of the generation.[13] This treatment and use of RECs is accepted and consistent across the U.S. Thirty-five (35) states and territories, along with voluntary buyers and sellers of renewable energy—including U.S. federal agencies, utilities and other electric service providers, thousands of companies and municipalities and millions of individuals—use RECs to verify and legally enforce delivery and consumption of renewable energy on the grid.[14] The exclusive use of RECs for this purpose is not contradicted by the remaining states and territories.[15]

As explained in the previous subsection, RECs are not needed for and do not affect renewable energy generation or production claims, precisely because generation attributes can be directly measured and because there is no double counting between production and consumption claims. Rather, RECs enable demand, purchasing, and supplier- or consumption-based compliance for renewable energy generation.

In RPS states, RECs are retired by load-serving entities (LSEs) and other regulated entities to verify that they are complying with state requirements to provide their customers with renewable energy. In addition, all options for voluntarily delivering, purchasing or otherwise using renewable electricity in the U.S., including onsite generation, must include RECs to substantiate a renewable energy usage or environmental claim. According to the U.S. Federal Trade Commission (FTC), the federal law enforcement agency responsible for oversight of marketing claims:

> "A marketer should not make unqualified renewable energy claims, directly or by implication, if fossil fuel, or electricity derived from fossil fuel, is used to manufacture any part of the advertised item or is used to power any part of the advertised service, unless the marketer has matched such non-renewable energy use with renewable energy certificates;"[16]

and,

> "If a marketer generates renewable electricity but sells renewable energy certificates for all of that electricity, it would be deceptive for the marketer to represent, directly or by implication, that it uses renewable energy."[17]

RECs are created at the point of generation, owned by the generator and then transacted to electricity distributors and suppliers (e.g. utilities) or directly to electricity consumers, either "bundled" with the electricity or separate from electricity ("unbundled"):

> "RECs have become an important tool for the renewable electricity market. Once renewable electricity is introduced into the grid, it is physically indistinguishable from electricity generated from conventional sources. Accordingly, consumers cannot determine the source of the electricity flowing into their homes and businesses. However, because electricity transactions can be tracked, entities can 'buy' renewable power by purchasing power bundled with RECs. Under the REC system, a renewable electricity generator splits its output into two components: (1) the electricity itself (i.e., 'null' electricity); and (2) certificates representing the renewable attributes of that electricity. Generators that produce renewable electricity sell their electricity at market prices for conventionally produced power and then sell the renewable attributes of that electricity through separate certificates. Organizations purchase these RECs to characterize all or a portion of their electricity usage as 'renewable' by matching the certificates with the conventionally-produced electricity they normally purchase. By allowing these certificates to be sold separately and not requiring the renewable attribute to

12. The term renewable energy certificate (REC) is used in this guide in place of slightly different names as used by some state, regional, and voluntary programs (e.g. renewable energy credit), which have the same basic features as described here.

13. In most state and tracking system definitions of RECs and green attributes, these GHG attributes are either explicitly included in definitions of RECs or attributes, or they are implicitly included in "all environmental benefits," "whole certificate," or similar inclusive language. But, slight variations in state REC or attribute definitions do not significantly affect the uniformity of the REC instrument as used across the U.S., and certainly do not affect their use in the voluntary renewable energy market. We are aware of only one state, North Carolina, that allows the avoided emissions attribute to be traded separately from the REC for RPS compliance. Though Delaware and Pennsylvania do not appear to require avoided emissions with RECs for compliance, the PJM-GATS tracking system used for compliance in these states includes avoided emissions attributes as a part of a "whole certificate." In the case of North Carolina, the contracting parties can specify that the avoided emissions attribute is attached to the REC if they so choose.

14. Jones, T. (2015). The Legal Basis of Renewable Energy Certificates. Center for Resource Solutions. Available online at: www.resource-solutions.org/pub_pdfs/The%20Legal%20Basis%20for%20RECs.pdf. Also see U.S. Environmental Protection Agency. (2008) Renewable Energy Certificates. Available online at: www.epa.gov/greenpower/documents/gpp_basics-recs.pdf.

15. Jones, T. (2015). The Legal Basis of Renewable Energy Certificates. Center for Resource Solutions. Available online at: www.resource-solutions.org/pub_pdfs/The%20Legal%20Basis%20for%20RECs.pdf.

16. U.S. Federal Trade Commission (FTC). (2012). Guides for the Use of Environmental Marketing Claims; Final Rule. Sec. 260.15(a). Available at: www.ftc.gov/sites/default/files/documents/federal_register_notices/guides-use-environmental-marketing-claims-green-guides/greenguidesfrn.pdf.

17. Ibid. Sec. 260.15(d).

Figure 2. REC Illustration

remain attached to the generated electricity, the REC approach provides flexibility and efficiency for the renewable electricity market."[18]

RECs are either created by a generator or issued to generators by one of several electronic certificate tracking systems ("REC tracking systems") that cover different regions of the U.S. Even in the case that a renewable generator is not registered with a tracking system, RECs are de facto created for each MWh of generation and may be transferred and retired contractually.

Trading a REC in the U.S., whether bundled or unbundled with underlying electricity, effectively transfers ownership rights to all of the attributes of the associated renewable electricity generation to the REC purchaser. Therefore, power without the renewable attributes, or "null power" where the renewable attributes have been sold to a different purchaser, is not renewable power and cannot be claimed as renewable or zero-emissions energy:

> "In addressing these issues in the Green Guides, the Commission [...] did warn that power providers that sell null electricity to their customers, but sell RECs based on that electricity to another party, should keep in mind that their customers may mistakenly believe the electricity they purchase is renewable, when legally it is not. Accordingly, it advised such generators to exercise caution and qualify claims about their generation by disclosing that their electricity is not renewable.[19]"[20]

In this way, RECs prevent double counting of the same renewable generation by multiple consumers or more than once by a particular consumer:

> "[T]he operation of the renewable energy market relies heavily on the expectation of all market participants that these certificates have not been counted or claimed twice (i.e., double counted). Such double-counting can occur, for instance, through [...] renewable energy claims made by a company that already sold the RECs for its renewable generation. [...] Such double counting, in turn, not only risks deceiving consumers but also threatens the integrity of the entire REC market. By selling RECs, a company has transferred its right to characterize its electricity as renewable."[21]

18. U.S. Federal Trade Commission. (2015). Letter from James A. Kohm, Associate Director, Division of Enforcement, Bureau of Consumer Protection, to R. Jeffrey Behm, Esq., Sheehey, Furlong & Behm, P.C. February 5, 2015. Available at: www.ftc.gov/system/files/documents/public_statements/624571/150205gmpletter.pdf.

19. See Statement of Basis and Purpose at 225, available at: wwwftc.gov/sites/default/files/attachmentslpress-releases/ftc-issues-revised-green-guides/greenguidesstatement.pdf.

20. U.S. Federal Trade Commission (FTC). (2015). Letter from James A. Kohm, Associate Director, Division of Enforcement, Bureau of Consumer Protection, to R. Jeffrey Behm, Esq., Sheehey, Furlong & Behm, P.C. February 5, 2015. Available at: www.ftc.gov/system/files/documents/public_statements/624571/150205gmpletter.pdf

21. Ibid.

Besides allowing suppliers and grid customers to verify delivery and use of renewable energy and preventing double counting, RECs also facilitate consumer demand and create access to renewable energy. RECs represent a standardized currency for renewable energy. They facilitate trading, creating market efficiencies, which creates a more vigorous market for renewable energy.

4.4 U.S. Renewable Energy Markets

Markets (or sources of demand) for renewable energy in the U.S. are markets for RECs, since RECs are used to verify delivery and consumption of specified renewable energy. These markets drive the development (supply) of renewable energy generation as it is needed to meet demand. There are two primary markets: state compliance (or RPS) markets and the voluntary market. As noted in Section 4.2, all but two (Iowa and Texas) of the 29 state RPS markets are consumption-based, meaning they regulate sales of renewable electricity to customers and ensure that electricity customers in the state receive or consume a certain percentage of renewable power. RECs sold into RPS markets are ultimately used (or "retired") by regulated entities (e.g. utilities) on behalf of (or to demonstrate delivery to) their customers to meet the state's requirement.

Separate from regulatory mandates, the voluntary renewable energy market leverages private, non-ratepayer funding to support renewable energy sources, and it provides a pathway whereby the appetite for voluntary action can be channeled to clean energy development. The voluntary market for renewable energy is also consumption-based. Driven by businesses, individuals, and other electricity consumers looking to demonstrate environmental leadership, reduce their carbon footprint, and/or get recognition from programs like the EPA's Green Power Partnership and Leadership Awards[22] and the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) certification for buildings, the voluntary market delivers renewable energy specifically to those customers who voluntarily purchase or consume renewable energy in excess or outside of what is required by law. The voluntary market may also include renewable energy that is economical and provided by a supplier to its customers in excess of the RPS as a part of its standard mix. RECs sold into the voluntary market are either retired by the voluntary user/buyer or retired on their behalf by a supplier.

Since both markets are consumption-based, in order to avoid double counting (consumption of the same MWh by more than one consumer), a REC can only be used once for either RPS compliance or a voluntary use, purchase or delivery.

Renewable energy projects may also sell their electricity into the broader wholesale power market, in which case it becomes part of the regional mix and is sold and purchased as unspecified power. However, since there is a REC associated with each MWh of renewable energy generation in the U.S., the RECs associated with that power are either retained by the generator and not used for a specified use claim, or they are unbundled and sold into either the compliance or voluntary market, in which case, again, the customer purchasing the REC or on whose behalf the REC was retired is claiming use of that renewable generation and its attributes.

Both markets are served by REC Tracking Systems. Although it is not necessary to use tracking systems to issue, transfer and retire RECs, most if not all RPS and voluntary programs require them, and the vast majority of volume transacted in renewable energy markets occurs in REC tracking systems. In these tracking systems, RECs are electronically serialized and issued to registered generators with accounts. They can be transferred and tracked between account holders and ultimately permanently retired or cancelled electronically by the entity making the claim or on behalf of an end-user making a claim. Account holders indicate whether the RECs have been retired on behalf of an RPS program, a Green-e certified voluntary sale or purchase, or even a specific voluntary customer, allowing compliance and voluntary retirements in the system to be reported. Each registered generator has certificates issued for all its renewable production. These tracking systems do not operate as trading platforms or exchanges. All REC sales and purchases are executed bilaterally or otherwise "over the counter" between contracting parties, and the REC transfers and retirements are reflected in the tracking system, similar to currency tracked in bank accounts. REC tracking systems provide exclusive issuance, trading, and retirement of RECs, as well as verification of static and dynamic generation data. Although they may have been initially built to serve either RPS programs or the voluntary market, the same REC tracking systems, like the RECs themselves, are now used for both markets.

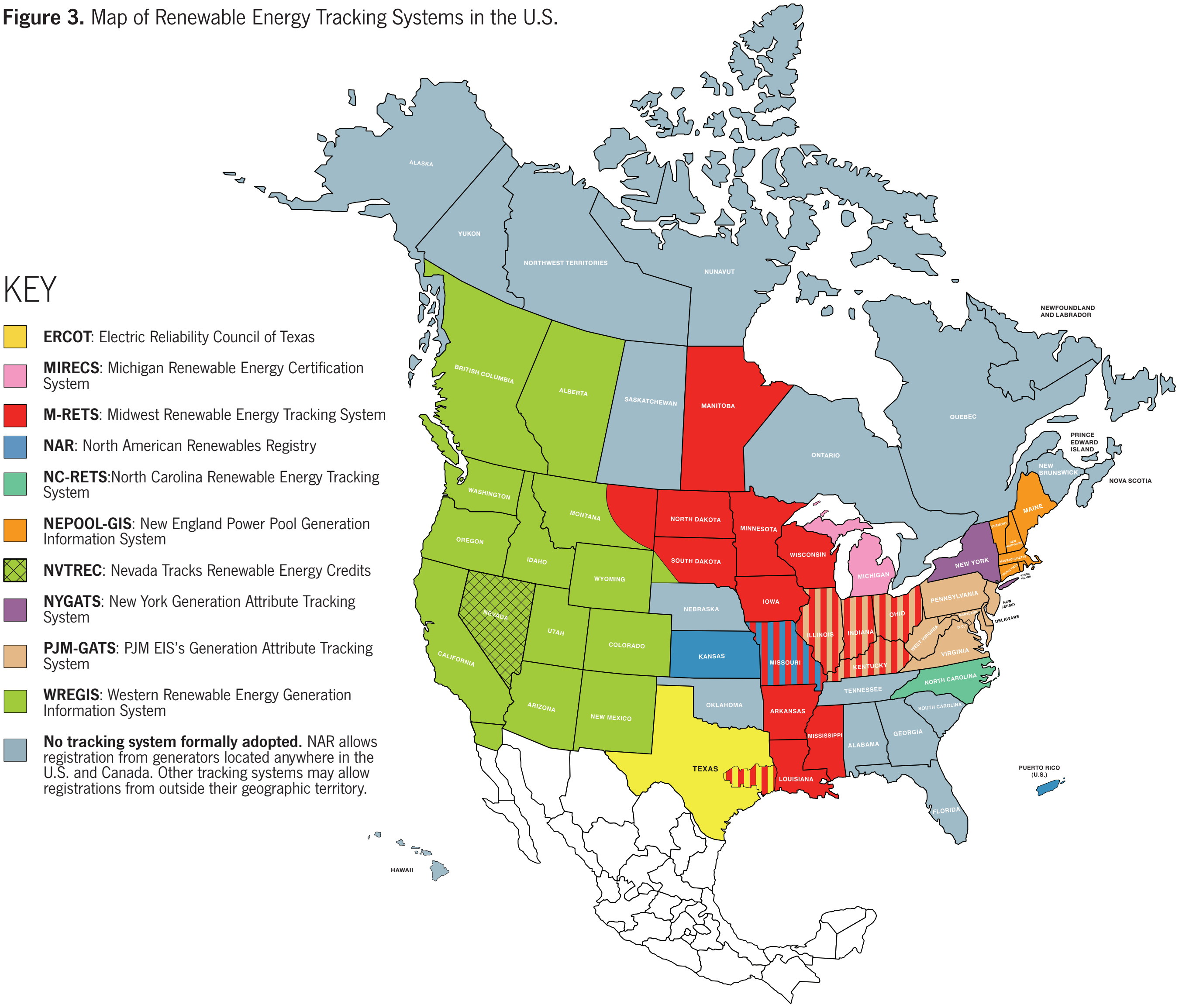
Figure 3 shows the regional REC tracking systems in the U.S. and Canada. All but two are quasi-governmental functional support entities. The Midwest Renewable Energy Tracking System (M-RETs) is an independent non-profit, though it is referenced in state legislation. The North American Renewables Registry (NAR) is a private tracking system run by the private firm APX[23] to cover generation in states and provinces that are not covered by other tracking systems, mainly non-RPS states. It should also be noted that the tracking systems covering the northeast and mid-Atlantic U.S.—including the PJM Generation Attribute Tracking System (PJM-GATS), the New England Power Pool Generation Information System (NEPOOL-GIS), and the New York Generation Attribute Tracking System (NYGATS)—are "all-generation" tracking systems. They track and issue certificates for production from all generation resources and each MWh of generation in the region, not only renewable facilities. All-generation tracking facilitates power source disclosure and residual mix[24] calculations.

22. Visit www.epa.gov/greenpower for more information.

23. www.apx.com.

24. See Subsection 4.5.1 for more information on residual mix.

Figure 3. Map of Renewable Energy Tracking Systems in the U.S.



Though both are REC-based and served by the same REC tracking systems, compliance and voluntary renewable energy markets have different geographic scopes and different eligibility requirements. Whereas RPS markets are subnational, so they can produce in-state or regional renewable energy development and benefits, the voluntary renewable energy market is national in scope,[25] so that voluntary purchasers can access renewable energy from across the country at the lowest cost. RECs issued in any state or tracking system can be sold to and claimed by voluntary customers anywhere across the country.

States determine eligibility rules for their RPS programs in terms of eligible fuel types, technologies, locations, and type of procurement (e.g. bundled vs. unbundled), as well as REC vintage and banking rules. Designated state agencies provide oversight and verification for these programs. The voluntary market, on the other hand, is, for the most part, not regulated by governmental agencies. Rather, private, third-party standards and certifications are used to verify delivery and ownership. Green-e® is the leading third-party certification for voluntary renewable energy in the U.S. and Canada. Like state RPS programs, third-party standards for the voluntary market limit eligibility and set rules in terms of technology, date of facility construction/operation, vintage of eligible sales, and other sustainability and consumer protection criteria. The REC Tracking Systems, along with Green-e certification, are used to verify that RECs are used for a state RPS program or a voluntary sales or purchase.

Though there are other important factors influencing renewable energy development—including incentives, tax credits, regulatory programs like The Public Utility Regulatory Policies Act (PURPA) which enable independent renewable power providers to sell their

25. See O'Shaughnessy, E. et al. (2016). Status and Trends in the U.S. Voluntary Green Power Market (2015 Data). National Renewable Energy Laboratory (NREL). Technical Report NREL/TP-6A20-67147. October 2016. Available online: www.nrel.gov/docs/fy17osti/67147.pdf. Also see Center for Resource Solutions (CRS). (October 16, 2016). 2015 Green-e Verification Report. Available at: www.green-e.org/2015.

power, other regulatory programs and policies that lower the cost of development, and carbon prices that support an economic advantage for zero-emitting sources—over the past 20 years, renewable energy markets (the combination of RPS and the voluntary market) have been the primary driver.[26]

Respective market volumes are shown in Figure 4. In 2015, RPS demand was about 214 million MWh. Of that, demand for "new" renewables built since the commencement of each state's RPS (in roughly the last 20 years) was about 126.5 million MWh.[27] In comparison, U.S. electricity customers voluntarily purchased about 78 million MWh of green power in 2015,[28] equivalent to 36% of combined RPS demand. About 56% of that, or 44 million MWh, was certified by Green-e.[29]

4.5 GHG Accounting for Delivered or Purchased U.S. Renewable Energy (Scope 2 Emissions) and Other GHG Claims for REC Suppliers and Owners

The last two columns of Table 2 provide examples of supplier and consumer GHG claims associated with REC purchases and ownership. But in general, REC owners can claim:

1. To be consuming electricity with the direct emissions (or emissions factor or profile) of the renewable generator of the REC (e.g. zero for wind and solar), and
2. That the generation of their electricity avoids emissions on the grid.

