ANALYSIS GROUP
ECONOMIC, FINANCIAL and STRATEGY CONSULTANTS

RGGI and Emission Allowance Trading
Summer 2017 Update

Options for Voluntary Cooperation among RGGI and Non-RGGI States

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July 2017

I. Executive Summary

The RGGI states have over eight years of experience running a voluntary multi-state program to limit emissions of CO_2 through a mass-based, allowance trading program. The states have administered a liquid and efficient market for trading emission allowances and have used the proceeds from allowance auctions to achieve economic benefits and meet the public policy objectives important to each RGGI state.[1]

Now, in the second major phase of RGGI program review, the RGGI states are considering program changes involving numerous design issues, including whether and how to ensure that the program design allows other states to participate in or link to RGGI.[2] The RGGI states recognize the benefits of a trading market that is as broad as possible and have a unique opportunity to shed light on the benefits of CO_2 allowance trading and to open the door to expanded trading opportunities for power plants located inside and outside the RGGI states.[3]

This Report is an update to a previous 2016 report issued by Analysis Group related to allowance trading in the context of the Clean Power Plan.[4] In this update, we review the possibility of expanded allowance trading absent such a federal program. We recognize that there are a number of critical RGGI program design features unrelated to expanded trading that are under consideration by the RGGI states; we limit our observations in this paper to questions related to an expanded trading platform.

In many ways, the issues of and the rationale and principles for pursuing a broader allowance trading program are the same absent an overriding federal obligation. In this report, we assess the core issues of allowance trading and identify principles and objectives for program design changes that RGGI states might incorporate to enable broader trading, if and when appropriate. We also assess various issues that other states might take into account as

[1] The nine RGGI states are Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont. New Jersey originally participated in the development of RGGI and in the first three years of RGGI's implementation (2009-2011).

[2] The RGGI states have noted the potential benefits of a broader trading market, stating that they "…welcome the possibility of additional jurisdictions participating in RGGI," and "…are open to conversation with other jurisdictions." The Regional Greenhouse Gas Initiative, *RGGI Program Review: June 27, 2017 Stakeholder Meeting* (hereafter "RGGI Stakeholder Meeting"), page 7.

[3] See, generally, RGGI Stakeholder Meeting, pages 7-10.

[4] Susan F. Tierney, Paul J. Hibbard, and Ellery Berk, "RGGI and CO_2 Emissions Trading Under the Clean Power Plan: Options for Trading Among Generating Units in RGGI and Other States," July 12, 2016 (hereafter "2016 Trading Report").

they consider how to enable generators in their states to participate in interstate carbon trading programs, including RGGI. Key themes of this report, summarized in Table 1, include:

RGGI deliberations regarding expansion of RGGI, whether through participation or linkage, should recognize the benefits of broader trading (from long-run efficiency and cost perspectives) when balancing the advantages and disadvantages of particular RGGI-imposed conditions on trading.

Achieving power-plant emission goals through mass-based limits with emissions trading covering a large number of sources minimizes compliance costs. This market-based design sends appropriate signals for investment in and operation of power system infrastructure and achieves policy objectives in the most economically efficient manner. This tradeable-allowance structure operates well in both regulated and competitive electric-industry contexts and integrates seamlessly with electricity market operations. A broader trading market with more participants creates the opportunity to lower overall costs of compliance. This is a critical consideration when evaluating program elements related to expanding the RGGI trading footprint.

RGGI states stand to benefit from proactively establishing trading principles and seeking best-practices collaboration with other states.

Independently and in the recent context of proposed federal rules, many states are considering approaches to reducing greenhouse gas emissions, including the possibility of joining or linking to existing CO_2 allowance trading programs. The RGGI program design is inherently flexible and respectful of states' various interests in economic, energy and environmental policy outcomes and provides the best opportunity for low-cost reduction of CO_2 emissions. Thus, the RGGI states are uniquely positioned both to demonstrate the successful history of workable, multi-state allowance-trading regimes and to take the lead on adapting the RGGI program structure to enable broader trading. We encourage the RGGI states to make the most of this opportunity to consider and embrace RGGI program design changes that would create an open trading architecture with which other states could align their own CO_2-reduction goals.

The RGGI states may want to reflect on the potential impact of expanded trading on RGGI state auction revenues with an eye towards longer-term cost reduction benefits.

Expanding RGGI to include other states will likely affect the initial level of auction proceeds to the RGGI states, since, all else equal, expanding the compliance footprint should lower the marginal cost of CO_2 control and thus lower the price of auctioned allowances. The reduction of

state auction revenues associated with declines in compliance costs due to broader trading may be small; nevertheless, the RGGI states have used these revenues effectively for eight years, creating additional carbon-reduction, cost saving and economic benefits through reinvestment. Consequently, the RGGI states may wish to explicitly weigh the risk of diminished allowance proceeds against the longer-run benefits of a broader allowance trading footprint.

Table 1: Key Trading Considerations

Threshold Issue	Description	Key Considerations
Larger Trading Region	RGGI is a nine-state region with potential to substantially increase its impact on reducing CO_2 emissions in the U.S. by expanding its footprint and/or trading with non-RGGI states interested in controlling carbon emissions from power plants.	Emission control programs based on allowance trading in the broadest possible region support least-cost compliance and provide appropriate signals to market participants for infrastructure investment and power plant operation. Broader trading also reduces the likelihood of market monopoly or illiquid trading. Expanded trading may impact auction revenues to RGGI states, a short-term effect of a longer-term reduction in emission control compliance costs.
The Importance of Trading Considerations and External Collaboration	RGGI is uniquely positioned to lead the expansion of a multi-state CO_2 trading market in the U.S.; RGGI can make decisions today that will enable broader trading in the future.	RGGI is a flexible program that provides for low-cost CO_2 emission reduction that could benefit from expanded trading. RGGI's decisions today about key program designs and trading rules with new member states and non-member states will set a precedent for the future of emissions trading in the U.S.
Auction Revenue Considerations	RGGI initially disburses almost all carbon allowances through a central auction and returns auction revenues to state governments, which use those revenues to further greenhouse gas reduction goals. Expanded trading may reduce auction revenues because allowance prices would likely fall with broader trading.	The RGGI states have effectively used auction revenues to further emission reduction and energy efficiency goals, among other uses. Broader trading could reduce these revenues to states as a result of lowered allowance prices. While short-term revenues may fall, the long-term efficiencies and cost decreases of broader trading will likely outweigh the impacts of short-term revenue reductions.