These claims are the same regardless of whether the RECs were delivered and consumed through an RPS or the voluntary market.

4.5.1 Scope 2 Accounting and Claims

As introduced in Section 4.1, the first set of claims to be consuming zero-emissions power (related to the direct emissions attribute) are called Scope 2 claims. In January 2015, The GHG Protocol released new Scope 2 Guidance as an amendment to the Corporate Standard.[30] The Guidance is the result of a four-year stakeholder engagement process involving over 200 Technical Working Group members representing 23 countries. The main elements of the Guidance are as follows.

1. The Guidance adopted an "attributional" accounting approach (called an "emission rate approach" in the Guidance) based on the direct emissions factor of the generation, rather than a "consequential" approach (called an "avoided emissions approach" in the Guidance) based on the avoided emissions associated with the generation (see Table 1 in Section 2). In other words, the emissions associated with purchased electricity are the gross emissions that can be attributed to the production of that electricity and are not adjusted based on the net change in emissions on the grid as a result of the production.

2. The Guidance requires reporting of two Scope 2 figures (or "dual reporting"): a market-based figure and a location-based figure. Each is explained below. The guidance provides a hierarchy of emissions factor data sources for each method.

3. The Guidance provides "quality criteria" for contractual instruments (e.g. certificates) that are used to demonstrate specified source consumption and use of a specified source emissions factor to calculate the market-based Scope 2 figure. These criteria include that the contractual instrument exclusively convey the direct GHG emission rate attribute; that it be tracked and retired on behalf of the reporting entity; that it be issued and retired as close as possible to the period of energy consumption to which the instrument is applied; and that it be sourced from generators located within the same market or electricity sector as the reporting entity's electricity-consuming operations.

4. The Guidance requires calculation and use of "residual mix" for unspecified purchases and null power under the market-based method (or disclosure of its absence). Residual mix characterizes the GHG intensity of unclaimed or publicly shared electricity (the mix of resources generating electricity in a region that are not being specifically purchased by a particular electricity user or group of users).

The market-based method allows a consumer to claim the benefits of its specified purchases and specified deliveries, including renewable energy purchased voluntarily or delivered through the RPS, and accurately calculate resulting Scope 2 emissions. It is based on supplier- and product-specific emissions rates, which for renewable energy are conveyed using RECs, whether they are bought separately from electricity, delivered through an electricity supplier's green power program or renewable electricity product, or consumed from on-site generation. The location-based method

26. See Mai et al. (2016) A Prospective Analysis of the Costs, Benefits, and Impacts of U.S. Renewable Portfolio Standards. Lawrence Berkeley National Laboratory. Also see Barbose, Galen (2017). U.S. Renewables Portfolio Standards: 2017 Annual Status Report. Lawrence Berkeley National Laboratory. Both available at: emp.lbl.gov/projects/renewables-portfolio/.

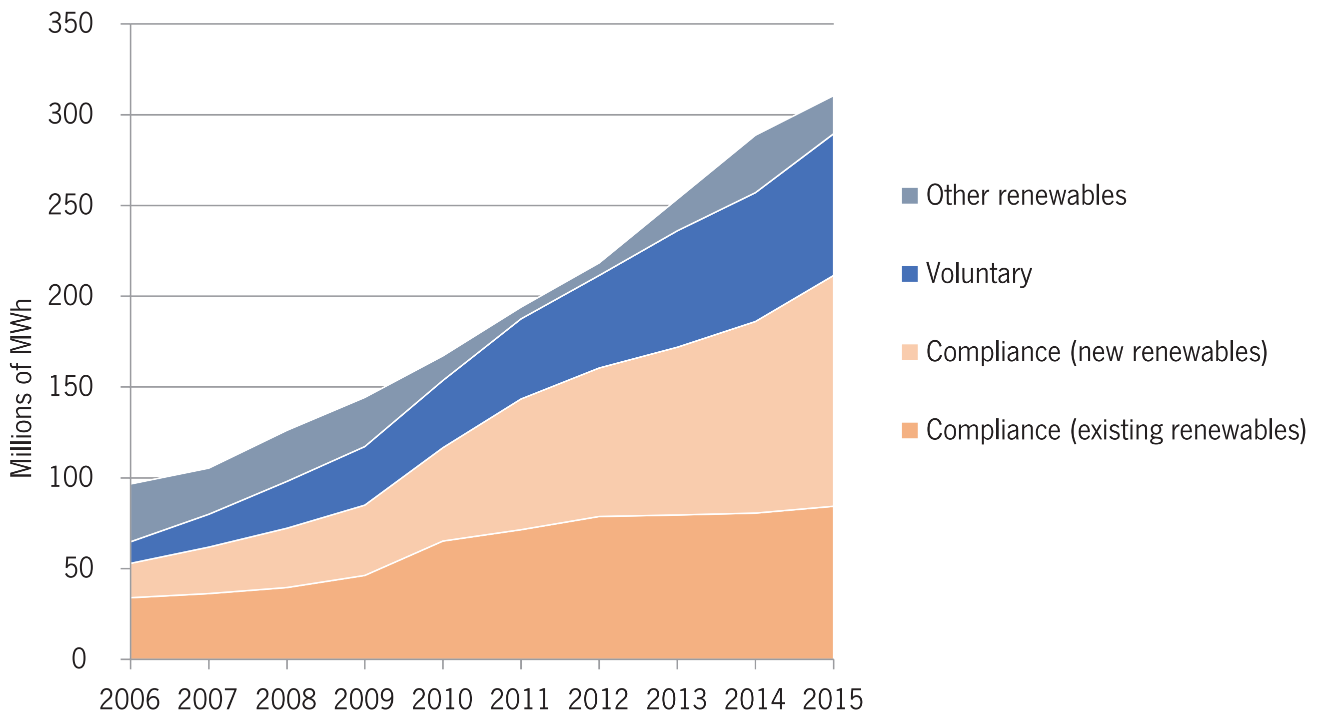
27. Barbose, G. (2016). U.S. Renewables Portfolio Standards: 2016 Annual Status Report. Presentation April 2016. Lawrence Berkeley National Laboratory. Available at: emp.lbl.gov/sites/all/files/lbnl-1005057.pdf

28. O'Shaughnessy, E. et al. (2016). Status and Trends in the U.S. Voluntary Green Power Market (2015 Data). National Renewable Energy Laboratory (NREL). Technical Report NREL/TP-6A20-67147. October 2016. Pg. 3. Available at: www.nrel.gov/docs/fy17osti/67147.pdf.

29. Center for Resource Solutions (CRS). (October 16, 2016). 2015 Green-e Verification Report. Available at: www.green-e.org/2015.

30. Sotos, M. (2015). GHG Protocol Scope 2 Guidance: An Amendment to the GHG Protocol Corporate Standard. World Resources Institute. Pg. 56, 60. Available online: www.wri.org/sites/default/files/Scope_2_Guidance_Final.pdf.

Figure 4. Comparison of Voluntary and Compliance Markets, 2006–2015 [31]



assigns the average emissions rate of electricity generated in the consumer's region (eGRID subregion) to every MWh used. It does not reflect any purchasing choice or action taken by the consumer or any RPS compliance activity undertaken by their supplier.

The market-based figure is required for electricity consumption in markets where differentiated energy products in the form of contractual instruments (including direct contracts, certificates, or supplier-specific information) are available. This explicitly includes the U.S.[32] This is the Scope 2 figure and allocation of emissions that is based on legal contractual instruments for delivering and consuming specified power—in the case of renewable energy, the REC—and it lines up with RPS program rules and the existing voluntary market. RECs (either bundled or unbundled) are at the top of the market-based emissions factor data hierarchy since they represent the most precise emissions factor information for Scope 2 accounting, and they represent the only means of reporting Scope 2 emissions using a specified renewable emissions factor in the U.S. and Canada. In the U.S., the location-based figure amounts to extra information, since it does not represent a legally enforceable allocation of attributes (i.e. emissions) (and again, it does not represent a physical distribution of emissions). It allows reporting entities to effectively see the average of what is produced in the region in which they consume, which is good for transparency and can affect other decision making. An example of Scope 2 calculations is provided in Table 3.

Lastly with respect to the direct emissions attribute, in order to avoid double counting in the case of unbundling (where RECs and the underlying electricity are delivered to different consumers), null power (electricity minus the REC) must be assigned the emissions of the residual mix. As a result, when either a supplier or end-use consumer purchases unbundled RECs, the RECs (re-)define the attributes (e.g. emissions) of the delivered or consumed electricity with which it is matched, and the attributes of the electricity otherwise delivered or consumed get (re-)distributed to the rest of the supplier's customers, such that their power gets incrementally dirtier. The regional mix and delivered emissions factor in the area where the unbundled RECs were generated will be automatically affected (i.e. get dirtier), provided there is no double counting (i.e. there is no one claiming delivery or consumption of renewable energy without the RECs). For example, if a consumer is located in Pacific Gas & Electric (PG&E) territory in Northern California and buys an unbundled REC from a wind facility in Texas, her electricity becomes renewable and gets cleaner and the utility emissions factor and regional grid emissions factor in Texas gets dirtier (by one less MWh of zero-emitting power). In this case, nothing might happen to PG&E's emissions factor. PG&E's mix has not changed, but the allocation has, from the unbundled REC consumer to the null power purchaser in Texas. The California consumer gets the REC and whoever gets the null power gets what she had. If, however, the California consumer is buying voluntary renewable energy from a facility in PG&E's territory, then that would be automatically reflected in PG&E's default mix (i.e. it would get dirtier) since PG&E would not have those RECs.

31. Based on data received via email from Jenny Heeter, National Renewable Energy Laboratory (NREL), May 12, 2017.

32. Ibid. p.43.

Regions will all-generation tracking systems (like the northeast and mid-Atlantic U.S.) calculate and disclose this exact transaction of attributes. For the rest of the country with renewable-only tracking systems, Green-e provides regional residual mix emissions factors, which have all Green-e certified renewable energy purchases factored out, for all non-purchasers of renewable energy in those regions to use.[33]

Depending on supply and demand, and the particular RECs purchased, unbundled REC purchases may allocate and redistribute existing renewable generation to different consumers on the grid without changing the composition of the grid. This is not unique to RECs, or, in fact, unbundled RECs, since contracts for existing physical electricity can also be reallocated to different consumers without affecting generation or grid composition. Purchasing any clean product, even ones that (unlike electricity) can be differentiated at the point of consumption based on their clean production, may not change overall production of that product, which may be a mixture of dirty and clean. That does not mean that all purchasers are equally responsible for the overall mixture. Different consumers are buying clean and dirty. Those that buy clean are changing their own usage (and the emissions associated with their usage), if not the overall production. That is what Scope 2 emissions accounting and accounting for RECs are intended to reflect—an accounting of responsibility for emissions on the grid (or purchased emissions). There is, however, also a demand-side effect of the choice to pay for the clean energy on the grid.

4.5.2 Avoided Emissions Accounting and Claims

In addition to and separate from Scope 2 GHG claims related to the direct emissions attribute, REC owners and RPS ratepayers can also make claims based on the avoided emissions associated with the renewable energy generation they consume. REC purchasers can claim that emitting generation was displaced or avoided on the grid as a result of the renewable generation they are using. These avoided emissions are typically calculated as described in Section 2, again, typically approximated using the non-baseload or marginal emission rate in the area of the REC generator. An example is provided in Table 4.

Avoided emissions claims made by REC owners are not equivalent to carbon offset claims. First, avoided grid emissions are not equivalent to absolute reductions on the grid or global reductions. They are only a calculation of the emissions displaced by the renewable generation. Avoided grid GHG emissions cannot be used to adjust a consumer's carbon footprint or for Scope 2 emissions calculations. Second, avoided grid emissions associated with the renewable generation are not necessarily caused by the renewable energy/REC purchase or purchaser. Rather, the generation used by the purchaser results in avoided emissions. In public statements, avoided grid emissions should always be associated with the renewable energy generation itself or the supply for the renewable energy product, rather than the purchaser's action.

In general, RECs should not be confused with carbon offsets. They are different instruments that convey different claims, and they are accounted for differently in a consumer's GHG emissions inventory or footprint. Whereas RECs represent a MWh of renewable energy

Table 3. **Example Scope 2 Calculations by Renewable Energy Consumers**

<table>
<tr><th colspan="2">Activity Information</th></tr>
<tr><td colspan="2">Location of electricity consumption: <u>Dayton, OH</u>

eGRID subregion: <u>RFC West</u>

A. Total Electricity Consumption = <u>100</u> MWh

B. Nebraska Wind RECs Purchased = <u>95</u> MWh</td></tr>
<tr><th>Market-based Scope 2 Emissions</th><th>Location-based Scope 2 Emissions</th></tr>
<tr><td>C. Adjusted Consumption = <u>5</u> MWh (A - B)

D. Residual Mix Greenhouse Gas Emission Rate for RFC = 1,248.99 lbs/MWh*</td><td>F. Regional grid average emissions factor for RFC West: 1,386.55 lbs/MWh**</td></tr>
<tr><td>Market-based Scope 2 Emissions = <u>2.8</u> tCO2e (C * D / 2204.62)</td><td>Location-based Scope 2 Emissions = <u>62.9</u> tCO2e (A * F / 2204.62)</td></tr>
</table>

*Available from Green-e
**Available from EPA's eGRID database

33. See "Residual Mix Emission Rates" on the Green-e website: www.green-e.org/programs/energy/documents.

generation, carbon offsets represent an amount of GHG emissions reduction in tons of CO_2e. REC purchasers effectively contractually fuel switch from a certain mix of electricity generation to renewable generation, and can therefore both reduce the portion of their carbon footprint associated with purchased electricity (Scope 2) and claim that their generation has some emissions effect on the grid. A carbon offset is a standalone, global emissions reduction beyond a baseline level of emissions from a project activity that would not have occurred but for the carbon offset market. Carbon offsets can be used to address any scope of emissions as a net adjustment to the gross consumer GHG inventory. Likewise, purchasing carbon offsets, which do not include non-GHG generation attributes, is not equivalent to purchasing renewable energy instruments or certificates, and carbon offsets cannot be used to make renewable energy consumption or zero-emissions electricity usage claims.

Though they are different instruments and projects must meet different criteria to generate each of them, a REC and a carbon offset cannot both be generated or issued for the same MWh of renewable energy generation since the avoided emissions attribute of renewable energy is included in both of them. An individual MWh can either be used and claimed as a REC or used to generate a carbon offset. Where carbon offsets are issued to renewable energy generators that meet carbon offset criteria, the RECs associated with those MWh must be retired to substantiate the creation of offsets in order to avoid disaggregation of the attributes included in a REC. Though RECs do not deliver offset claims, avoided emissions are included in a REC so that voluntary renewable energy sales and RPS programs can deliver these benefits and so that they are not sold off separately, for example in a carbon offset.

To avoid double counting, RECs should not be used as carbon offsets or emissions reductions in production-based GHG Regulations. If RECs are used as emissions reductions in GHG emissions markets, either representing a quantity of emissions reductions or avoided emissions, or representing a quantity of renewable energy generation to reduce a GHG compliance obligation, there is double counting since the same reduction due to renewables will be automatically counted under the regulation (or cap) and then counted and used for compliance again as an emission reduction. This is effectively the same double counting as would occur if carbon offsets were permitted for use in a cap-and-trade program from projects within a capped sector.

4.6 The Effect of GHG Regulation on RECs

In the previous sections, we have explained how GHG Regulation affects renewable generation attributes (Section 3) and how those attributes are accounted for in existing markets using RECs (Subsections 4.2–4.5). In this subsection, we explain how GHG Regulation therefore affects the accounting instruments and claims of renewable energy market participants. It affects claims made by REC owners and suppliers related to delivery and consumption of renewable energy in two primary ways.

4.6.1 Direct Emissions Associated with Imported Power

Broadly speaking, production-based GHG Regulation does not affect the direct emissions of renewable energy generation, as noted in Section 3. It will not affect the claims of REC owners to the direct emissions attribute or Scope 2 GHG accounting by REC purchasers due to the distinction between production and consumption claims (explained in Subsection 4.1). However, where emissions associated with imported power are included in and accounted for under the GHG Regulation, this affects RECs. This is the first primary effect of GHG Regulation on RECs.

State-level GHG Regulation or caps (or regional caps within a larger self-contained grid) may cover both emissions from in-state resources as well as emissions associated with imported power.