In order to encourage the expansion of RGGI (via linkage or the addition of member states) and the geographic market for allowance trading - RGGI states could address several design considerations relevant to broader trading.

There are a number of specific considerations related to the RGGI program design and trading platform the RGGI states may need to address if they wish to facilitate RGGI's expansion or linkage to new states. Some of these should be relatively straightforward and fully consistent with RGGI's program goals and approach; others may present tradeoffs with RGGI states' traditional goals and objectives.

In this report we discuss several design considerations relevant to expanded trading, summarized in Table 2:

(A) **Program Structure and Minimum Requirements** - A state could become a member of RGGI by using the Model Rule to voluntarily set state laws and requirements ensuring that the state participates in RGGI governance and that its affected sources are subject to the same basic set of compliance and reporting obligations as sources in other RGGI states. Alternatively, a state could create its own CO_2 mass-based emission control program but give its affected sources the option to comply in whole or in part by purchasing and retiring RGGI allowances, without the state actually becoming a member of RGGI. There are a number of core compliance and reporting requirements that the RGGI states might consider necessary to allow trading with sources in non-member states, such as (1) the state cap, (2) appropriate identification of affected sources, (3) requiring or enabling the release of allowances into the market, and adoption of COATS or creation of a substantially equivalent emission tracking program, and (4) reporting and compliance obligations consistent with that of RGGI affected sources. RGGI should review the Model Rule to identify the core administrative requirements for states that wish to enable trading with RGGI state sources.

(B) **Allowance Comparability** – The joint setting of an initial RGGI budget/cap and the agreed-upon distribution of that emissions budget to individual state budgets is what established the *fungibility* of allowances across the RGGI states and created conditions allowing free and open trading of allowances among RGGI sources. Creating allowance fungibility between RGGI and non-RGGI states will require a similar evaluation of historical emission and operational data of the sources in the non-RGGI states compared to the historical and current circumstances in the RGGI states. This can help inform deliberations over emission reduction comparability and thus over comparability of allowances.

In this context, there are many relevant analytical metrics and perspectives from which to assess control program comparability across states as (1) an initial budget matter, and (2) comprehensively, in the context of annual budget reductions. Linkage with or the addition of new states will require discussion regarding allowance comparability; however, it would be highly valuable for the RGGI states to proactively signal potential requirements for fungibility.

(C) **Allowance Distribution** – In theory, the RGGI states could require that allowances used for compliance be distributed initially into the market through an auction mechanism. We recommend against such a requirement because the manner in which allowances move into the market – whether they are auctioned or, for example, given away for free – affects neither the cost of allowances in power production nor the ultimate level of reduction in CO_2 emissions. Even in the RGGI states where the auction is the main means of initially distributing allowances, RGGI allowances now trade in the secondary market, at prices buyers and sellers of allowances are willing to pay at any point in time. The price of all allowances is driven by the marginal cost to meet the aggregate CO_2 cap on affected sources across the trading region; this price is not affected by the party that ultimately captures the value of allowances through initial distribution. We do not think that the efficiency gains of supporting trading among electric generating units in a broader region will be undermined by these differences in allowance-allocation mechanisms or industry structure. In fact, RGGI's current agreements allow each state to decide who receives the value of the CO_2 allowance currency, and we encourage the RGGI states to maintain this fundamental element of the program design.

(D) **Emission Allowance Tracking** – RGGI states will need to have confidence that the administrative framework governing the creation, monitoring, tracking, and retirement of a non-RGGI state's emission allowances has equivalent integrity to the framework within the RGGI program. RGGI could make it easy for states to fully participate in RGGI allowance auctions and the secondary market and to have allowances tracked through the RGGI CO_2 Allowance Tracking System ("COATS").[5] Alternatively, non-RGGI states could be required to demonstrate substantial equivalence between internal state tracking programs and COATS in order to establish full fungibility with RGGI allowance transactions.

[5] RGGI COATS was based on a basic EPA emissions tracking system used by many states for other pollutants, adapted to the RGGI trading system.

(E) **Market Monitoring** –Effective market monitoring has given RGGI states comfort about underlying market-power considerations in the allowance market. If a state becomes a RGGI participant, the transactions of sources within that state would fall under the purview of the RGGI market monitor. To the extent that sources in non-RGGI states are allowed to transact freely with RGGI state sources, RGGI may want to ensure that any allowances used for compliance in RGGI states be subject to the same or similar monitoring requirements (especially in the secondary market) as in the RGGI program.

Table 2: Specific Design Considerations

Threshold Issue	Description	Key Considerations
Program Structure and Minimum Requirements	RGGI operates based on a core set of compliance and reporting obligations established in its Model Rule and according to state regulations. RGGI will likely need to establish a set of similar requirements for non-RGGI trading partners.	Key considerations related to program structure and minimum requirements include the emissions caps trading partners adopt, the sources covered under CO_2 regulation, the method of disbursing allowances, and emissions reporting and compliance guidelines.
Allowance Comparability	The RGGI states have achieved substantial reductions in regional CO_2 emissions over time, resulting in increasing allowance values. RGGI also employs a CCR and price floor and is considering an ECR.	Whether and how to require that partner states set CO_2 caps that match the stringency of the current RGGI cap, and whether to require that trading partners abide by price floors and have their own CCR and ECR reserves are issues RGGI must consider to ensure fungibility of allowances across trading regions. As non-RGGI states begin to consider trading with or joining RGGI, it will be important for RGGI to proactively identify a strategy for setting comparable emissions caps and therefore creating fungible allowances with new trading partners.
Allowance Distribution	RGGI does not dictate how allowances are initially distributed, though RGGI recommends that states reserve at least a portion of allowances for public purposes. In practice, nearly all RGGI allowances are distributed initially through a central auction.	Initial disbursement of allowances does not affect the value or "opportunity cost" of allowances in the market, and thus does not affect the aggregate cost of compliance or the price of electricity generation. Thus, there is little reason to condition trading on the distribution of allowances. Allowance distribution does, however, affect the distribution of initial allowance value, which can lead to various economic outcomes (e.g., "windfall" to affected sources allocated allowances, electricity bill reductions where allocations are used by utilities to offset electricity costs, etc.).
Emission Allowance Tracking	RGGI uses a standardized system to track the creation, trading, and retirement of emissions allowances.	RGGI should allow non-RGGI trading partners to participate in RGGI allowance auctions and the secondary market, tracking their activity through RGGI COATS or should require partner states to demonstrate substantial equivalence between independent tracking programs and COATS.
Market Monitoring	RGGI requires careful monitoring of the allowance market to guard against hoarding and other forms of market manipulation.	RGGI's market monitoring has not been challenging or disruptive from administrative or market activity perspectives, yet it has provided a great deal of comfort to states in the program. Such oversight of market activities is arguably more important with broader trading regions and more market participants. RGGI may want to consider linking trading to some market oversight assurance mechanism in partner states.