Table 4. Example Avoided Emissions Calculations by Renewable Energy Consumers

Activity Information
Location of electricity consumption: Dayton, OH eGRID subregion: RFC West A. Total Electricity Consumption = 100 MWh B. Nebraska Wind RECs Purchased = 95 MWh
Supplemental Report of Avoided Grid Emissions
E. Non-baseload Greenhouse Gas Emission Rate for Nebraska (MRO West) = 1965.21 lbs/MWh**
Avoided Grid Emissions = **84.7 tCO2e** (B * E / 2204.62)

**Available from EPA's eGRID database

As discussed previously, emissions from in-state resources can be directly regulated and measured. In other words, it is the generation or the source that is regulated. In-state zero-emitting renewable energy would not have a compliance obligation but would be recorded as zero-emitting. Again, consumption claims on this in-state generation would not be affected by the regulation. RECs associated with renewable energy located in the state can be consumed inside the state or they can leave the state, in which case that renewable energy is effectively being consumed by customers outside the state.

In contrast, emissions associated with imported power from generation outside the state or regulated region often cannot be directly regulated. The regulator often cannot assign compliance obligations to those sources based on their direct emissions (or assign no compliance obligations to zero-emitting sources). Instead, the state can regulate the delivery or import of power, the power delivered into the state to meet load, at the point of the importer. In this case, the state assigns emissions to imported power, establishing the source of the power that is delivered. The state is reporting to be importing or consuming zero-emissions power, not just generating zero-emissions power. Since the REC instrument delivers the direct emissions of renewable energy and the REC owner has the right to claim consumption of electricity with those direct emissions (e.g. zero), the REC must be imported with the power and used inside the state to avoid double counting. If the power from a renewable energy source located outside the state is delivered to the state and counted as zero-emissions power (or assigned the emissions factor of renewable energy) and the RECs associated with renewable energy located outside the state are not also consumed in the importing state, there could be consumption claims being made on the same renewable energy in different states. The state with GHG Regulations will be importing zero-emissions power, and the REC owner or RPS in a different state will also be claiming consumption of that same MWh of zero-emissions power.

GHG Regulation can therefore result in double counting of renewable energy if RECs are not required to report a zero-emissions renewable energy import. The imports portion of the GHG Regulation is therefore effectively consumption-based. In other words, regulation of emissions associated with imported power is effectively a Scope 2 "claim" being made by the state, rather than a Scope 1 claim, and so it would double count a delivery or Scope 2 claim made through another state's RPS or voluntary program based on the REC. This is similar to but not in conflict with the RPS since the RPS of the importing state can still deliver imported renewable energy to specific customers of regulated suppliers in that state (meaning RECs associated with renewable imports can still be used for the RPS in the importing state).

As an example of this, California, Oregon, the Western Renewable Energy Generation Information System (WREGIS) (the REC Tracking System for the western U.S.), and the western Energy Imbalance Market (EIM), are all, as of publication, evaluating questions around RECs associated with imports into California. Specified renewable imports into California are assigned a specified source emissions factor by the California Air Resources Board (CARB) regardless of whether the RECs associated with that power are also imported with that power.[34] Those RECs can therefore be used in other states. Oregon is considering whether to allow those RECs for compliance in its RPS, and WREGIS has been asked to clarify its certificate definition and whether or not California's policy represents a claim on WREGIS certificates.

RECs are similarly affected anywhere else that GHG Regulation or its emissions accounting protocol assigns emissions to power on the grid rather than measuring emissions at the point of generation.

4.6.2 Avoided Emissions Claims and Demand-side Impact for REC Owners

The second primary effect of GHG Regulations on RECs, and most importantly for the purposes of this guide, is that production-based GHG Regulation automatically counts GHG reductions at regulated units due to renewable energy generation toward compliance and removes the avoided grid emissions (prevents a net change in emissions) associated with renewable energy generation (see Section 3). Avoided grid emissions are an attribute that is conveyed to consumers using RECs in both RPS and voluntary renewable energy markets, so that these markets can have some impact on grid emissions (see Subsection 4.3). Once GHG Regulations for the power sector are put in place, RECs from renewable energy in the regulated sector carry an avoided emissions attribute of zero.

It is important to clarify that the avoided emissions attribute in the REC is not being double counted, removed or disaggregated by production-based GHG Regulations, since there is no separate consumption claim being made and no separate instrument being issued for a delivery or consumption claim. Again, the difference between production and consumption permits both the renewable energy generator and the REC consumer to claim production and use, respectively, of generation that avoids emissions. Rather, the emissions effect of renewable energy is simply counted toward compliance and the value of the attribute (which nevertheless remains exclusive in the REC for consumption) is reduced to zero. This change to the regulatory status of the renewable energy generation and the value of its attributes has important implications for demand in different renewable energy markets.

34. Sec. 95111(a)(4) and 95111(g)(1)(M)(3) of California's Mandatory Reporting Regulation (MRR).

4.7 The Effect of GHG Regulation on Renewable Energy Demand

Bearing in mind these two primary effects of GHG Regulations on RECs, there are two questions to consider:

1. What is the effect of double counting of electricity imports on RPS and voluntary demand?

2. What is the effect of counting the GHG impact of renewable energy toward compliance with GHG regulations and removing avoided emissions associated with renewable energy on RPS and voluntary demand?

First, double counting of direct emissions associated with imports may impact both the RPS and voluntary markets, and it means leakage and less renewable energy if permitted. Though entities regulated under an RPS may still purchase double counted imports if permitted, ratepayers and policymakers may be frustrated to learn that the RPS is double counting and producing less renewable energy than it otherwise would, which could lead to policy changes. Voluntary demand for renewable energy that is being double counted or that does not convey the direct emissions attribute or emissions profile of the generation can be expected to be quite low or zero, assuming consumers are aware of it. In our experience, a large proportion of voluntary customers purchase renewable energy at least in part to claim use of zero-emissions power and reduce the emissions associated with their consumption of electricity (Scope 2 emissions). Green-e, which certifies the majority of the U.S. voluntary market, explicitly prohibits double counting and will not allow double counted imported renewable energy to be included in certified voluntary sales.

Second, the effect of GHG Regulations on avoided emissions may be more important for voluntary renewable energy than it is for RPS. There are two dimensions to this effect that are important to voluntary purchasers, which are addressed in the following two Subsections 4.7.1 and 4.7.2. Broadly, the effect is that, 1) there is less impact that drives voluntary demand, and 2) voluntary renewable energy is not “surplus to regulation” (with respect to GHG emissions at regulated units), which also drives demand, and in which case it may not be “voluntary” at all.

4.7.1 Reduced Demand-side Impact

Regarding the first dimension, as explained in Section 3, voluntary renewable energy generation under GHG Regulations does not affect emissions on the grid. While renewable energy generation displaces emitting generation, the regulatory emissions limit or cap on GHGs will not change and renewable energy generation frees up room under the cap for more emissions. There is no net change in emissions on the grid due to renewable energy. Historically, it has been important to voluntary consumers and investors that their renewable energy not only generates zero emissions, but that it has some effect on emissions on the grid, which it does not in this case. Many companies and individuals purchasing in the voluntary market, particularly large corporate purchasers driving the market, are motivated by climate change. They purchase not only to reduce their greenhouse gas footprint, but also to move the needle on climate change and affect some demand-side change on the grid. If they cannot, they may not purchase at all or they may purchase from somewhere else where they can.

4.7.2 Removal of Regulatory Surplus

The second dimension may be even more significant to voluntary demand. Under GHG Regulations, compliance entities automatically count and report all emissions and emissions reductions that occur at their facilities, including GHG reductions due to voluntary renewable energy generation. This means that reductions caused by voluntary renewable energy are automatically counted toward reductions that are required by law. Without reductions from voluntary renewable energy, the same amount of reductions must occur anyway, regardless of what causes or who pays for them. In this scenario, voluntary renewable energy can have no GHG impact beyond what is already required, and furthermore, it subsidizes compliance for regulated entities. As voluntary renewable energy generation reduces emissions that can be counted toward compliance, voluntary purchases help reduce the cost of GHG compliance, making it cheaper and easier for fossil units to comply. Another way of framing this is as a transfer of wealth from voluntary renewable energy buyers to fossil generators. This presents a very different value proposition for voluntary buyers in comparison to circumstances prior to GHG Regulation or purchasing renewable energy from a region without GHG Regulations.

Historically, voluntary renewable energy is not used to meet governmental targets, laws, or legal mandates. The voluntary market stands apart from and builds on compliance efforts. This separation enables the voluntary market to make an incremental difference often referred to as “regulatory surplus.” While it may be less important that an RPS and other regulatory programs have an independent and incremental impact with respect to other regulatory programs, and in this case on emissions relative to GHG Regulations, voluntary purchasers of renewable energy may value this incremental impact highly. To the extent that “voluntary” is by definition “not required by law” or “surplus to regulation,” regulatory surplus may be a critical criterion for sustaining voluntary action and clear voluntary claims. Whether regulations are production-based or consumption-based, renewable energy generation counted toward those regulations cannot be considered surplus to regulation. The production vs. consumption distinction is important with respect to double counting, but it is irrelevant with respect to regulatory surplus.

Regulatory surplus with respect to GHG emissions may be especially important for voluntary demand. Since, again, many of the companies and individuals purchasing in the voluntary market do so as part of a commitment to address climate change, an effect on emissions beyond what is required by law may be a critical non-financial benefit for voluntary purchasers. Where renewable energy sold into the voluntary market does not have an effect beyond compliance, and instead only serves to help regulated entities comply with existing regulatory requirements, this changes the effectiveness of voluntary renewable energy as a climate change solution for participating companies and individuals. As such, voluntary demand for renewable energy may decline or shift.

Again, to avoid loss of benefits, loss of regulatory surplus, or paying the price of carbon (e.g. buying allowances) to restore these benefits, voluntary buyers in states or regions with GHG Regulation may purchase renewable energy from outside of the state or region. In this case, voluntary purchasers will be supporting economic investments in other states or regions. To the extent that some voluntary purchasers may only be motivated to purchase local or in-state renewable energy, counting voluntary renewable energy toward GHG compliance may reduce overall voluntary demand. Either result would have negative impacts on the growth of renewable investments in the regulated region and eliminate any GHG compliance contributions that strong voluntary renewable energy markets offer. In other words, if GHG regulations count voluntary renewable energy, the state may lose it, in which case it provides neither emissions reductions beyond nor within the cap.

Where voluntary demand does not decline or shift, this may be because voluntary customers have simply not been made aware of how GHG Regulation is affecting their benefits. Marketing and sales of renewable energy to voluntary customers that is not surplus to regulation and does not affect grid emissions without disclosure of these reduced benefits may be considered deceptive. Though the FTC has not specifically addressed this situation, it may be a matter of consumer expectations versus delivered benefits that falls squarely within the purview of that agency. It may be something that the agency considers in future revisions to its environmental market guidelines. If not from the FTC, sellers of products with reduced benefits may face public scrutiny from environmental organizations or other consumer groups.

Finally, while we have assumed that the impact of GHG Regulations on avoided emissions is less important for RPS renewable energy, it is worth considering with respect to the intended goals of RPS and the expectations of RPS ratepayers. RPS generation and ratepayers subsidize GHG compliance for fossil generators under cap-and-trade and other GHG Regulation the same way that voluntary purchasers do, and there is a transfer of wealth from the RPS ratepayer to regulated emitters. If the RPS was not there, emitting units would have to pay to reduce emissions in some other way. Ratepayers, if made aware of this fact, may very well be frustrated to learn that the renewable energy they are paying for through the RPS is simply making it cheaper for coal and natural gas plants to comply with GHG Regulations or allowing those emitters to avoid taking action to reduce their emissions. If we do not expect that voluntary purchasers of renewable energy will pay for GHG compliance, it may be that we should not expect RPS ratepayers that have agreed to pay more for renewable energy through the RPS to feel any differently. The following sections address policy mechanisms that can restore avoided emissions claims and regulatory surplus for the voluntary renewable energy market. States may consider using the same mechanisms to ensure that the RPS program also has an independent and incremental impact on statewide GHG emissions beyond GHG Regulations.

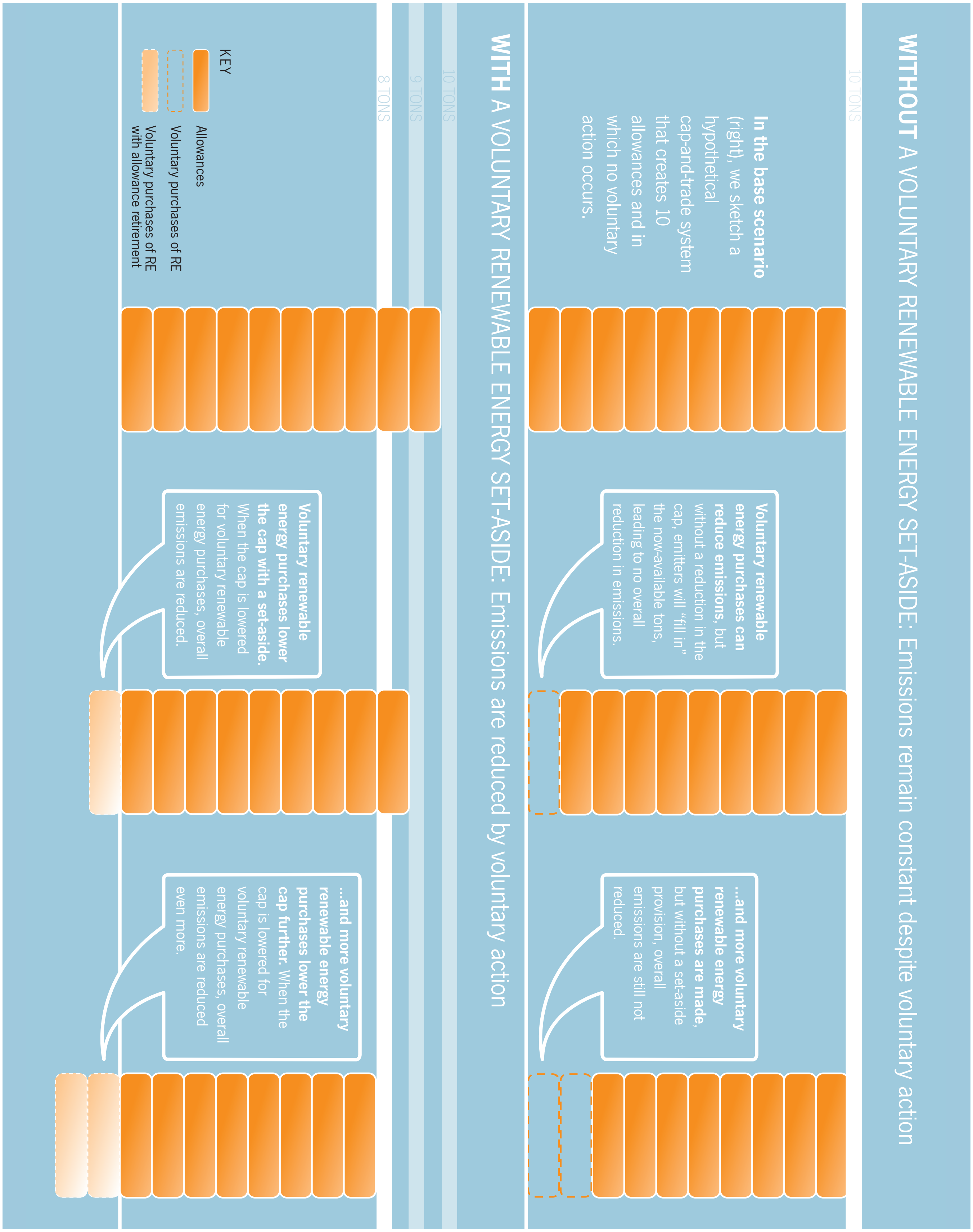
5. Allowance Set-Asides for Voluntary Renewable Energy

In general, GHG regulatory programs can effectively restore avoided emissions claims and regulatory surplus for voluntary renewable energy by lowering regulatory GHG limits, either at the sector-wide or plant level, on behalf of voluntary renewable energy generation. This counteracts the automatic counting of emissions reductions associated with voluntary renewable energy and explicitly recognizes emissions reductions from voluntary renewable energy as incremental to what would otherwise be achieved through production-based GHG Regulations. The design and functionality of regulatory mechanisms to do this, along with the calculation and allocation of voluntary renewable energy emissions reductions, depend on the type and structure of the GHG Regulations. Existing regulations and mechanisms are described in Section 7, and guidelines for states are provided in Sections 8 and 9. In this section, we describe the general features of a proven mechanism to protect voluntary renewable energy: voluntary renewable energy set-asides.

For GHG Regulations that set an annual or periodic emissions limit (budget, ceiling, or cap), issue allowances or permits (e.g. in tons of CO_2e) up to that limit (or level of the cap), and then decrease that limit over time, all the while allowing the allowances or permits to be traded among emitters—commonly referred to as an ETS or cap-and-trade—only the retirement of allowances will affect the overall level of emissions. Such systems can include allowance “set-asides” (also called reserves or reserve accounts), in which allowances are quite literally set aside, taken out of circulation to be held or used for a certain purpose, including, for example, price containment or voluntary renewable energy. With an allowance set-aside mechanism for voluntary renewable energy, allowances are set aside and periodically retired on behalf of the voluntary market, effectively lowering the cap or emissions budget on its behalf. This is illustrated in Figure 5, which also illustrates why set-asides are sometimes called “off-the-top” mechanisms.

Regulators have a number of options in terms of administering the set-aside. Allowance allocations and retirements can be made to occur at any time, though more frequent allocations and retirements provide more certainty to the market. Allowances can be set aside according to a pre-set schedule in advance of

Figure 5. Voluntary Renewable Energy Set-aside Illustration



voluntary renewable energy sales or in response to voluntary sales as they are reported or requested. Scheduled allocations may provide more certainty to the GHG market, but less certainty to the voluntary renewable energy market since a limited number of allowances could limit voluntary activity. Retirement can occur automatically based on voluntary market data (for example, from REC tracking systems) or upon request by voluntary renewable energy sellers and purchasers. States can determine eligibility requirements for retirements through the set-aside, based on renewable energy facility type, location, size, age, etc. For example, a state may choose to retire allowances for voluntary renewable energy sales/purchases from in-state facilities only or from both facilities located in the state and those located outside the state that deliver power to the state (since that power may reduce emissions at regulated facilities as well). States must also determine how to calculate the avoided emissions associated with voluntary renewable energy—that is, the number of allowances to retire per unit of voluntary generation/sale (or in other words, the number of allowances per REC). This involves adopting an emissions factor to be applied to the volume of renewable energy sales, which can be the emissions factor of a typical marginal natural gas generating unit or a non-baseload output emissions factor, for example, as an estimation of avoided emissions.

Without a set-aside, voluntary renewable energy purchasers would have to independently buy and retire allowances (i.e. pay the price of carbon) to achieve regulatory surplus and restore their emissions benefits, which would represent a significant increase in the price of voluntary renewable energy. Green-e certification for voluntary renewable energy requires use of a set-aside mechanism or independent allowance retirement for all certified voluntary sales sourcing from a capped region in the U.S. and Canada. This requirement is intended to reflect consumer expectations identified during extensive stakeholder engagement.

As the mechanism that protects voluntary demand for renewable energy in the regulated state or region, set-asides have economic benefits for states. To the extent that they help maintain voluntary demand and prevent it from shifting outside the capped region, voluntary renewable energy set-asides may allow states the opportunity to capture the private investment dollars that may otherwise go elsewhere. In other words, set-asides may remove a significant barrier to investment and the development of renewable energy beyond that which is mandated by the RPS, and this could lead to increased revenue from voluntary purchasers for in-state and affected generation.

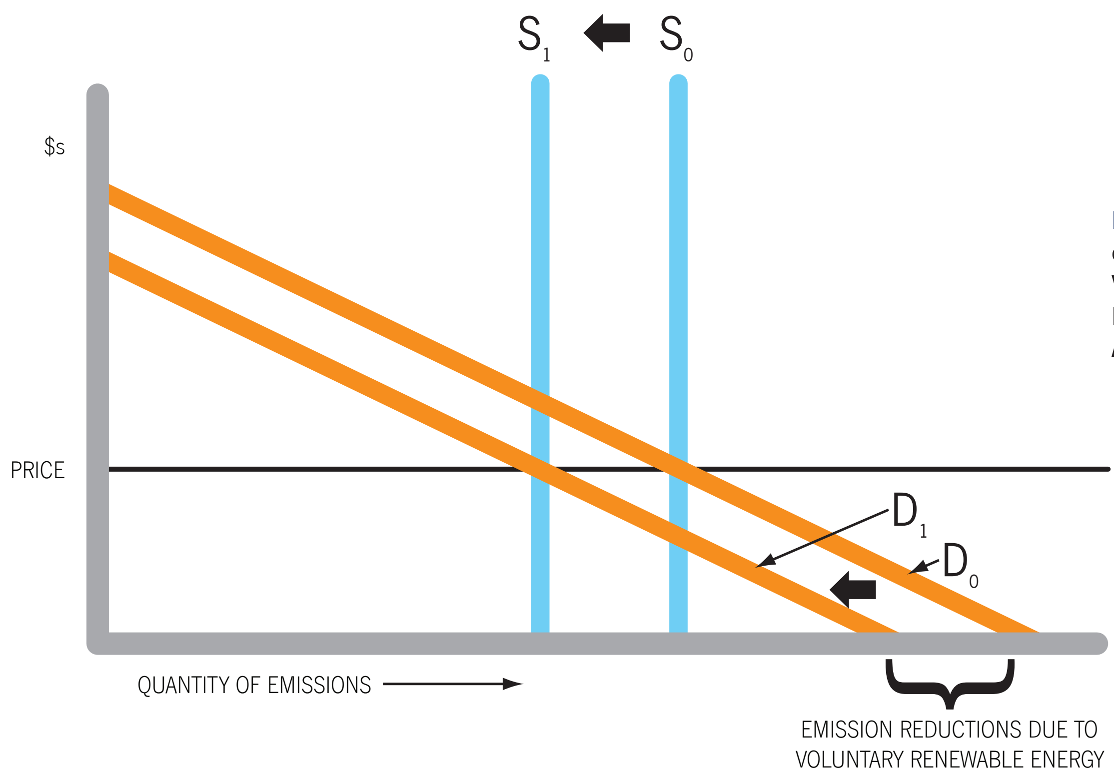


Figure 6. Illustration of the Effect of the Voluntary Renewable Energy Set-aside on Allowance Prices

S_0 = the initial supply of allowances, before accounting for voluntary renewables

S_1 = the supply of allowances, after the set-aside adjustment

D_0 = the initial demand for allowances without reductions from voluntary renewables

D_1 = the demand for allowances with reductions from voluntary renewables

PRICE = price of allowances

As shown in Figure 6, the cost of the set-aside is usually insignificant if not cost-neutral for compliance entities since the decrease in supply of allowances and corresponding increase in price is offset by the decrease in demand for allowances due to reductions from voluntary renewable energy and corresponding decrease in price.[35]

Different versions of voluntary renewable energy set-asides have been adopted in both California and RGGI and are described in detail in Section 7. In both cases, they received broad support from a wide range of stakeholders and market participants. In California, for example, over 50 organizations publicly supported the inclusion of the Voluntary Renewable Energy Reserve Account in the cap-and-trade program, including energy companies, project developers, environmental and public health advocates, industry associations, academic institutions, and others.[36]

It is important to note that allowance retirements through set-asides may not be equivalent to or represent global emissions reductions and therefore do not convey such a claim or benefit (i.e. a carbon offset claim) to the voluntary REC purchaser or user. This depends on the degree to which the GHG allowance market is oversupplied, in which case the number of allowances is greater than the amount of emissions and retirement of an allowance may not represent an actual emissions reduction.[37] It may also depend on a demonstration that other mechanisms do not counteract or reverse the effect of retiring the allowances, and overall proof that retirement of allowances in that system results in real global emissions reductions. However, the set-aside nevertheless restores regulatory surplus and avoided grid emissions for voluntary renewable energy.

35. Despite this illustration (which depicts decreases in supply and demand that are 100% offsetting), the actual cost of the set-aside will depend on the amount of renewable energy generation, the conversion factor used relative to actual displaced emissions, and other details.

36. See Joint Letter in Support for Voluntary Renewable Energy Set-Aside in the Proposed California Cap-and-Trade Program, December 13, 2010, resource-solutions.org/site/wp-content/uploads/2015/08/Voluntary-Renewable-Set-Aside_12-13-10.pdf.

Coalition letter to Kevin Kennedy, CARB Office of Climate Change on the issue of off-the-top treatment of voluntary renewable energy purchases, June 7, 2010,www.resource-solutions.org/pub_pdfs/nonprofit_and_clean_energy_coalition_7_7_2010.pdf.

Comments of Renewable Energy markets Association (REMA) on a Western Climate Initiative (WCI) paper, February 19, 2010,www.renewablemarketers.org/pdf/file_111.pdf.

Letter to Senator Boxer on Recommended Changes to Cap-and-Trade Design Under ACESA to Support the Voluntary Renewable Energy Market, July 23, 2009, resource-solutions.org/site/wp-content/uploads/2015/08/Senate_EPW__off_the_top_072309.pdf.

Letter to Claudia Orlando, California Air Resources Board supporting off-the-top approach to voluntary renewable energy purchases in a California cap-and-trade program, June 12, 2009, resource-solutions.org/site/wp-content/uploads/2015/08/Center-for-Resource-Solutions-comment.pdf.

6. The GHG Benefits of U.S. Voluntary Renewable Energy

This voluntary market leverages private investment to reduce the environmental and health impacts of electricity generation. We recommend that states design GHG Regulations to protect the ability of voluntary actions to reduce emissions. This will support and enhance, rather than undercut, voluntary renewable energy markets and motivate more businesses to invest in clean energy with their private funds. Preserving the avoided GHG emission value of voluntary renewable energy produces incremental emissions reductions driven by private sector investment. In other words, it ensures that GHG Regulation does not represent a ceiling for reductions. This may reduce the cost of future GHG regulation or increases to regulatory targets, or reduce the need for regulation altogether, as voluntary emissions reductions fill the gap between regulatory requirements and science-based targets.

The voluntary renewable energy market is important in every region of the country—either to supply the voluntary market or as a source of demand for voluntary renewable energy. Figures 7 and 8 show supply and sales, respectively, of Green-e certified renewable energy in 2015.

In states that supply the voluntary market, voluntary renewable energy is already avoiding emissions on the grid. In states that consume voluntary renewable energy, there is an opportunity to meet that demand with local supply and bring investment and additional emissions reductions to the state.

Thousands of businesses and millions of individuals in every state across the country voluntarily purchase green power, and thousands of renewable energy generators across the country supply it to them, amounting to billions of kilowatt-hours of renewable energy annually.[38] The latest report on the voluntary renewable energy market from the National Renewable Energy Laboratory (NREL) shows that the amount of renewable energy purchased through the voluntary market represents approximately 2% of total U.S. electricity sales and is growing at 10% per year.[39] The voluntary renewable energy market represents 25% of all non-hydro renewable generation nationally and is equivalent in size to 61% of combined state compliance or Renewable Portfolio Standard (RPS)

37. See Sotos, M. (2015). GHG Protocol Scope 2 Guidance: An Amendment to the GHG Protocol Corporate Standard. World Resources Institute. Pg. 70. Available online: www.wri.org/sites/default/files/Scope_2_Guidance_Final.pdf.

38. See www.epa.gov/greenpower/. Also see the National Renewable Energy Laboratory's (NREL's) market analysis atwww. nrel.gov/analysis/market_green_power.html.

39. Based on figures from O'Shaughnessy, E. et al. (October 2016). Status and Trends in the U.S. Voluntary Green Power Market (2015 Data). National Renewable Energy Laboratory (NREL). Technical Report NREL/TP-6A20-67147. Using 2015 total US electricity sales of 3.7 billion MWh from U.S. Energy Information Administration (EIA): www.eia.gov/electricity/state/unitedstates/.

markets from facilities built within the last 20 years.[40] Leading corporate buyers invested in nearly six gigawatts (GW) of new renewable energy capacity in the past three years alone.[41] In 2015 and 2016, the majority of renewable capacity additions have been made outside of state-mandated renewable energy requirements, 60% and 55% respectively,[42] and a significant portion of this has been built to serve voluntary customers. We have quantified the avoided emissions value of voluntary renewable energy in the U.S. in Subsection 6.1.

It is worth acknowledging that: 1) avoided emissions due to renewable energy decrease as the proportion of renewables increases over time, and 2) a price on carbon will produce an economic advantage for non-emitting, renewable sources of electricity regardless of renewable energy markets. Notwithstanding the first fact, voluntary purchasers expect that whatever avoided emissions occur on the grid due to that generation will not just be making compliance cheaper and will be above and beyond what is required by law. This does not change the incremental difference that voluntary renewable energy can make even as the proportion of renewables increases. Regarding the second, voluntary renewable energy markets may still be an effective, separate tool to achieve more emissions reductions faster once there is a price on carbon. It may not be in the state's best interest to use only carbon pricing to achieve emissions reductions, especially emissions reductions from renewable energy. Renewable energy markets can be much more effective at driving renewable energy development than a price on carbon alone. Voluntary renewable energy purchasing may not continue solely on the basis of the economic incentive produced by the carbon price once emissions reductions are captured under the cap (see Subsections 4.7.1 and 4.7.2). One should not assume that once a certain carbon price or level of renewable energy penetration (less than 100%) is reached, voluntary renewable energy markets cannot provide additional benefit. Based on our experience, there will always be those that want to reduce beyond what is required by law, and the state can facilitate that activity to achieve additional environmental benefit.

6.1 Avoided GHG Emissions on the Grid Due to Voluntary Renewable Energy

On average, between 2013 and 2015, renewable energy generators across the U.S. generated over 52 million MWh of renewable energy per year on behalf of the voluntary and corporate consumers, based on Green-e and National Renewable Energy Laboratory (NREL) data.[43] This supply was distributed across the U.S. as shown in Figure 9. This amount of voluntary generation translates to over 32 million metric tons of CO_2 avoided on the grid per year. These avoided emissions are distributed across the U.S. as shown in Figure 10, the avoided emissions "heat map."

Figures 11 and 12 show regional projections of voluntary renewable energy and associated avoided emissions, respectively, based on the Energy Information Administration's (EIA) 2017 Annual Energy Outlook (AEO) projections.[44]

7. The Current Landscape of GHG Regulations in the U.S.

As of publication, 11 states have enacted GHG regulations—nine RGGI states (CT, DE, ME, MD, MA, NH, NY, RI, and VT), California, and Washington. All except Washington are cap-and-trade or ETS programs. As introduced in Section 5, cap-and-trade programs set an annual or periodic emissions limit (or cap), issue emissions allowances (e.g. in tons of CO_2e) up to the cap, which are distributed among emitters (either freely or by auction), and then decrease the cap over time thereby reducing overall emissions. The allowances may be traded among emitters. Emissions trading schemes like cap-and-trade are widely perceived as an economically efficient means of regulating GHG emissions, as they incentivize emissions reductions at locations where the marginal cost of abatement is the lowest. Washington's program, the Clean Air Rule, is not cap-and-trade, but rather direct regulation of emissions with a tradable

40. Ibid. Using 2015 total non-hydro renewable electricity generation of 309,301 gigawatt-hours (GWh) from EIA. And using 2015 RPS demand from renewables built since the commencement of the RPS of 126,517 GWh, obtained from Lawrence Berkeley National Laboratory (LBNL).

41. See Business Renewables Center. (May 2017). Corporate Renewable Deals 2012-2017. Rocky Mountain Institute. Available at: businessrenewables.org/corporate-transactions/.

42. See Barbose, G. (2017). U.S. Renewables Portfolio Standards: Status Update and Review of Costs, Benefits, Impacts. Presentation to Michigan State IPU Grid School, March 28, 2017. Lawrence Berkeley National Laboratory. Slides 8–9.

Also see Barbose, G. (2016). U.S. Renewables Portfolio Standards: 2016 Annual Status Report. Presentation April 2016. Lawrence Berkeley National Laboratory. Available at: emp.lbl.gov/sites/all/files/lbnl-1005057.pdf.

43. See the 2015 Green-e Verification Report (at: www.green-e.org/docs/2015%20Green-e%20Verification%20Report.pdf) and NREL's Status and Trends in the U.S. Voluntary Green Power Market (2015 Data) (at: www.nrel.gov/docs/fy17osti/67147.pdf) for more information.

44. See the methodology used for EIA's "Energy Use: Total: Renewable Energy: Reference case without Clean Power Plan 2050" scenario. Accessed August 24, 2017. Data available at: bit.ly/2zmen8V.

compliance instrument representing emissions reductions. These programs are described in the following subsections, along with set-asides or other mechanisms designed to protect the voluntary renewable energy market. A summary of Green-e Standard requirements is also included to provide a sense of how the voluntary market has adjusted to accommodate these programs. Later in this section, we describe potential future GHG regulation in different states.

A total of nearly 2.9 million MWh of voluntary renewable energy annually would not be avoiding emissions beyond what is required by law without a voluntary market policy mechanism (based on 2015 data). This translates to over 1.8 million metric tons of avoided emissions that would not be beyond compliance. Put another way, that is 1.8 million allowances that would be potentially freed up under the cap without a voluntary market policy mechanism, or still another way, 1.8 million metric tons of additional emissions reductions beyond compliance achieved by voluntary renewable energy with a voluntary market policy mechanism. This is shown as an overlay to Figure 10's heat map in Figure 13. Voluntary renewable energy supply and avoided emissions in states with existing GHG regulations in 2015 is shown in Table 5. In reality in 2015, Washington's cap wasn't yet in force, so that generation was not affected, and California plus eight of nine RGGI states do have a voluntary market set-aside, though the set-asides capture only a portion of total voluntary renewable energy sales. As a result, 308,957 metric tons (about 17% of the 1.8 million tons avoided by VRE) were retired on behalf of the voluntary market in California and RGGI states in 2015.

Table 5. 2015 Voluntary Renewable Energy Supply and Avoided Emissions in States with GHG Regulations

State	VRE Supply 2015 (MWh)	2015 avoided emissions (tons CO_2)
CA	616,824.14	255,697.39
CT	N/A	N/A
DE	1,716.00	1,146.22
MA	3,575.00	1,728.62
MD	2,132.80	1,424.63
ME	33,656.53	16,273.94
NH	2,277.00	1,101.00
NY	294,684.00	159,691.45
RI	N/A	N/A
VT	N/A	N/A
WA	1,928,551.00	1,366,664.20
Total	2,883,416.47	1,803,727.46

Figure 14 shows the proportion of total emissions reductions achieved in the power sector represented by voluntary renewable energy in 2015 in both California and RGGI, about 4% and 6% of total annual reductions in the sector, respectively.

Based on the average allowance clearing prices for 2015 in California and RGGI, the annual compliance value of avoided emissions from voluntary renewable energy is over $3.2 million in California and over $1.1 million in RGGI.