II. Background and Purpose

RGGI: History and Current Status

Starting in 2003, public officials from ten Northeast states[6] met to consider how they could collectively reduce carbon emissions from power plants in those states. The states had multiple objectives, including taking a lead on controlling carbon-dioxide emissions through changes in power production and end use consumption, demonstrating the feasibility of an emission-trading program for CO_2, and investing in clean energy. Planning for the Regional Greenhouse Gas Initiative ("RGGI") took place over several years, with participating states signing a Memorandum of Understanding between 2005 and 2007. Guided by a common Model Rule, each state voluntarily implemented its own enabling authority to participate in the program, and program requirements took effect at the start of 2009.

In short, the RGGI states initiated the first CO_2 mass-based limit and allowance trading program in the country without any federal program.

Although initiated voluntarily, the program is a mandatory emissions-control program for all existing and new fossil-fuel power plants with a generating capacity of 25 megawatts or more in each participating state. RGGI has a regional CO_2 mass-based emission limit, which is apportioned to the participating states through state allowance budgets.[7] A state's allowance budget establishes the number of emission allowances allocated to that state but does not introduce a binding limit on the actual emissions that can occur at power plants in that state. The regional cap is, however, binding, and power plants in the RGGI states collectively may not emit above that limit.

The multi-state emissions budget (or "cap") was originally set to 188 million short tons of CO_2 per year in 2008 and was reduced to 91 million short tons in 2014, following a

[6] New Jersey originally participated in the development of RGGI and in the first three years of RGGI's implementation (2009-2011).

[7] A challenging aspects of the initial negotiations between the states during development of RGGI centered on the relative size of each state's emission allowance budget. The states had to agree not only on the size of the overall mass-based limit, but also on the share of allowances that would go to each state. Because this was a voluntary program, these allocation decisions needed to be rooted in the context of existing power plant portfolios, developed with the aid of extensive modeling analysis, and finalized with cooperative discussions among the states. As discussed further in this paper, there are now extensive data sources to support deliberations, if needed, between RGGI states and potential trading partners with respect to how to set budgets in a way that ensures emission allowance comparability.

comprehensive program review in 2012. Under this revised program, the RGGI cap declines by 2.5 percent annually through 2020.[8]

RGGI requires that each covered source possess a tradable emission allowance for each short ton of CO_2 it emits within three-year control periods. The original program design granted each state the ability to decide how its allowance budget would be distributed to affected generating units. States agreed to a goal of using at least 25 percent of the value of the allowances for consumer benefit or other strategic energy purposes such as energy efficiency or renewable resource development and eventually decided to participate in a central auction process for the initial distribution of most allowances. Approximately 90 percent of allowances are now sold initially through quarterly central auctions[9] administered by RGGI, Inc. The proceeds from the auctions, totaling $2.7 billion through June 2017,[10] are distributed to the states in proportion to the number of allowances each state elects to distribute through the auction.

RGGI rules allow for the use of offsets and banking of allowances.[11] There is a floor price (or "minimum reserve price") for allowances sold in the quarterly auctions, which increases by 2.5 percent annually, starting at a floor price of $2.05 per allowance in 2015. There is also a "trigger price" at which a specific quantity of additional allowances (i.e., the Cost Containment Reserve ("CCR")) is released into the market by the RGGI states. The CCR is designed to moderate allowance prices when they would otherwise exceed the trigger price. The CCR holds 10 million allowances, annually, and the trigger price was set to $4.00 in 2014, increasing each year through 2020.[12] Allowance tracking is conducted through the RGGI CO_2 Allowance Tracking System ("COATS").

[8] Basic information about RGGI is sourced from the RGGI, Inc., website. RGGI, Inc. is the nonprofit organization established to administer development and implementation of the RGGI program. http://www.rggi.org.

[9] "Regional Greenhouse Gas Initiative (RGGI): An Emissions Trading Case Study." (2015). Environmental Defense Fund, CDC Climate Research, IETA, and Caisse Depots Group. http://www.ieta.org/resources/Resources/Case_Studies_Worlds_Carbon_Markets/rggi_ets_case_study-may2015.pdf

[10] "Auction Results." RGGI, Inc. http://rggi.org/market/co2_auctions/results

[11] Generating units can obtain offsets for projects within the RGGI region that reduce emissions of CO_2, methane, or sulfur hexafluoride through mechanisms such as landfill methane capture, forest projects, and avoided methane emissions from agricultural manure management options, among others. Offsets are limited to 3.3 percent of a covered entity's emissions. Unlimited banking of allowances is permitted across 4-year control periods, but banked allowances must factor into future state emissions budgets. Undistributed or unsold allowances may be retired at the end of compliance periods.

[12] The CCR trigger price was $4.00/allowance for calendar year 2014, $6.00/allowance in 2015, $8.00/allowance in 2016, $10.00/allowance in 2017, and thereafter 1.025 times the CCR trigger price in the prior year.

The RGGI Model Rule includes a periodic program-design review process. The states conducted and completed the first comprehensive review in 2012, and the 2016 review process is underway. Program reviews include a full evaluation of the program, supported by stakeholder participation from regulated entities, environmental nonprofits, consumer and industry advocates, and others. It is possible that over the next several years of RGGI program implementation - that is, between now and the completion of the next RGGI review process - other states may seek to and/or benefit from achieving carbon reduction goals by joining or linking with RGGI. While we recognize that there are many critical items for the RGGI states to consider in its program review, this report is focused on the possibility of expanded trading.