7.1 The Regional Greenhouse Gas Initiative (RGGI)

Originally established as a Memorandum of Understanding between Governors in 2005, RGGI was the first mandatory cap-and-trade program in the United States. This agreement included a provision requiring each member state to propose for legislative approval a policy substantially reflecting the Model Rule[45], a set of proposed regulations collectively deigned by the group to ensure consistency across the region. RGGI currently covers CO_2 emissions at fossil fuel-fired electricity generators with a capacity of 25 MW or greater in Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont. Although New Jersey was one of the original signatories, it withdrew from RGGI in 2011. For each short ton of CO_2 emitted annually, affected parties must procure an allowance from quarterly auctions or from other generators within RGGI. Alternatively, they may purchase carbon offsets from eligible projects. Proceeds from regional allowance auctions are reinvested into strategic energy and consumer benefit programs. Through 2014, $1.37 billion was reinvested into energy efficiency, renewable energy, GHG abatement, and direct bill assistance programs. The RGGI CO_2 Allowance Tracking Systems (COATS) is used to record each regulated entity's compliance and is managed by RGGI, Inc., a nonprofit organization designated to provide administrative and technical assistance to RGGI states. RGGI, Inc. provides a range of services to facilitate allowance trading and compliance, but all regulatory and enforcement authority is retained by member states.[46]

During RGGI's first compliance period, which ran from 2009 through 2011, emissions fell below the specified annual cap of 188 million short tons of CO_2. In part due to the increased use of natural gas, as well as decreased electricity demand in the region, the annual cap for the second compliance period, which ran through 2013, was reduced to 165 million short tons. Following the first comprehensive Program Review,[47] the 2014 cap was reduced again to 91 million short tons and was set to decrease annually by an additional 2.5% through 2020, which marks the end of the fourth and final control period. RGGI estimates that

45. See www.rggi.org/design/history/model_rule.

46. Regional Greenhouse Gas Initiative (RGGI). (2017). Program Overview. Available at: www.rggi.org/design/overview.

47. See www.rggi.org/design/program-review.

Figure 7. Map of Green-e Supply, 2015

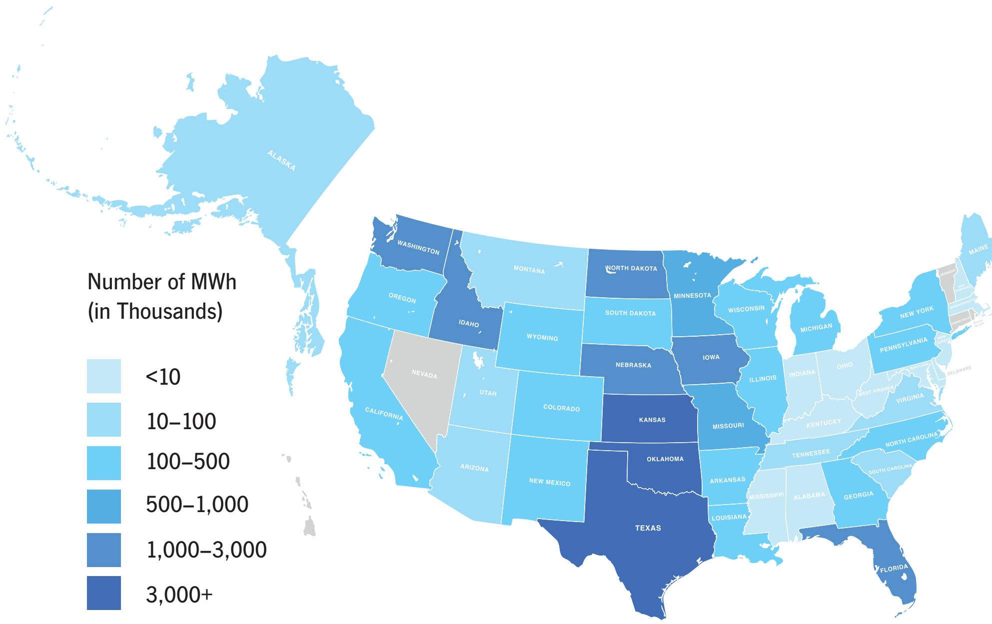
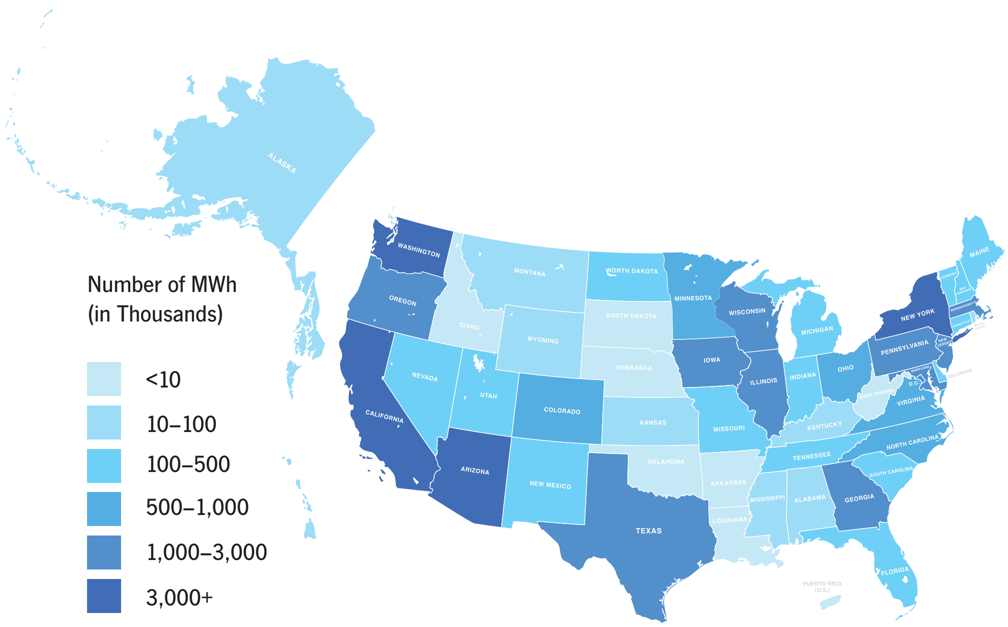


Figure 8. Map of Green-e Sales, 2015



115 million pre-2014 allowances were privately banked due to the oversupply issues that occurred before the cap was sufficiently tightened, and so to ensure that annual caps are met with real reductions, RGGI has made interim adjustments to account for banked allowances. For example, the adjusted cap for 2014 was 82,792,336 short tons, and the final adjusted cap in 2020 will be 56,283,807 short tons of CO_2. Historical RGGI state emissions relative to the cap are shown in Figure 15. By 2020, RGGI is estimated to reduce power sector CO_2 emissions in member states by 45% compared with 2005 levels.[48] If adopted, recently proposed revisions will extend regulation with the goal of reducing emissions by an additional 30% between 2020 and 2030; the final cap set in 2030 would be approximately 65% lower than the original cap set in 2009.

Eight of the nine RGGI states (all except Delaware) have adopted an optional provision in the Model Rule (Section XX-5.3(d)) that allows the use of set-asides to maintain the avoided emissions benefits of voluntary renewable energy. The Model Rule provides a sample formula with which states can calculate the quantity of allowances that would need to be allocated to a voluntary renewable energy set-aside account to maintain the environmental benefits of each MWh bought and sold within the RGGI voluntary market. The suggested formula is: CO_2 tons = MP x EF; where,

> "CO_2 tons, rounded down to the nearest whole ton, is the number of allowances to be placed in the reserve account; MP is the projected MWh of voluntary renewable energy purchases in the State during the future control period that

48. Environmental Defense Fund (EDF), et al. (2015). RGGI: An Emissions Trading Case Study. Available at: www.c2es.org/docUploads/rggi-ets-case-study-may2015.pdf.

Figure 9. **Map of Voluntary Renewable Energy Generation (2013-15, 3-year Average) in the U.S.**

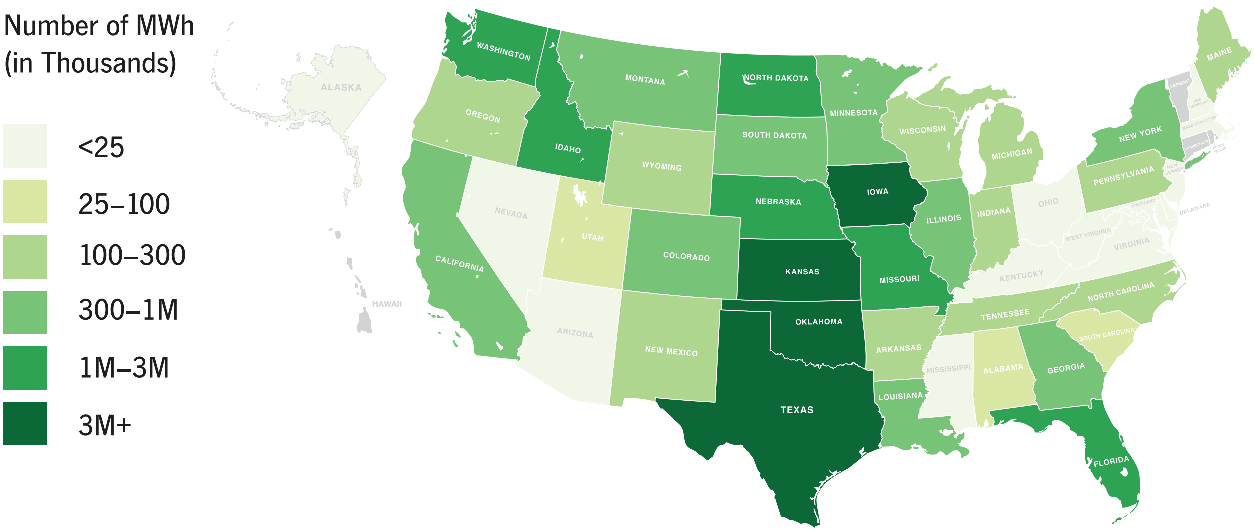
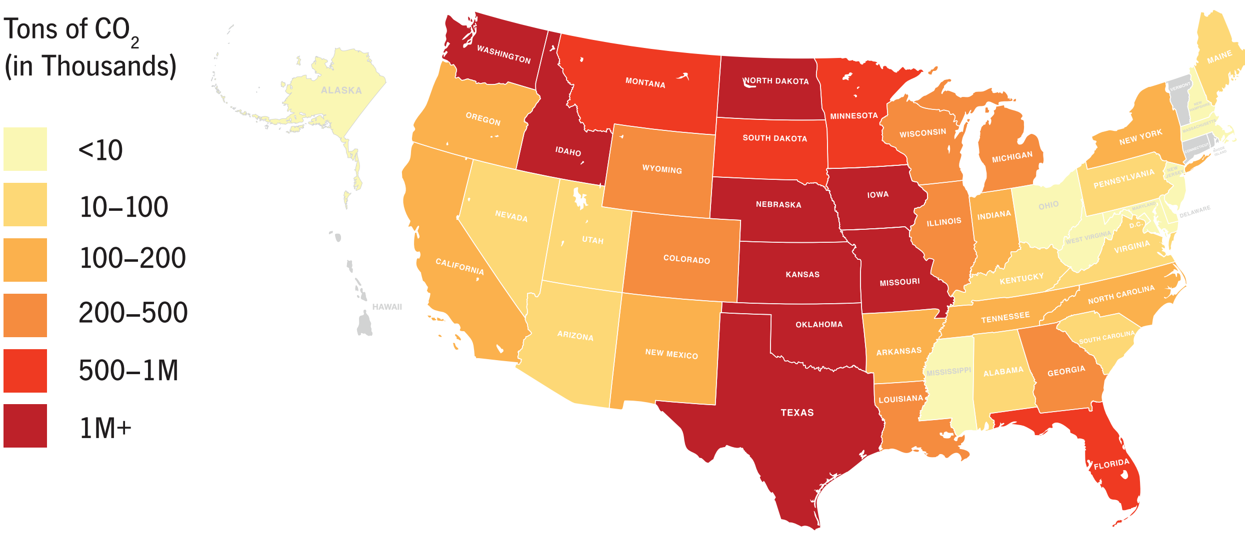


Figure 10. **"Heat Map" of Voluntary Renewable Energy Avoided CO2 Emissions (2013-15, 3-year Average) in the U.S.**



> meets the requirements of this subdivision; and EF is the CO_2 emissions factor for the control area where the electricity represented by the sale was generated."[49]

In RGGI, states set aside allowances to match actual generation used to satisfy voluntary demand using data submitted in association with these sales. While it is the designated regulatory agency in each state who is responsible for allocating set-asides into the correct accounts, this process must be initiated by reputable sources, typically retail electricity providers, submitting the appropriate documentation delineating relevant criteria relating to voluntary renewable energy sales.

RGGI set-asides are associated with the state in which the electricity is purchased and consumed. In other words, allowances are set aside in the state of the voluntary sale, rather than the state of voluntary generation, where different. That means voluntary generation in Delaware that is sold into other RGGI states will still retain its avoided emissions benefits if the set-asides in those other states are used. However, any voluntary generation being sold and consumed within Delaware, whether it is generated in-state or in another RGGI state, will have no set-aside and will fail to retain its avoided emissions benefits due to Delaware's failure to adopt the optional set-aside provision. In addition, the Model Rule allows each state to set a cap or limit on the amount of allowances that can be allocated to the set-aside account for each control period. In Connecticut, for example, state regulation requires that no more than 1.5% of the allowance budget be allocated to the Clean Energy Purchase

49. Regional Greenhouse Gas Initiative (RGGI). (2013). Model Rule. Sec. XX-5.3(d). Available at: www.rggi.org/docs/ProgramReview/_FinalProgramReviewMaterials/Model_Rule_FINAL.pdf.

Figure 11. **Projection of Voluntary Renewable Energy Generation in the U.S., by Region**

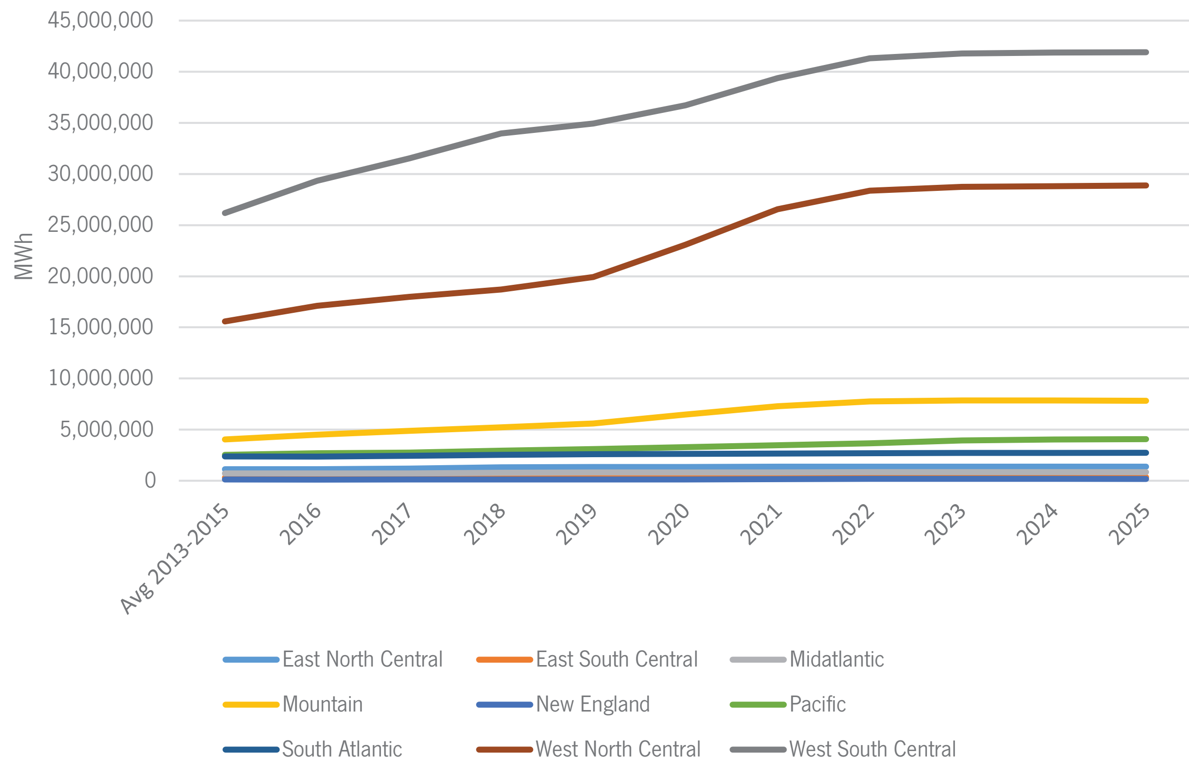


Figure 12. **Projection of Voluntary Renewable Energy Avoided CO_2 Emissions in the U.S., by Region**

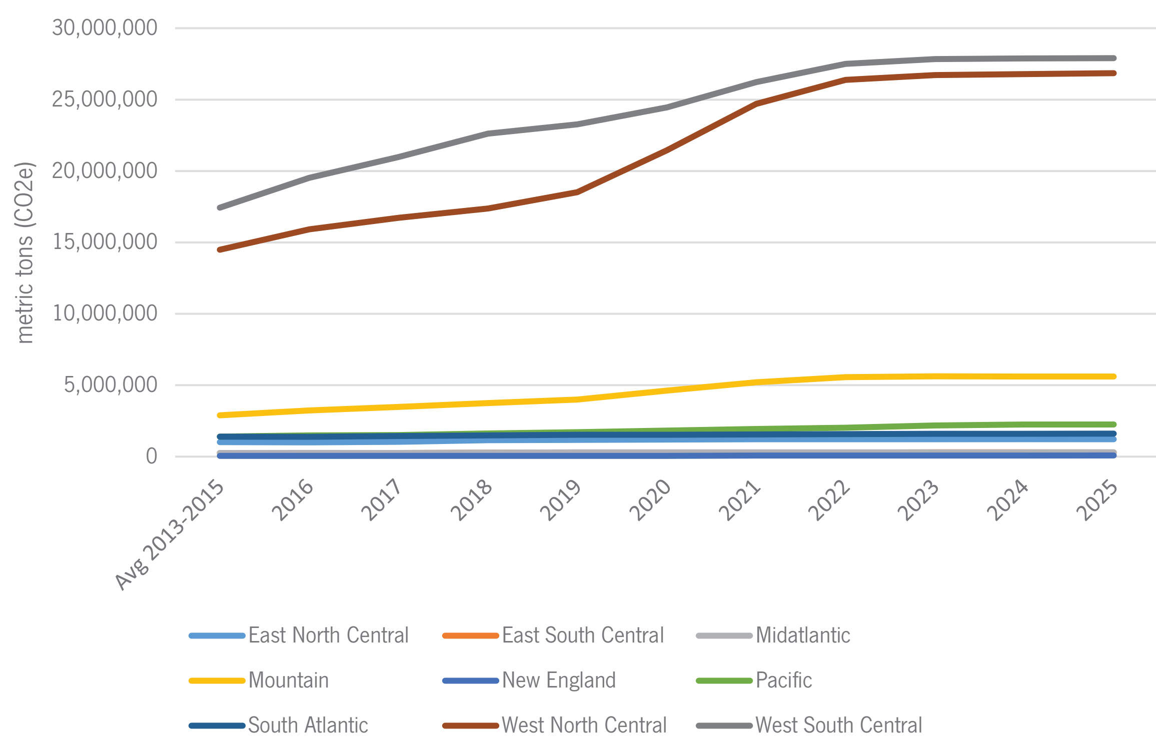
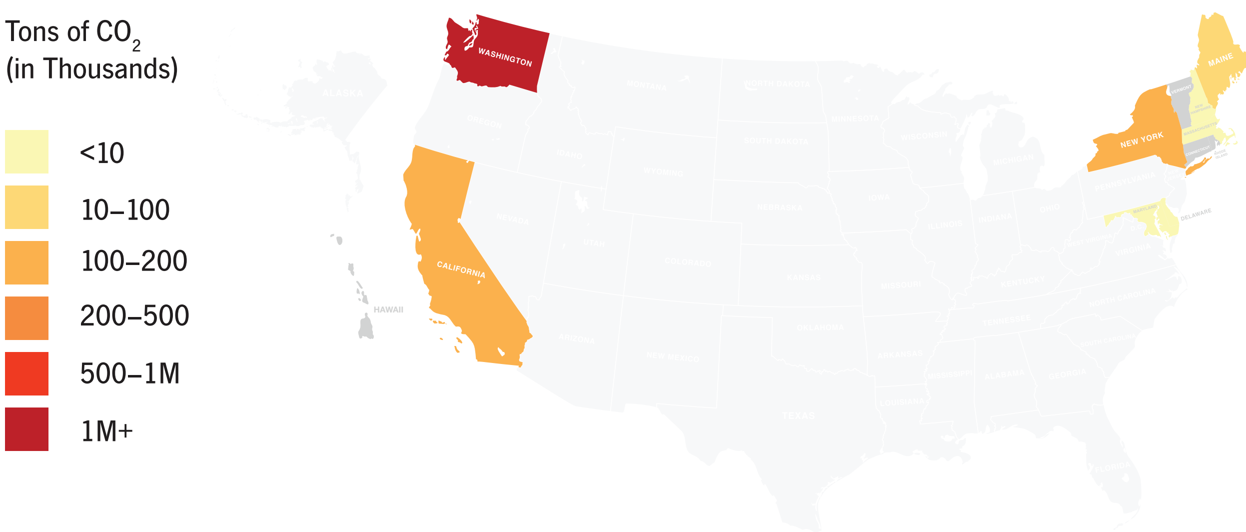


Figure 13. GHG Regulations (Existing and Possible) Overlay with Heat Map



Set-Aside Account.[50] Other states set this limit by specifying an exact number of allowances available; for example, Massachusetts currently limits VRE set-asides to 200,000 annually.[51] The RGGI Model Rule provides no suggested limit, leaving states to make this determination independently. While subscriptions to the set-asides have historically fallen beneath these thresholds, growth in the voluntary market driven by increased corporate renewable energy sourcing and increased awareness of the set-asides and their benefits among voluntary purchasers could produce subscription levels that approach the set-aside caps, in which case there may be risk of voluntary sales without avoided emissions benefits.

Each RGGI state has also developed its own definition of the types of renewable energy that may be eligible to apply to have set-aside allowances retired. For this reason, MWh of generation used in Green-e certified transactions must meet the eligibility definitions determined by both the state of sale and those embodied in the Green-e Renewable Energy Standard for Canada and the United States (formerly Green-e Energy National Standard)[52]. Variations by state are largely based on the commercial online date (COD), resource type, and generator location. Should either Green-e or state eligibility rules be more stringent than the other, the more stringent eligibility criteria takes precedence for Green-e. Green-e certification also requires that the MWh of generation retain its full GHG benefits, even when voluntary sales in a given state exceed the amount of available set-asides. If voluntary renewable energy sales were to exceed the set-aside cap, additional measures would be necessary to protect Green-e eligibility.

7.2 California Cap-and-Trade

The California Air Resources Board (CARB) adopted the state's cap-and-trade program in 2011, and the first compliance period began in 2013. This program is authorized by the Global Warming Solutions Act of 2006 (Assembly Bill [AB] 32), which requires California to return to 1990 emissions levels by 2020. The AB 32 Scoping Plan includes a number of complementary policies, such as the Low Carbon Fuel Standard and the RPS. Cap-and-trade relies on the Mandatory Reporting of Greenhouse Gas Emissions Regulation (MRR), which has required major GHG emitters to report their GHG emissions to CARB since 2009. Like RGGI, compliance is satisfied through the retirement of tradable emissions allowances, which are either issued directly by CARB or can be purchased at quarterly auctions. Unlike RGGI, California's cap is not limited to the electricity sector. It also covers industrial emitters and, as of 2015, distributors of heating and transportation fuels. Affected parties originally only included large, stationary sources annually emitting more than 25,000 $MTCO_2e$, but with the beginning of Phase II in 2015, fuel distributors were included to cover emissions from nonpoint sources. This Phase II expansion increased coverage from 35% to 85% of emissions in California. Also unlike RGGI, California's program is not limited to carbon dioxide. Covered emissions also include methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, sulfur hexafluoride, and nitrogen trifluoride.

Allowances are allocated freely to industrial emitters, to prevent emissions leakage and ease the regulatory transition, as well as to electrical distribution utilities and natural gas suppliers, to prevent price spikes for ratepayers. AB 1532 mandates that the State's

50. Connecticut Department of Energy and Environment. (2013). Section 22a-174-31: Control of Carbon Dioxide Emissions/Carbon Dioxide Budget Trading Program. Available at: www.ct.gov/deep/lib/deep/air/regulations/mainregs/22a-174-31.pdf

51. Massachusetts Department of Environmental Protection (MassDEP). (2013). 310 CMR 7.70: CO_2 Budget Trading Program Regulations. Available at: www.mass.gov/eea/docs/dep/service/regulations/770reg13.pdf.

52. See Green-e Renewable Energy Standard for Canada and the United States (formerly Green-e Energy National Standard) v3.1. Available at: www.green-e.org/programs/energy/documents.

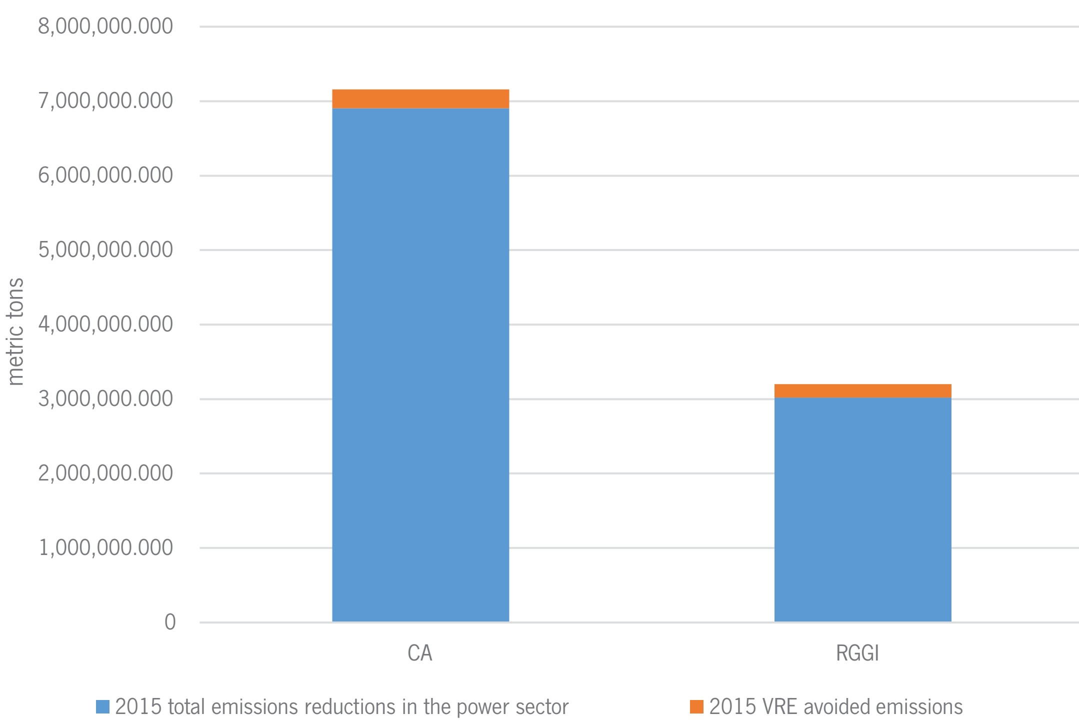
portion of auction proceeds be invested in ways that further reduce GHG emissions while maximizing co-benefits, and Senate Bill (SB) 525 further requires that 25% of these funds specifically do so in ways that benefit disadvantaged communities. Additionally, 8% of compliance obligations may be met by purchasing CARB-approved offset credits from forestry, urban forestry, livestock digesters, or destruction of ozone depleting substances projects.[53] The transfer and retirement of allowances and offsets to meet these goals is reported using the Compliance Instrument Tracking System Service (CITSS).

Due to the inclusion of additional sectors in 2015, the emissions cap increased from 162.8 million metric tons (MMT) in 2013 to 394.5 MMT in 2015. The cap is set to gradually decrease to 334.2 MMT by 2020. Historical covered emissions relative to the cap are shown in Figure 16. By 2020, cap-and-trade is expected to reduce emissions from these regulated entities by 16%, including emissions associated with imported electricity. California has linked its emissions trading scheme with that of Quebec, and allowances from these regions have been entirely interchangeable since 2014. In July 2017, a bipartisan effort in the California legislature allowed for the extension of this regulation through 2030, and there have been discussions about future linkages with the remaining members of the Western Climate Initiative (WCI)—British Colombia, Manitoba, and Ontario.[54]

California's program features a set-aside mechanism to protect the voluntary market for renewable energy; its design is fairly similar to the RGGI set-aside, with a few notable differences. Like RGGI's set-aside, CARB's Voluntary Renewable Energy Program (VREP) allows purchasers of eligible electricity to request retirement of allowances on their behalf. In order for a generator to establish VREP eligibility, it must not have served load prior to July 1, 2005, it must be delivering voluntary renewable energy directly into California, and it must meet all CEC eligibility requirements for the RPS. As an alternative to RPS eligibility, smaller generation could historically establish eligibility by demonstrating compliance with the CEC guidelines for California's Solar Initiative (CSI). However, these requirements were broadened in 2017 to compensate for diminished CSI funds resulting in fewer generators qualifying for the program.

During the first compliance period, allocation to the VREP was set at 0.5% of the total annual allowance budget, but this was revised

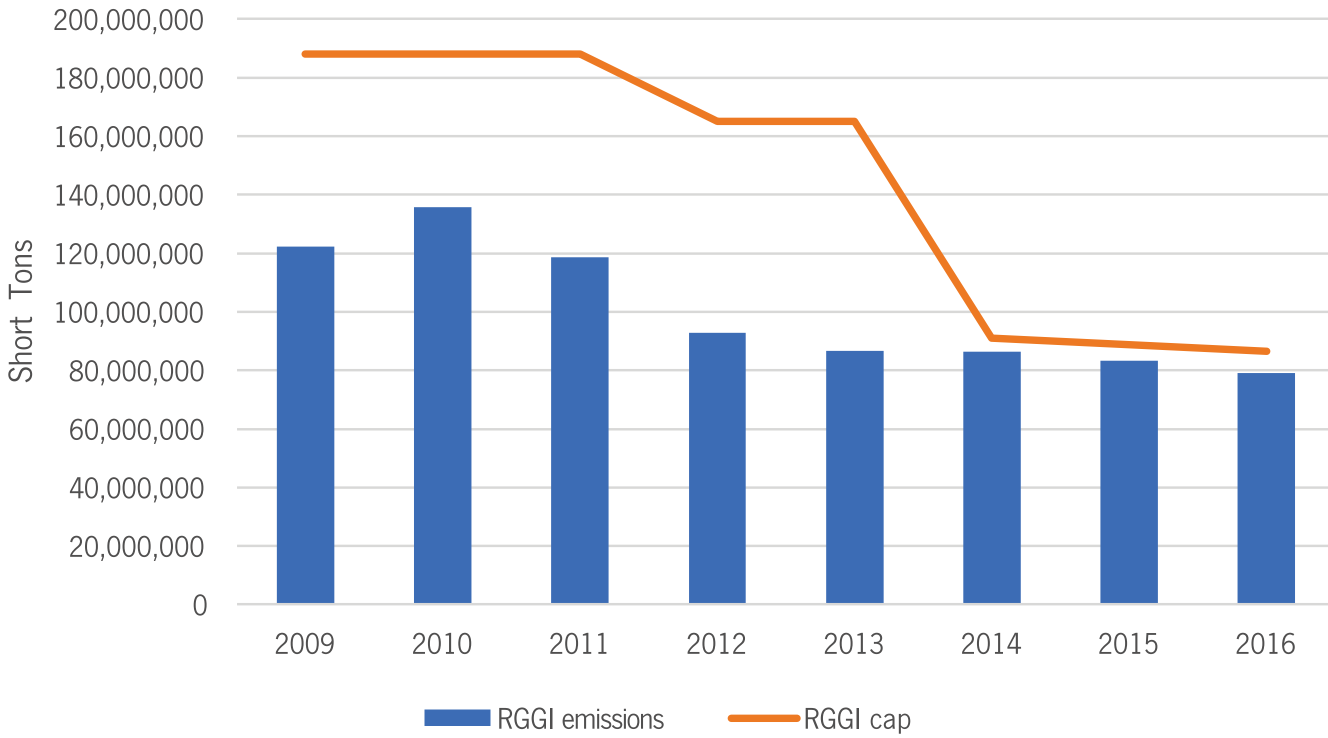
Figure 14. Emissions Reductions from the Power Sector under Cap-and-trade Compared with Avoided Emissions Due to Voluntary Renewable Energy Generation in California and RGGI



53. California Air Resources Board. (2012). Cap-and-Trade Regulation Instructional Guide. Available at: www.arb.ca.gov/cc/capandtrade/guidance/chapter1.pdf.

54. Center for Climate and Energy Solutions. (2014). California Cap-and-Trade Program Summary. Available at: www.c2es.org/docUploads/calif-cap-trade-01-14.pdf.

Figure 15. Emissions in RGGI States Relative to the RGGI Cap (2009-2016).



down to 0.25% for the second compliance period. Despite this decrease, the actual amount of available VREP allowances increased due to the growth of the cap-and-trade program—from 814,000 in 2013 to 986,250 in 2015. In 2020, the amount of allowances available to match with renewable energy purchased in the California voluntary market will be 835,500.[55] Annual allowance allocations to the set-aside are shown in Table 6. Allowances are set aside and tracked in CITSS and are held within the Voluntary Renewable Electricity Reserve Account. Unlike RGGI, when the demand for California set-asides is less than the allocated supply as a percentage of the total allowance budget, the unused allowances remain in the set-aside account for use at a later date. In RGGI states, allowances allocated but not retired on behalf of voluntary renewable energy sales are returned to the compliance market.

Table 6. Annual VRE Allowance Allocations (2015–2020) (MTCO2e)[56]

Year	Allowances
2015	986,250
2016	956,000
2017	926,000
2018	895,750
2019	865,750
2020	835,500

Similar to RGGI, this regulatory cap on VREP allowance allocations has not been an issue for the voluntary market to date. As a result, along with other reasons, CARB decided in August 2017 not to extend allocations to the VREP beyond 2020.[57] However, several growing segments of voluntary demand for renewable energy in California may lead to a potential shortage of VREP allowances in the future. If this were to occur, it would have implications for the eligibility of California supply being used in Green-e certified transactions. Green-e certification requires that VREP-eligible generation must also meet the requirements delineated in the *Green-e Renewable Energy Standard for Canada and the United States*, and VREP allowances must be retired in amounts necessary to maintain the GHG benefits associated with these MWh of voluntary renewable energy. In cases where facilities in or delivering into California are not eligible for VREP yet still meet all other requirements for Green-e certification, or where VREP allowances have been depleted, Green-e participants must independently procure

55. California Air Resources Board. (2012). Chapter 7: What is the Process for Retiring Allowances From the Voluntary Renewable Electricity Reserve Account. Available at: www.arb.ca.gov/cc/capandtrade/guidance/chapter7.pdf

56. California Air Resources Board. Available online at : www.arb.ca.gov/cc/capandtrade/renewable/renewable.htm

57. State of California, Environmental Protection Agency, Air Resources Board (CARB). (August 2017). Amendments to the California Cap on Greenhouse Gas Emissions and Market-based Compliance Mechanisms. Final Statement of Reasons (FSOR). p. 399-400. Available at: www.arb.ca.gov/regact/2016/capandtrade16/ctfsor.pdf.

and retire California-eligible allowances in amounts corresponding to CARB's VREP allowance allocation methodology.