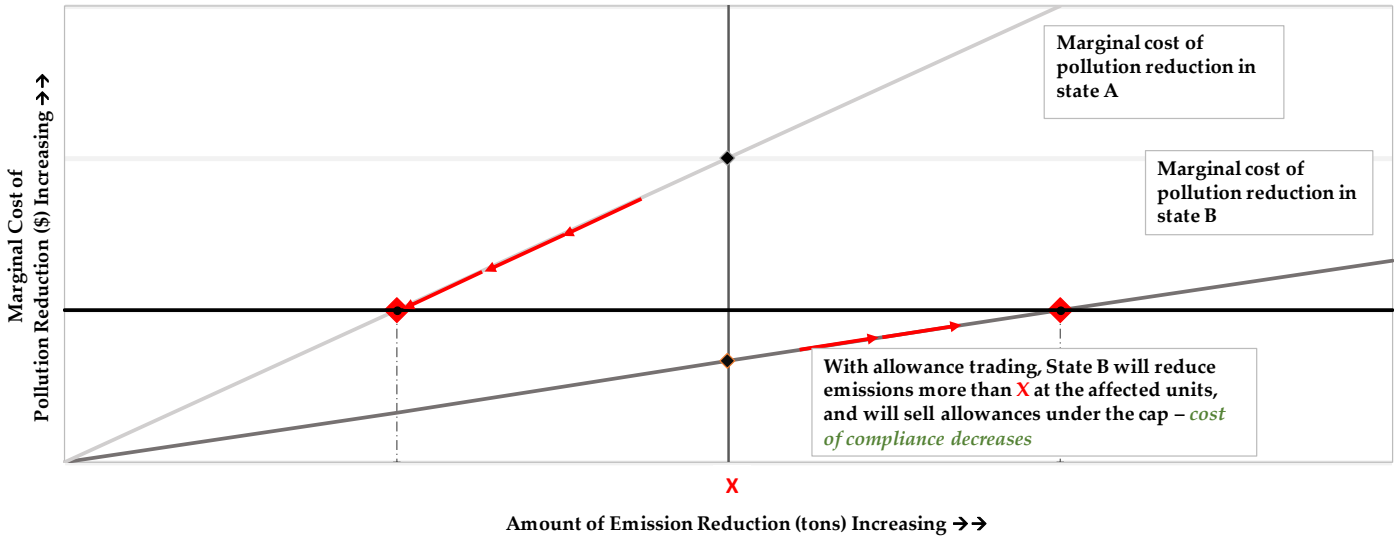
Emission-Allowance Trading: The Economic Rationale and Experience to Date

Given the context discussed above, it is useful to recall the rationale for a state to consider allowance trading as an emission reduction compliance strategy. From an economic perspective, emission-allowance trading programs represent an efficient mechanism for pollution control. Such programs rely on market forces rather than administrative approaches to identify the least-cost pathway to reducing emissions and comply with environmental requirements. A market-based approach to pollution control enables innovation in regulated entities' search for the lowest-cost means of compliance without disrupting energy-market dynamics and without many of the complexities associated with other emissions-control programs.[13]

[13] Laws and regulations controlling pollution, emissions or discharges often include provisions that treat classes of generating units that differ by age, economics, location, and readiness of commercially available control technologies differently. For example, pollution-control programs sometimes grandfather-in existing generating units while imposing control requirements on new units. Additionally, as pollution-control technologies evolve, successive generations of new power plants may face the required application of different "best available control" technologies. In addition, the CAA authorizes EPA to use different pollution-control mechanisms for different types of pollutants. For example, emissions-controls might involve: (1) unit-specific technology requirements or emission-rate limitations (e.g., for the Mercury and Air Toxics Standard (MATS)); (2) consumption or flow limits (or performance standards) (e.g., for NSPS for criteria pollutants in new power plants); (3) emission-rate averaging or "bubbling" (e.g., across units at a single station, or among plants owned by a single owner; e.g., for volatile organic compounds and other emissions in many states' current State Implementation Plans); (4) state, regional, or national emission caps and allowance-trading programs (e.g., the national Title IV Acid Rain Program with its cap on SO_2 emissions and emissions-trading program; the 9-state RGGI program); and (5) pollutant taxes, fees, offsets, and power-plant operating limits and other restrictions in permits.

The currency in an emission-trading program – an emission allowance – allows some power plant owners to emit above their plant's presumptive emission limits by buying allowances to cover emissions at a lower total cost of compliance than that plant would incur to reduce emissions to the point of plant-specific compliance. Conversely, the lowest-cost outcome for other plant owners may be to reduce an affected unit's emissions more than required for compliance, which can minimize compliance costs by both reducing total allowance costs and generating offsetting revenue through the sale of excess allowances at clearing prices that exceed the cost to achieve additional emission reductions. See Figure 1.

Figure 1: Allowance Trading Impacts on Sellers and Purchasers



This design of allowance-trading programs leads to market-based allowance prices, which are set by the marginal cost of compliance across all generators in the trading region, regardless of generator characteristics (e.g., age, generating-unit efficiency). This is a proven method of minimizing the collective cost of compliance across a set of affected units and achieving the highest level of efficiency in meeting state and federal emission control goals or requirements.

The efficiency of emission-trading programs has been demonstrated through industry experience and through empirical studies of past programs. The first instance of an emission-trading program was EPA's Acid Rain Program, designed to reduce sulfur-dioxide ("SO_2") emissions across a fleet of power plants owned by different companies. This program successfully achieved SO_2 emission reduction goals more quickly and at a cost much lower than

projected and lower than costs typically observed under alternative emissions approaches.[14] Two other instances of successful emission-trading programs include RGGI and California's AB32, which is the first economy-wide carbon-emissions trading program.

These programs have paved the way for future pollution control programs in the United States and beyond.