7.3 Washington State Clean Air Rule

In September 2016, Washington became the latest U.S. state to implement GHG regulation, taking action under existing state law, the Washington Clean Air Act. The Clean Air Rule (CAR) is not an allowance-based cap-and-trade program. Instead, it calculates emission baselines and sets tailored emissions standards for individual regulated facilities, allowing flexibility to use tradable credits for overcompliance and non-regulated reductions. It covers natural gas distributors; petroleum product producers (i.e. refineries and importers); metal, cement, pulp and paper, and glass manufacturers; power plants; and waste facilities.

Beginning in 2017, facilities and fuel suppliers annually emitting at least 100,000 metric tons of GHGs must report their emissions to the Department of Ecology (Ecology) and are subject to regulation on a three-year compliance timeframe. These covered parties must follow an emissions reduction pathway that lowers emissions by an average rate of 1.7% per year. To comply, facilities and fuel suppliers can directly reduce their own emissions, purchase emissions reductions from other eligible projects or programs, obtain approved allowances from other approved GHG-reduction programs, or purchase emission reductions from other regulated entities that reduce beyond compliance. The 100,000-ton coverage threshold decreases every three years until the annual emissions threshold for regulated entities reaches 70,000 metric tons. The regulation introduces a new compliance instrument, the Emission Reduction Unit (ERU). An ERU is not an allowance, which represents a quantity of emissions; rather, it is an accounting unit representing the emission reduction value of one metric ton of CO_2e.

The CAR currently covers two-thirds of all in-state emissions, and this is expected to increase as the threshold for coverage gradually lowers. Energy-intensive, trade-exposed businesses are not subject to regulation until 2020 and were given the chance to opt into an alternative compliance pathway determined by a separately calculated formula. To ensure that emissions traded in the market come from permanent reductions, a regulated entity that intentionally scales back production or ceases operation will have the corresponding ERUs transferred to the CAR's ERU Reserve to prevent temporary curtailments solely intended to monetize ERUs. ERUs in this Reserve may be utilized for a number of reasons, one of which is to offset emissions increases associated with entities subject to this regulation opening or expanding operations within Washington. Ecology estimates that the CAR will prevent $9.6 billion in potential negative economic impacts associated with climate change by 2036.[58]

Another intended purpose of the ERU Reserve is, "to promote the viability of voluntary renewable energy programs in Washington"[59] by retiring ERUs in the Reserve on behalf of voluntary renewable energy generation. However, the majority of ERUs are allocated to the Reserve as a percentage of required emissions reductions, accounting for 2% of a covered party's annual decrease. These ERUs in the Reserve have effectively been used for compliance. Furthermore, ERUs can be issued for certain activities within covered sectors, including the electricity sector. As a result, there is a potential for double crediting of emissions reductions, and these ERUs may not represent real reductions. Voluntary renewable energy is the last of six priorities for retirements of Reserve ERUs. It is unclear whether there will be adequate ERUs in the Reserve for voluntary market sales after ERUs are first retired on behalf of curtailed facilities, newly covered facilities not factored into the emission baseline, qualifying changes in production, harmonizing ERU generation with reduced GHG emissions, and programs with positive environmental justice impacts.[60] Though compliance begins in 2017, ERUs will not be allocated to the Reserve until the end of the first compliance period in 2020, making it impossible to know the percentage of ERUs that represent real reductions, as well as whether there will be sufficient ERUs in the Reserve for voluntary renewable energy until then.

The CAR is still in its early stages, and additional details and protocols for best practices will likely emerge. However, until these concerns with the ERU Reserve have been resolved, eligibility for Green-e certification will require additional protocols to ensure that the GHG benefits associated with voluntary renewable energy purchases from Washington are preserved. To be eligible for certification, any generation in Washington with a commercial online date of January 1, 2017 or later will be required to maintain the GHG benefits of those MWh in one of two ways. One option is to independently retire eligible emissions allowances from other programs (e.g. California) in amounts in accordance with Washington's average rate of GHG emissions for marginal resources.[61] Alternatively, generation could be matched with retired, Green-e-compliant ERUs that can be proven to represent emissions reductions beyond the emission reduction pathway at a covered party. Eligible emissions allowances and Green-e-compliant ERUs used for Green-e certified transactions cannot be used for CAR compliance.

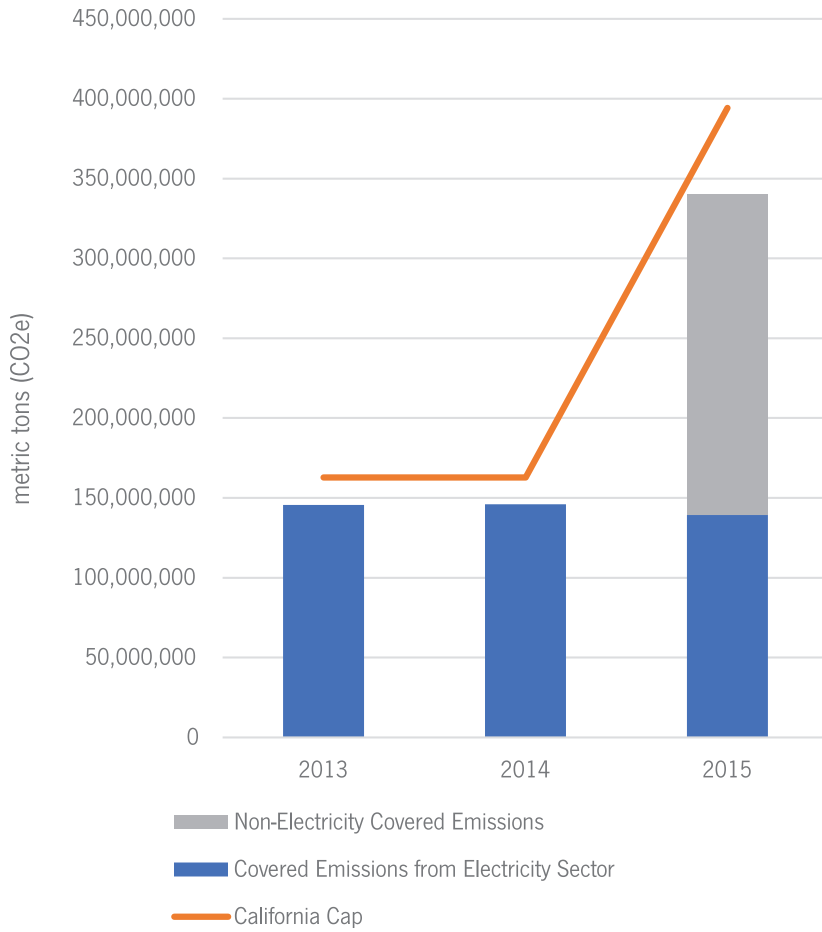
58. Washington State Department of Ecology. (2017). Clean Air Rule. Available at: www.ecy.wa.gov/programs/air/permit_register/clean_air_rule/car.htm.

59. WAC 173-442-240 (2)(c).

60. Washington State Department of Ecology. (2016). Chapter 173-442 WAC: Clean Air Rule. Available at: www.ecy.wa.gov/laws-rules/WAC173442/X1510a.pdf.

61. The emissions factor referenced in this section is available in WAC 173-442-160(5)(c)(i)(B); as of 4/10/2017 this factor was 970 lbs of CO2e/MWh (0.44 MT of CO2e/MWh).

Figure 16. **Emissions in California Relative to the California Cap (2013–2015)**



7.4 Potential for Additional GHG Regulation at the State Level

While, as of publication, the fate of the Clean Power Plan is undetermined but inauspicious under the Trump Administration, expanded GHG regulation among states still carries some momentum. The uncertainty surrounding Clean Power Plan and U.S. involvement in the Paris Agreement have made initiatives at the state and local level, not to mention corporate and other voluntary action, increasingly meaningful.

Expansion of RGGI appears to hinge on political factors. For example, in New Jersey, Governor Chris Christie has used his veto power to block legislative efforts that would require the state to rejoin RGGI. With Governor Christie terming out in 2018, proponents of GHG regulation are hopeful that the next governor will be less likely to obstruct these efforts. In addition to all democratic candidates seeking the position, the top republican gubernatorial candidate, current Lt. Governor Kim Guadagno, has expressed support for recommencing RGGI membership.

Virginia also seems poised to pursue GHG regulation in the near future. In May 2017, Governor Terry McAuliffe signed an executive order directing regulators to formulate rules to reduce GHG emissions in Virginia's electricity sector. While this prospective regulation will likely resemble cap-and-trade, it is unclear whether it will be associated with RGGI or will function as an independent ETS. Virginia was also one of 12 states whose governors signed an open letter to the Trump Administration in support of the U.S. remaining a signatory of the Paris Agreement. The majority of these states are either currently regulating GHG emissions in the electricity sector or are considering potential strategies for doing so in the future. However, Governor McAuliffe will leave office in 2018, and GHG regulation faces staunch opposition amongst republicans in the state legislature.

Pennsylvania, whose governor was also a signatory to the letter to the Trump Administration, has flirted with the idea of RGGI membership. During his 2014 campaign, Governor Tom Wolf promised to join RGGI if elected. Although he was elected, his promise has not so far been fulfilled.

Oregon publicly supports GHG regulation but, as of publication, is still considering the best path forward. In its most recent legislative session, three GHG-related bills were introduced, but none were voted on prior to adjournment. Two of the bills, SB 557 and House Bill (HB) 2135, would create a cap-and-trade system similar to California's, while the third, SB 748, would create a GHG pollution permit program that would directly regulate emissions without a compliance trading mechanism.

Other states that publicly support the Paris Agreement have pursued and achieved GHG reductions through other means, including energy policy and other programs not specifically aimed at GHG emissions. Some states have implemented policy changes that are aimed at GHG emissions, but that do not directly regulate them. For example, Colorado, Illinois, Minnesota, and New York, all now use a social cost of carbon in calculations and assessments of energy policy changes. These alternatives do not affect benefits of voluntary renewable energy.

8. Guidance for States Considering GHG Regulations

States and regions may face a number of constraints when designing GHG Regulations for the power sector, including limitations to legal and regulatory authority, power supply mix, power market structure, resource availability, other existing regulatory programs, legislative objectives and targets, and others. Within those constraints and priorities, we encourage air regulators to consider the growth of voluntary and corporate renewable energy by adhering to the following general guidelines.

1. Be consistent with other existing state GHG programs, if possible.

In practice this means consider cap-and-trade first. States can use California and RGGI as good models for their programs. Building a program that is compatible opens the possibility of trading (or "linkage") and simplifies the national landscape of requirements for voluntary buyers and sellers with national operations and sales. Cap-and-trade is a familiar model at this point for many in the electricity market, or at least there are those with long experiences upon which to draw. Cap-and-trade in particular also allows for relatively straightforward incorporation of a voluntary renewable energy allowance set-aside (described in Section 5), which is a credible and proven mechanism to protect the voluntary market and one with which the market is again familiar.

2. Include an allowance set-aside or otherwise lower the GHG emissions limit on behalf of the voluntary renewable energy market.

As explained in previous sections, an allowance set-aside or other mechanism to allow voluntary renewable energy to reduce emissions beyond compliance may be key to sustaining and/or growing voluntary activity, which can support state environmental and economic goals and reduce the costs of regulation.

In setting up their mechanisms and selecting from the number of options mentioned in Section 5, states should consider the way that voluntary renewable energy is consumed in the state. This data can be obtained from market participants, certifications like Green-e, and other market analysts, such as the National Renewable Energy Laboratory (NREL).[62] For example, the majority

Table 7. Hypothetical Electricity Sector Data

Fuel type	No. of plants	Plant emissions factor (tons/MWh)	2017 generation (MWh)	2017 emissions (tons)	2017 RE avoided emissions (tons) (using NG emissions factor)
Coal	3	10	300	3,000	n/a
NG	7	4	420	1,680	n/a
Solar (util. scale)	2	0	80	0	320
Wind	4	0	200	0	800
Geothermal	1	0	50	0	200
Hydro	2	0	150	0	600
Biomass (not regulated)	1	9	50	450	-250
Total	20	n/a	1,250	5,130	1,670
Total Regulated	10	n/a	720	4,680	1,920

2017 VRE generation (~25% of total RE) (MWh)	2017 VRE avoided emissions (tons) (using NG emissions factor)
130	520

62. Visit www.nrel.gov/analysis/green-power.html.

of voluntary renewable energy sales sourcing from the state may be made through a small group of large retailers (e.g. utilities), or there may be a large and/or growing number of small voluntary consumers sourcing from onsite solar facilities. Small, distributed onsite consumers may be less likely to apply to a set-aside, if they are even aware of it, in which case automatic retirement based on voluntary market data may be more effective. On the other hand, large voluntary suppliers are easier to communicate with and may tolerate more complexity.

3. As explained in Subsection 4.6.1, if emissions associated with imported power are included in the regulation, require RECs for reporting zero-emissions renewable imports to prevent double counting direct emissions.

8.1 Guidance for States Considering Direct Regulation of Emissions at the Plant Level (Command and Control)

Cap-and-trade may not be a viable option for some states for a variety of reasons. Federal guidance or regulation may also limit how states address GHG emissions from the power sector. As a result, states may consider traditional command and control of GHG emissions from the power sector, in which (production-based) regulatory limits on GHGs are set at the plant level. As described in previous sections, these policies have the same general effect on voluntary renewable energy as cap-and-trade, and they can also be designed to ensure that voluntary renewable energy can reduce emissions.

The effect of voluntary renewable energy will be automatically factored into the baseline emissions level for the policy. This means that the baseline will be lower due to voluntary renewable energy, i.e. voluntary renewable energy up to the baseline year has affected emissions in the state. That is important for maintaining the eligibility of that pre-regulation generation in the voluntary market. In addition, states should also use voluntary market activity (which can be obtained from REC tracking systems, programs like Green-e, or market participants) to set compliance obligations. States can calculate avoided emissions from renewable energy serving the voluntary market, as we have done for the whole country in Subsection 6.1, and factor those reductions into compliance obligations. In other words, states can lower the compliance targets (increase stringency) in total by the amount of reductions from voluntary renewable energy.

For sectoral GHG Regulations, the overall sectoral limit can be reduced by the amount of emissions avoided emissions associated with total voluntary renewable energy sales from renewable generators in the sector. For project-based command and control, the total avoided emissions from voluntary renewable energy must be allocated or assigned to individual plants, and then their compliance obligations can be lowered by that amount. To do this, one can simply apply the percentage of overall emissions represented by the individual plant to the total quantity of avoided emissions from voluntary renewable energy, which will produce an amount of avoided emissions for that plant. Reducing the compliance obligation for that plant by that amount will effectively restore regulatory surplus for voluntary renewable energy with respect to GHG emissions at that plant. We provide an example of this in Subsection 8.1.1 (Tables 7–9 and Figures 17–18).

This is, of course, an approximation of how avoided emissions are actually distributed among plants, and the calculation of avoided emissions itself is an estimate based on marginal emissions factors and other assumptions about what is being backed down and when. Nonetheless, policy mechanisms can employ estimation and approximation to simplify regulation and achieve benefits for the state and voluntary purchasers.

8.1.1 Command and Control Example

Table 8. Sectoral GHG Regulation with Adjustment for Voluntary Renewable Energy

2017 baseline (tons)	2018 target (tons)	2018 target adjusted for VRE (tons) (2018 target—2017 VRE avoided emissions)
4,680	4,446 (5% reduction)	3,926 (16% reduction)

States can calculate compliance targets/obligations periodically in order to make this adjustment. Alternatively, they can set compliance targets/obligations up front, use voluntary market projections for these adjustments, and reserve the right to adjust compliance obligations in response to growth in the voluntary market.

8.2 Guidance for States Considering Rate-based GHG Regulations

As mentioned briefly in the Introduction, rate-based GHG Regulations do not have the same effect on renewable energy generation as mass-based GHG regulations. In a mass-based system, measures like renewable energy and energy efficiency substitute zero-emitting generation or energy savings for fossil power generation and the effect of this is automatically reflected in the metric for compliance—stack emissions at regulated units. Those same measures will not affect the emissions rate of fossil plants (tons/MWh). When energy efficiency or renewable energy avoids generation at a regulated unit, this reduces both the numerator and the denominator, but the rate does not change.