Purpose of this Report

In this report, we are focused on the potential expansion of RGGI (through linkage or the addition of new states), and we review key issues relevant to the RGGI states and to states considering participation or linkage. Our focus is not meant to imply that expansion is the only or most important consideration facing the RGGI states at this time, nor do we intend to imply that RGGI must accommodate other states or that other states will necessarily take steps to limit emissions of CO_2 through an allowance trading mechanism. Nevertheless, as discussed in the previous section and as realized by the RGGI states over almost a decade, control of carbon through a mass-based limit and allowance trading program promotes economic efficiency,

[14] The Acid Rain Program "is largely considered a successful cap-and-trade system. By 2007, the program had achieved its 2010 reduction goal at an estimated cost that was considerably lower than that of *command-and-control* regulations, which mandate that each power plant adopt a specific technology to reduce SO_2 emissions or a standard that requires each power plant to emit below a specific fraction of SO_2 emissions per unit energy produced." Juha Siikamäki, Dallas Burtraw, Joseph Maher, and Clayton Munnings, "The U.S. Environmental Protection Agency's Acid Rain Program," November 2012. http://www.rff.org/RFF/Documents/RFF-Bck-AcidRainProgram.pdf. A recent retrospective review of various studies of the effectiveness of the SO_2-emissions trading policy compared actual costs of the program relative to predicted costs prior to the program's implementation. The report discussed "how the costs of achieving environmental objectives through cap and trade compare with those of a 'counterfactual' (hypothetical alternative) command-and-control regulatory approach. In addition to being less costly than traditional command-and-control policies would have been, the program's costs were significantly below estimates generated by government and industry analysts in the debate leading up to the passage of the CAA. In 1990, the U.S. Environmental Protection Agency (EPA) estimated the cost of implementing the Acid Rain Program (with allowance trading) at $6.1 billion. In 1998, the Electric Power Research Institute (EPRI), an industry organization, and Resources for the Future (RFF), an independent think tank, estimated that total implementation costs would be $1.7 and $1.1 billion respectively (based in part on actual figures for the first few years of the program…). In sum, the SO_2 allowance-trading system's actual costs, even if they exceeded the cost-effective ideal for a cap-and-trade system, were much lower than would have been incurred with a comparable traditional regulatory approach, and were much lower than the trading system's predicted costs. There is broad agreement that the SO_2 allowance-trading system provided a compelling demonstration of the cost advantages of a market-based approach." Gabriel Chan, Robert Stavins, Robert Stowe, and Richard Sweeney, "The SO_2 Allowance Trading System and the Clean Air Act Amendments of 1990: Reflections on Twenty Years of Policy Innovation," Harvard Environmental Economics Program, January 2012. http://www.hks.harvard.edu/fs/rstavins/Monographs_&_Reports/SO2-Brief.pdf.

lowest possible compliance costs, and potential local/state economic benefits.[15] As state interest in carbon control grows, so too does the likelihood of state action, and the importance of learning from experience and seeking compliance mechanisms that take advantage of existing structures. Therefore, our focus on expansion is intended to highlight this issue and provide input on broad principles that may warrant consideration in connection with opening the RGGI program and/or its trading platform to other states.

Our assessment starts with the following premises and context:

- As the first carbon-emission-allowance trading market in the U.S., RGGI has successfully operated since 2009 and has produced net positive economic outcomes for consumers and for the economies of the participating states. The success of the RGGI program to date suggests that states will continue to view the RGGI program as an effective approach to controlling emissions of CO_2 and meeting state climate goals.
- As discussed further in this report, the RGGI states will likely need to take action on various program-design issues if they want to create a structure that will enable (and potentially encourage) trading among generators in RGGI and non-RGGI states.
- The universe of potential CO_2 allowance trading partners includes electric generating units ("EGU") in states with a variety of structural conditions (e.g., states with competitive electric industry structures versus states with vertically integrated electric industries); states whose power plants operate in regional wholesale power markets regulated by the Federal Energy Regulatory Commission ("FERC") versus those that do not; and states with varying electric-industry market circumstances and trends (e.g., different and changing fuel mix, technologies, and price; different levels of additions and retirements of generating capacity; flat versus increasing growth in electricity demand). These differences have the potential to affect the ease and/or cost of reducing CO_2 emissions in each state, as well as the opportunities for and impacts associated with emission compliance trading across states.

[15] See our prior studies assessing the economic impacts of RGGI during its first six years of operation - (1) Hibbard, Paul, Andrea Okie, Susan Tierney, and Pavel Darling, "The Economic Impacts of the Regional Greenhouse Gas Initiative on Nine Northeast and Mid-Atlantic States: Review of RGGI's Second Three-Year Compliance Period (2012-2014)," July 2015; (2) Hibbard, Paul J., Susan F. Tierney, Andrea M. Okie, Pavel G. Darling, "The Economic Impacts of the Regional Greenhouse Gas Initiative on Ten Northeast and Mid-Atlantic States: Review of the Use of RGGI Auction Proceeds from the First Three-Year Compliance Period," November 15, 2011.

- Also for the purpose of this report, although we recognize that RGGI is a voluntary program and that the RGGI states have a variety of CO_2 control compliance options, we assume that RGGI remains in place going forward.

We divide the following discussion of considerations related to expanding the RGGI trading platform into two parts. First, we highlight key themes and principles that the RGGI states may wish to keep in mind as they consider the potential value of and risks associated with facilitating a broader trading region ("Key Trading Considerations"). Second, we discuss some specific issues that must be addressed to allow additional states to participate in RGGI or "link" the state's CO_2 compliance mechanism to the RGGI trading platform ("Specific Design Considerations").

III. Key Trading Considerations

Larger Trading Region

As discussed above, mass-based emission control programs that permit allowance trading in the broadest possible region support least-cost compliance with emission-control objectives. These programs send appropriate signals for investment in and operation of power system infrastructure and achieve policy objectives in the most economically efficient manner. This has been demonstrated time and again through national programs such as the Title IV SO_2 allowance trading program as well as state and regional programs (like RGGI). This tradeable-allowance structure operates well in both regulated and competitive electric-industry contexts and integrates seamlessly with electricity market operations.[16]

However, the size of the market - in terms of states, affected sources, the number of owners of affected sources, and the diversity of emission control alternatives - can influence the overall cost of compliance, efficiency of program implementation, and competitiveness and equity in allowance market operations. A broader market creates the opportunity to lower overall costs of compliance and minimize the possibility that a limited set of compliance entities, the existence of affected resource owners with market power, and or a thin or illiquid market will compromise compliance efficiency or create competitive inequity.

The efficiency, cost and competitiveness gains resulting from market-based emission-trading programs covering wide geographic regions strongly suggest that states seeking a broad trading market should err on the side of minimizing trading obstacles. The RGGI states may want to place a strong emphasis on this overarching principle when balancing the benefits and costs of any particular condition on expanded multi-state trading, in effect asking the question: would the condition under consideration facilitate emission-trading between generators inside and outside of RGGI? If so, are the advantages associated with incorporating this element (or condition) worth the potential disadvantages of including it from the perspective of the RGGI states?

Several key considerations that can encourage or deter broad trading among RGGI and other states are described below. A focus on the higher-level objectives of reducing CO_2 emissions and minimizing associated compliance costs relative to the potential disadvantages of expanded trading is important as the number of states interested in addressing emissions of

[16] See footnote 14 for more detail.

CO_2 grows, and as momentum builds towards greenhouse gas reduction programs covering a majority of the U.S. population.

The Importance of Trading Considerations and External Collaboration

While not yet required under federal rules, states are independently considering approaches to reducing greenhouse gas emissions, including the possibility of joining or linking to existing CO_2 emission allowance trading programs. The RGGI program is inherently flexible and respectful of states' various interests in economic, energy and environmental policy outcomes, and it is also a professional, well-coordinated program that provides the best opportunity for low-cost reduction of CO_2 emissions. Thus, the RGGI states are uniquely positioned to demonstrate the successful history of workable, multi-state CO_2 allowance-trading regimes and to take the lead on adapting the RGGI program structure to provide a clear and beneficial path for other states to achieve CO_2 emission reductions in the electricity sector.

Particularly at this point in time, the RGGI states would benefit from ensuring that in addition to core program design decisions, careful consideration is given to resolving the changes or explicit guidance needed to facilitate expanded emission trading, in the event that non-RGGI states are seeking to collaborate. We encourage the RGGI states to make the most of this opportunity to identify, consider and embrace RGGI program design changes that would create an open trading architecture with which other states could align their own CO_2-reduction goals.

Auction Revenue Considerations

Studies have evaluated the multi-state RGGI program and have demonstrated the economic and policy benefits to the RGGI states of (1) disbursing nearly all allowances into the market through a central auction mechanism, (2) returning auction revenues to the RGGI states, and (3) using those revenues in various ways to further greenhouse gas reduction goals, address electricity cost concerns, clean energy and consumer benefit objectives, such as energy efficiency and renewable energy investments and job creation. Expanding the allowance trading platform to include other states will likely affect the initial level of auction proceeds to the RGGI states. This could result from changes in the value of allowances, since all else equal, expanding the compliance footprint should lower the marginal cost of CO_2 control and thus lower auctioned allowance clearing prices (and thus state revenues).

Impacts on state auction revenues associated with beneficial compliance cost reductions resulting from broader trading may well be small; nevertheless, the RGGI states have used these revenues effectively for eight years, creating additional carbon-reduction, cost saving and

economic benefits through reinvestment. Consequently, the RGGI states may wish to explicitly recognize this potential impact and weigh the risk of some decreased allowance proceeds against the longer-run benefits of a broader allowance trading footprint. While in the short-term, state revenues could in theory fall due to broader trading, in the long-term, broader trading will facilitate lower CO_2 emission control costs, a benefit that would likely outweigh any short-term negative impacts of broader trading.

IV. Specific Design Considerations

To the extent that the RGGI states wish to facilitate expanded trading, there are a number of specific considerations related to RGGI program design or to state-to-state trading compatibility that RGGI states may need to address.

Some of these considerations should be fully consistent with RGGI's program goals and approach. Others may present tradeoffs with RGGI states' traditional goals and objectives and require an evaluation of the advantages and potential disadvantages associated with broader trading. Each of these issues is discussed below.

Program Structure and Minimum Requirements

RGGI operates as a mass-based limit on aggregate emissions of affected power plants, according to a core set of compliance and reporting obligations established in the RGGI Model Rule and specific state laws and regulations. A state could become a member of RGGI by using the Model Rule to voluntarily set state laws and requirements ensuring that the state participates in RGGI governance and its affected sources are subject to the same basic set of compliance and reporting obligations as sources in other RGGI states. Alternatively, a state could set its own CO_2 mass-based emission control program, but give its sources the option to comply in whole or part by purchasing and retiring RGGI allowances, without the state actually becoming a member of RGGI.[17] In this instance, the RGGI states and the non-RGGI state would require functional comparability, with the requirements and trading platform of the non-RGGI state meeting minimum standards agreeable to the RGGI states (and vis-versa).

There are a number of core compliance and reporting requirements that the RGGI states might consider for states not actually joining RGGI as minimum features of a state program to enable trading of allowances between sources inside and outside of RGGI. Such requirements may include the following:

- The setting of a mass-based limit on aggregate state emissions from affected sources (i.e., a state cap), with the cap translated into allowances representing one short ton of CO_2 emissions. How the cap is set and how it changes over time will affect the comparability of the state's allowances to the allowances created and issued under

[17] A state could also allow allowances created under its program to be used by RGGI state affected sources, and/or allow the states allowances to be included in the RGGI auction process.

the RGGI program. This comparability - discussed in more detail below - is necessary to ensure fungibility of allowances across RGGI and non-RGGI states.

- The identification of affected CO_2-emitting electric generating units - existing and new - that are subject to the requirements of the program, and that at least roughly parallel the scope of affected sources (i.e., the type and size of generating units) included in the RGGI program (to avoid emissions leakage to sources not included in the program).[18]
- The release of allowances into the market each year and either directing, administering, or permitting such allowances to be freely traded in secondary markets on the RGGI COATS trading platform or an in-state trading platform that has equivalent transparency and tracking features as the RGGI COATS platform. Whether the allowance distribution methods matters is discussed further below. Compliance and reporting obligations for affected sources that are substantially similar to those included in the RGGI Model Rule, including provision for retirement of emission allowances that are comparable in terms of quantities, timing, and banking options, the reporting of emissions and allowance movement, and provisions for enforcement.

Many of these core requirements, while administrative in nature, are critical to ensure that a state's program imposes similar obligations with similar stringency, and thereby creates a structure with sufficient comparability to the RGGI program. These details, in combination with the comparability of the mass-based limit set by the non-RGGI states (discussed below), are what establishes comparable value from a CO_2 reduction perspective - or *fungibility* - of an allowance created in the RGGI and non-RGGI states. This basic level of fungibility can enable allowances to be tradable across trading platforms without eroding RGGI program objectives.