Table 9. Project-based Command and Control with Adjustment for Voluntary Renewable Energy

Plant name	2017 baseline (tons)	Percent of total emissions (rounded)	2018 target (tons)	2018 target adjusted for VRE (tons) (2018 target—percent of total * VRE avoided emissions)
Coal 1	1,000	22%	950	836
Coal 2	1,000	22%	950	836
Coal 3	1,000	22%	950	836
NG 1	240	5%	228	202
NG 2	240	5%	228	202
NG 3	240	5%	228	202
NG 4	240	5%	228	202
NG 5	240	5%	228	202
NG 6	240	5%	228	202
NG 7	240	5%	228	202
Total	4,680	101%	4,446	3,922
			(5% reduction)	(16% reduction)

Rate-based regulations can include an explicit adjustment to rates to reflect the effect of renewable energy generation. The Clean Power Plan (2015) includes an instrument called an Emission Rate Credit (ERC) to be used for just such an adjustment and to track and account for emissions reductions that can be used to adjust rates in states with rate-based GHG regulations. ERCs can be issued to renewable energy generators and energy efficiency projects and sold to regulated generators for compliance. The regulated generators use ERCs (denominated in MWh) to adjust their rate for avoided generation by adding them to the denominator, effectively lowering the rate.[63]

Where rate-based GHG regulations, such as the rate-based approach under the Clean Power Plan, issue ERCs or a similar compliance instrument to voluntary renewable energy, and those ERCs/instruments are used for compliance, that voluntary renewable energy is no longer surplus to regulation. To restore regulatory surplus and to sustain voluntary demand in this case, states can require that ERCs and RECs be kept bundled together, so that a voluntary REC purchaser also gets the ERC, which is not used for compliance. Alternatively, states can create ERC set-asides on behalf of the voluntary renewable energy market. Each of these alternatives may have consequences in the market that may require complementary regulatory mechanisms, but nonetheless, there are alternatives to protect voluntary demand for renewable energy under rate-based compliance that allow an adjustment for renewable energy.

9. Guidance for States With GHG Regulations

1. Adopt an allowance set-aside or otherwise lower the GHG emissions limit on behalf of the voluntary renewable energy market, if one is not already included in the regulation.

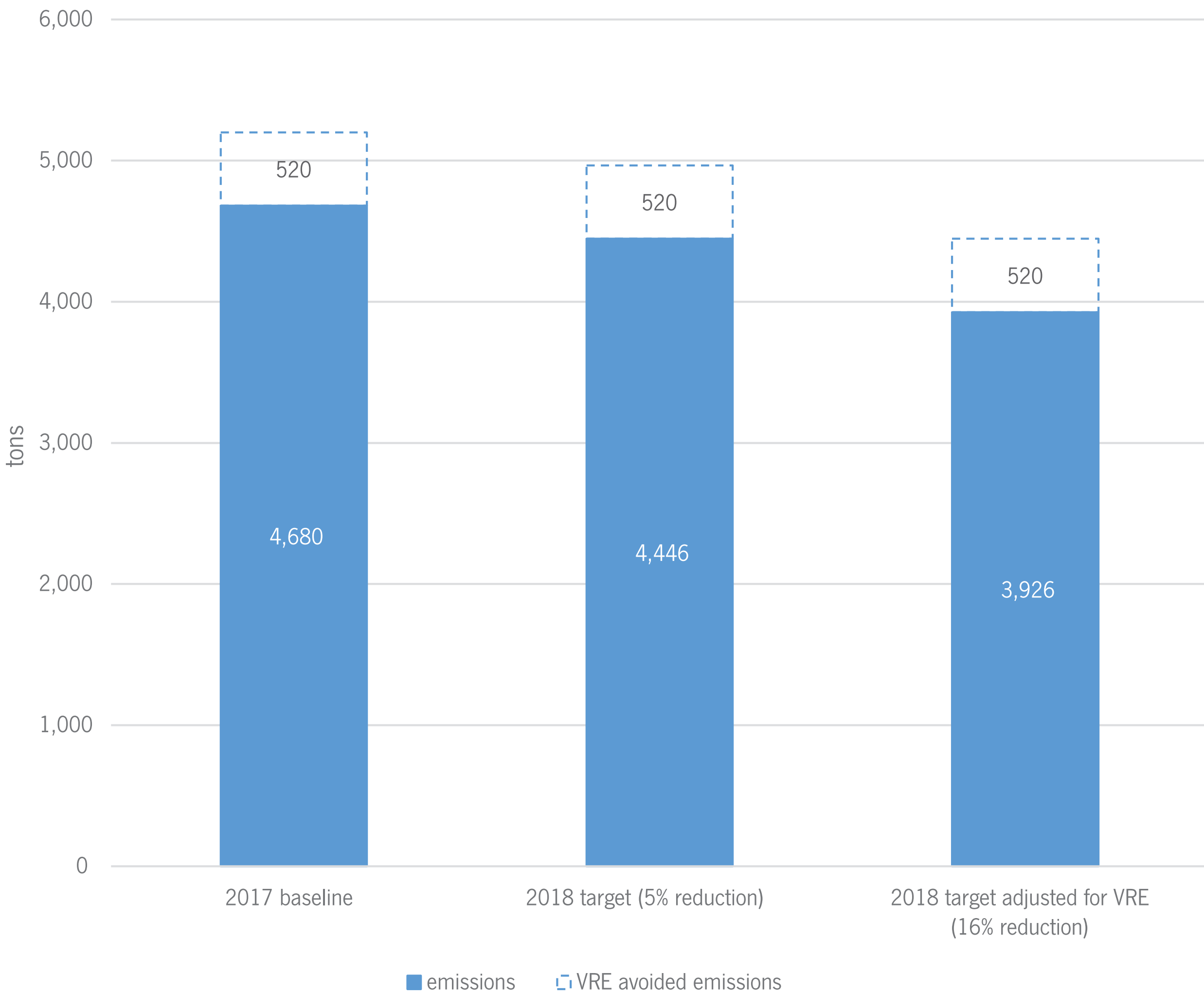
As of publication, Delaware is the only state in RGGI, and the only U.S. state with cap-and-trade,[64] without a set-aside mechanism for the voluntary market. Without the set-aside, customers in Delaware cannot buy Green-e certified renewable energy from Delaware or other RGGI states, and Delaware cannot sell Green-e certified renewable energy to in-state customers. This means that voluntary buyers in Delaware must get their certified renewable energy from outside of the RGGI region. In 2015, Green-e certified over 104,000 MWh in sales to over 1,160 retail customers located in Delaware. Adoption of the set-aside would allow for this demand to be met by resources in Delaware and RGGI. Other RGGI states would also benefit in that RGGI generation could be sold in Green-e certified products to customers in Delaware.

2. Ensure that the voluntary renewable energy mechanism is effective in reducing emissions on behalf of the voluntary market.

63. For more information see Jones, T. (October 16, 2015). Renewable Energy in the EPA Clean Power Plan. Part 1: Introduction to Emission Rate Credits. Center for Resource Solutions. Available at: resource-solutions.org/wp-content/uploads/2015/10/Renewable-Energy-In-the-EPA-CPP-1.pdf. And Jones, T. (October 16, 2015). Renewable Energy in the EPA Clean Power Plan. Part 2: Interactions with and Impacts on RECs and Renewable Energy Markets. Center for Resource Solutions (CRS). Available at: resource-solutions.org/wp-content/uploads/2015/10/Renewable-Energy-In-the-EPA-CPP-2.pdf.

64. Canadian provinces of Ontario and Quebec also have cap-and-trade and do not include a voluntary renewable energy set-aside mechanism.

Figure 17. **Sectoral GHG Regulation with Adjustment for Voluntary Renewable Energy**



For example, the Washington CAR, described in Section 7, includes the ERU Reserve, a mechanism that is, in part, intended to retire ERUs on behalf of the voluntary renewable energy market in the state. However, Green-e identified several concerns with its effectiveness in restoring regulatory surplus for the voluntary market.[65] Foremost among them is that ERUs, which are not allowances and instead represent emissions reductions, are allocated to the Reserve as a percentage of the total reductions that are required by regulated entities, meaning they are not emissions reductions that are surplus to regulation. In order to preserve regulatory surplus, ERUs retired for voluntary renewable energy must be generated by lowering the emissions at regulated units in excess of requirements.

Washington state could create a new mechanism for the voluntary market to identify and retire ERUs that represent actual reductions beyond compliance at regulated units. There remains additional concern about whether there will be enough of these ERUs to satisfy demand from the voluntary market, in which case the new mechanism may not be effective. Alternatively, the state could simply lower compliance pathways to account for voluntary renewable energy, as described in Subsection 8.1.

3. Strengthen and extend existing voluntary renewable energy set-aside mechanisms.

California and RGGI both have opportunities to strengthen their set-aside programs. Both mechanisms currently require that voluntary market participants apply to the set-aside in order to have allowances retired. The result of this is that in both regions only a portion of the voluntary market applies and is covered by the set-aside. Though Green-e requires it for all certified sales from capped regions, all voluntary sellers and buyers should be using the set-aside in order to ensure that generation used to

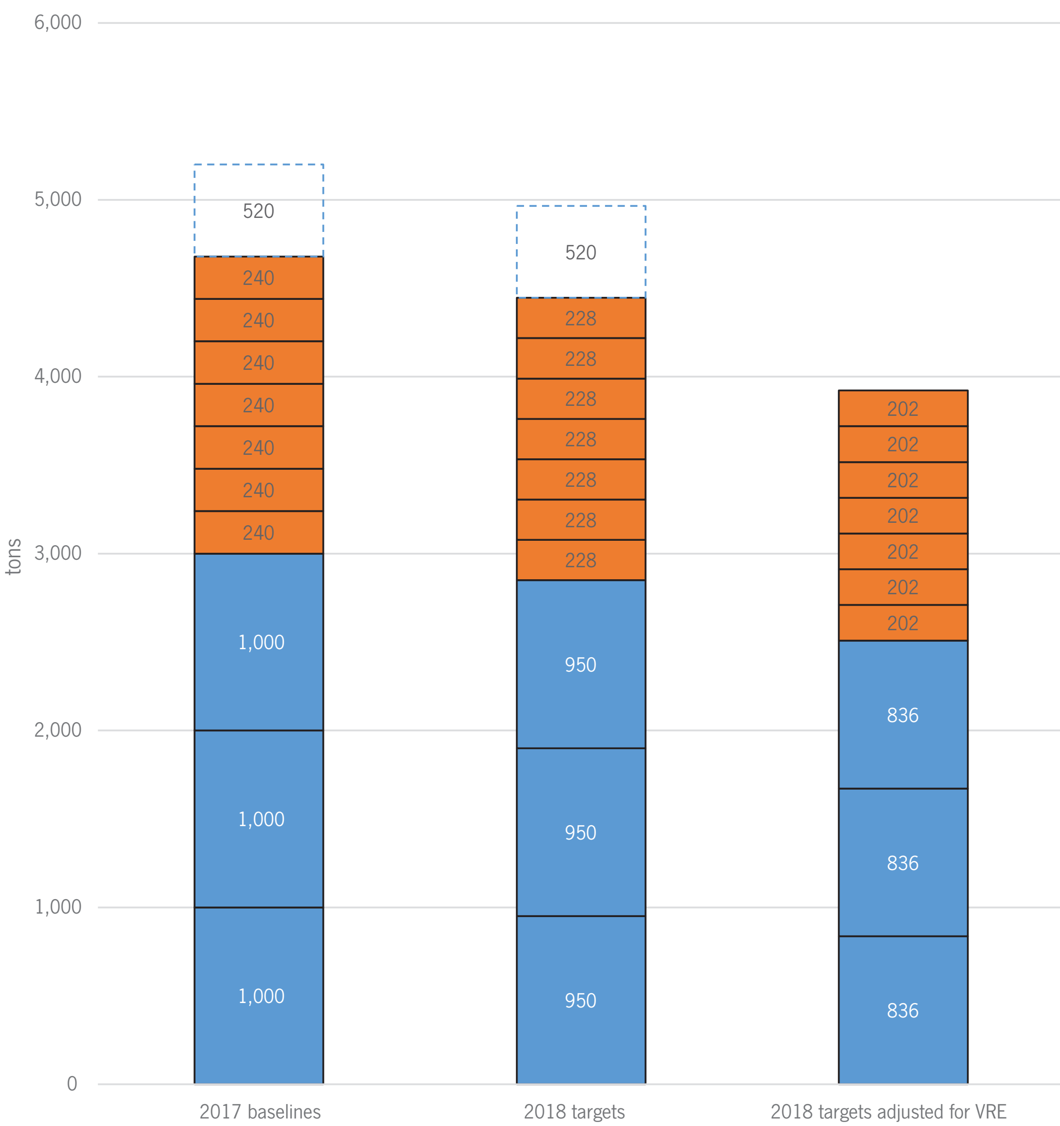
65. For a complete summary of Green-e's concerns with the Washington CAR ERU Reserve mechanism, see the March 8, 2017, "Green-e Energy Participant Market Advisory: Washington." Available at: www.green-e.org/files/03082017_green-e_participant_wa_advisory.pdf.

meet voluntary demand has an effect on grid emissions and is incremental to the cap, including onsite solar and other distributed generation where the RECs are retained by the consumer. Other voluntary purchasers, particularly onsite solar customers, may either not be aware of the set-aside or are deterred from applying due to its complexity. The application process can be removed to make retirements automatic based on voluntary generation and purchasing data that can be obtained from REC tracking systems, certification programs like Green-e, and/or other data sources for onsite solar. This would allow the set-aside to cover the whole voluntary market in these states. Apart from producing benefits for these voluntary customers, this would also put additional downward pressure on the cap and reduce additional emissions.

California and RGGI states can also do more to communicate the benefits of the set-aside to customers. Additional outreach to both the solar community as well as retail suppliers with voluntary programs in the region regarding the set-aside, how it works, and the benefits it provides to voluntary buyers could increase interest in and use of the set-aside mechanism.

In RGGI, voluntary renewable energy market participants must apply to the set-aside in the state in which the voluntary sale was made. This is different from California, where they apply to the set-aside for any in-state or imported generation delivered to the state that was used in a voluntary sale. As a result, the RGGI set-aside only accommodates voluntary renewable energy that is generated and sold into a RGGI state (other than Delaware). There is no set-aside for RGGI renewable energy that is sold

Figure 18. **Project-based Command and Control with Adjustment for Voluntary Renewable Energy**



outside of RGGI or in Delaware, which therefore has no avoided emissions benefit and cannot be Green-e certified. California's approach—retirement in the state of generation rather than the state of sale—may be simpler and would allow for RGGI renewable energy to be sold outside of RGGI with full emissions benefits and Green-e certification.

Finally, the risk of expiration or depletion of allowances in the set-aside can also cause a decrease in voluntary demand. California committed to allocating allowances to the set-aside only through 2020. In August 2017, CARB decided, over objections from the market, not to extend allocations beyond 2020 based on historical requests for retirement, the amount of voluntary renewable energy allowances remaining in the account, uncertainty over future requests, and perceived impacts to compliance prices in combination with other changes to the program.[66] As described in Section 5, we disagree that the set-aside significantly increases allowance prices, and in California there are many reasons to expect that voluntary demand for renewable energy and subscriptions to the set-aside will exceed historical levels.[67] Though there may be several years before the California set-aside nears depletion and the state has committed to monitoring the market and considering re-starting allocations as the set-aside nears depletion,[68] uncertainty about supply of set-aside allowances may nevertheless affect demand. Similarly, the set-aside caps in RGGI may present a problem with dramatic growth in voluntary sales or increased awareness of the set-asides among voluntary buyers and sellers in RGGI states. We recommend that states commit to allocating and retiring allowances through a voluntary renewable energy set-aside to cover all voluntary sales sourcing from affected supply for the lifetime of the program, until or unless there is no voluntary market due to regulatory requirements to deliver 100% renewable energy.

10. Conclusion

Voluntary renewable energy generation provides important GHG emissions benefits across the country. Voluntary buyers of renewable energy expect their purchases and investments to support renewable energy that reduces emissions, not to simply reduce the costs of compliance for regulated entities. Avoided emissions beyond regulatory requirements are important to voluntary consumers and moving the needle on climate change is a key driver of voluntary action. Without additional provisions, such as allowance set-asides for voluntary renewable energy, GHG Regulations will have the unintended consequence of reducing the demand-side impact of voluntarily purchasing renewable energy and shifting the costs of compliance away from regulated entities and onto those taking voluntary action.

States and regions can prevent decreases in voluntary demand and support privately funded emissions reductions beyond compliance targets by adopting cost-effective regulatory mechanisms to reduce regulatory targets on behalf of the voluntary market. There are proven examples of successful programs in California and in RGGI states that can be used as models by states that are considering GHG Regulations. Even these successful programs can be strengthened and extended in a number of ways to produce additional benefits and provide additional certainty to both GHG market and voluntary renewable energy market participants. There are also examples of programs that have thus far failed to include effective mechanisms to protect the voluntary market. Voluntary renewable energy in these states has a reduced impact on GHG emissions and climate change mitigation that can reduce voluntary activity and investment and/or represent an issue in terms of honest marketing of renewable energy to customers. •

66. State of California, Environmental Protection Agency, Air Resources Board (CARB). (August 2017). Amendments to the California Cap on Greenhouse Gas Emissions and Market-based Compliance Mechanisms. Final Statement of Reasons (FSOR). p. 399-400. Available at: www.arb.ca.gov/regact/2016/capandtrade16/ctfsor.pdf.

67. For more on these reasons, see April 12, 2016 CRS comments to CARB in response to the March 29, 2016 Workshop on Cap-and-Trade Regulation Post-2020 Emissions Caps and Allowance Allocation. Available at: resource-solutions.org/wp-content/uploads/2016/04/CRScomment_3-29Workshop_4-12-2016.pdf.

68. State of California, Environmental Protection Agency, Air Resources Board (CARB). (August 2017). Amendments to the California Cap on Greenhouse Gas Emissions and Market-based Compliance Mechanisms. Final Statement of Reasons (FSOR). p. 399-400. Available at: www.arb.ca.gov/regact/2016/capandtrade16/ctfsor.pdf.

CRS center for resource solutions

1012 Torney Ave. 2nd Floor
San Francisco, CA 94109
www.resource-solutions.org
415-561-2100

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