The most direct way to establish fungibility would be for a state to join RGGI, establish a state cap (or budget) that's comparable to the effective budget for RGGI states, implement the core Model Rule requirements through state legislation or regulation, as needed, and have the state's affected sources participate in the RGGI COATS platform.

Alternatively, a state could participate, not as a RGGI member, but rather adopt the core allowance creation, transfer, use, retirement, etc. requirements in the Model Rule, and set a state cap that is comparable to the effective cap for the RGGI states. Finally, a state could develop its own allowance creation, transfer, use, retirement, reporting, and other requirements without

[18] RGGI covers all sources with capacity of 25 MW or greater, including all new and existing sources.

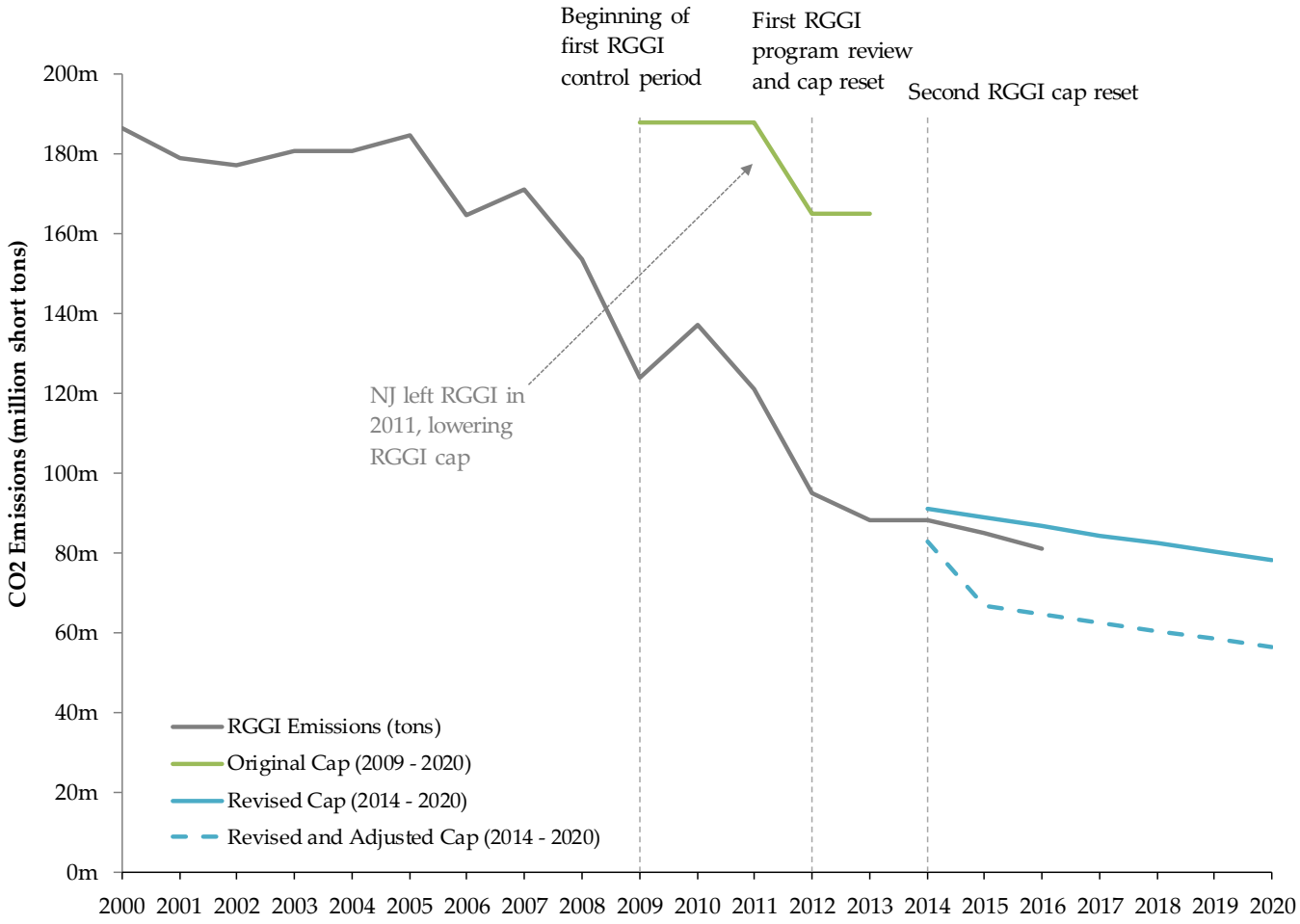
specific reference to the requirements in the RGGI Model Rule. In this case the RGGI states would need to create a review process by which it may determine the comparability of the state's cap and program to the RGGI program in order to establish fungibility and allow for trading with sources in the RGGI states.

Allowance Comparability

The process by which the RGGI states *voluntarily* adopted common rules, set an aggregate cap, and apportioned that cap amongst member states established the rough equivalence of compliance obligations across the RGGI states, opened the door to agreement amongst states to jointly administer a single cap, and permitted the free trading of allowances among the region's affected sources. In particular, the RGGI states used basic historical data on affected sources' emissions and operations, conducted power sector modeling covering the RGGI states (and beyond) to understand how the operations of affected sources (existing and new) may change over time, and then agreed upon the appropriate apportionment of the RGGI cap based on a joint review of the historical data, modeling, and associated state-by-state considerations.[19] See Figure 2 for a depiction of RGGI emissions and the regional RGGI cap over time. The initial setting and apportionment of the overall RGGI budget ensured that all allowances created by states in RGGI were effectively equivalent from the perspective of CO_2 emissions and climate change impacts.

[19] The regional RGGI cap was initially set to hold emissions constant at 2009 levels through 2014 before achieving a 10% reduction in emissions from 2009 levels by 2019. 2009 emission levels were projected based on assumptions made in 2005 and were specifically calculated as average emissions in the RGGI states between 2000 and 2002 plus a four percent buffer. RGGI state emissions never met these projected levels and instead fell far below these projections, in part due to energy efficiency improvements, a transition from coal to natural gas resources due to the shale gas boom, and to reduced energy demand during the financial crisis. During the first RGGI program review, RGGI states reduced the regional cap from 165 $mtCO_2$ to 91 $mtCO_2$ and introduced an adjustment for the substantial number of banked allowances, amounting to approximately 140 $mtCO_2$ of emissions. (Ramseur, Jonathan L.," The Regional Greenhouse Gas Initiative: Lessons Learned and Issues for Congress." *Congressional Research Service*, May 16, 2017.)

Figure 2: RGGI Emissions and CO_2 Cap



Source: RGGI, Inc., available at www.rggi.org.

Many of the features and impacts of the RGGI program (e.g., allowance prices, electricity prices, competitive equity, and fairness) are closely tied to this overall level and jointly-developed apportionment of the RGGI budget relative to operating affected sources in states and across the RGGI footprint. A core feature of the RGGI program from the outset was the rough comparability of state allowance apportionments relative to circumstances in place at the time of program formation. In effect, the joint setting of an initial RGGI budget/cap, and the agreed-upon distribution of that budget to individual state budgets, is what established the fungibility of allowances across the RGGI states and created the precedent conditions to allowing free and open trading of allowances among sources in the RGGI region. Overtime, the level of carbon reductions achieved is equivalent across the states because they are achieved (1) starting with substantial equivalence amongst the states, and (2) progressing through annual cap reductions of equal proportion across the states.

In a parallel sense, the review of a non-RGGI state's overall mass-based limit vis-à-vis the RGGI states would be a useful exercise in determining whether the state's cap/budget is sufficiently equivalent to those of the RGGI states. An exercise of this sort based on known historical emission and operational data of the sources in the non-RGGI state, compared to the historical and current circumstances in the RGGI states, can help inform deliberations over emission reduction comparability and thus comparability of allowances. However, the RGGI states will need to identify the figures of merit for evaluating state mass-based limits. There are several different lenses through which to view a state's carbon reduction commitments from the perspectives of both starting point budget and subsequent annual reduction target, all of which would be evaluated relative to the current conditions and/or historical trajectory of CO_2 emissions across the RGGI states. RGGI and potential partner states may consider comparisons such as these when setting carbon caps for new member or partner states. Additional examples of carbon cap metrics include but are not limited to the following:

- Starting point mass-based emission limit
  - In terms of tons of CO_2 based on current or recent historical emissions
  - In terms of tons of CO_2 calculated as a specific tonnage or percent reduction from a historical level of emissions, referenced to a set goal, or the equivalent reductions achieved in the RGGI states, other states, or the non-RGGI state's power region
  - In terms of tons of CO_2 based on a specific carbon intensity value (pounds per megawatt-hour, or lb/MWh) tied to a particular technology or mix of resources
  - In terms of tons of CO_2 based on the carbon intensity (lb/MWh) of generation from affected sources
  - In terms of tons of CO_2 based on the carbon intensity (lb/MWh) of total generation or electrical load within the state
- Annual percent reductions in CO_2 emissions
  - Equal to the annual percent reductions set for the RGGI states on a going-forward basis
  - To achieve overall reductions equivalent to historical cap reductions in the RGGI states
  - Equal to an annual target that deviates from the RGGI targets to allow for either a more measured transition towards or to accelerate reductions from the starting point, to a specific endpoint of equivalence with the RGGI states over a set period of time

Ultimately, conditions across states and over time vary significantly, and with respect to seeking budget and allowance comparability there may be no perfect answer, or no single answer that should stand as a litmus test for participation in or linkage to RGGI. Should a non-RGGI state wish to join RGGI or establish trading with the RGGI states, there will likely need to be both analysis of relevant metrics and a specific discussion between the RGGI states and non-RGGI state to develop a level of comfort around the question of equivalence in the value of an allowance across the states. However, to the extent that the RGGI states have a point of view on the boundaries of an acceptable approach to developing a state budget and/or annual reductions that will be viewed as comparable by the RGGI states, it would be highly valuable for the RGGI states to proactively signal that framework.

There are other elements tied to the comparability of an allowance that the RGGI states and any non-RGGI state considering participation or linkage may wish to consider. Specifically, as noted earlier the RGGI states have administered the initial distribution of allowances primarily through quarterly joint allowance auctions administered by RGGI Inc., with states providing nearly all of their allocated allowance budgets to RGGI for the auctions. These auctions have been administered subject to allowance price floors and the mitigation of allowance prices on the high end through the release of additional allowances (the Cost Containment Reserve ("CCR")), with the release occurring at a preset trigger price. The RGGI states are also currently considering the merits of withholding allowances (the Emission Containment Reserve ("ECR")) to mitigate the landing price of allowances on the low end. Finally, there are various compliance options - namely banking of allowances and the potential use of offsets - that affect the degree of flexibility in the program. Since all of these mechanisms can affect the price of an allowance under certain conditions (that is, other than when they clear in the non-mitigated price range), they directly affect the value of an allowance. Consequently, in considering the fungibility of allowances, states will need to review any similar price mitigation measures included in the program of states wishing to establish trading linkage with the RGGI states.

Allowance Distribution

The RGGI states could require that allowances used for compliance in the RGGI states be initially distributed in a specific way – e.g., distributed in whole or in part[20] initially through a

[20] As noted earlier, the original RGGI program design granted each state the ability to decide how its state allowance budget would be allocated to affected generating units in the state. States agreed to a goal of using at least 25 percent of the value of the allowances for consumer benefit or other strategic energy purposes such as energy efficiency or renewable resource development, and eventually decided to participate in a central auction process for the initial dispersal of most allowances.

single- or multi-state auction mechanism. While the RGGI states have benefited significantly from near-exclusive reliance on RGGI's centralized auctioning of allowances, it is not essential from a market-efficiency perspective for making this a condition on non-RGGI allowances used for RGGI state compliance. The clearing price and value of allowances in the secondary market is the same whether a state gives its allowances away for free (regardless of the recipient) or distributes them through an auction or any other mechanism. The ultimate price of all allowances is driven by the marginal cost to meet the aggregate mass-based limit on affected sources across the trading region, which is not affected by the recipient of the value of allowances.

Economically rational participants that receive allowances for free but that do not need them to generate electricity would simply monetize the value of their allowances by selling them into the secondary market. Thus, a requirement to initially auction allowances as a condition of trading with RGGI is neither necessary nor prudent given that non-RGGI states may use a non-auction allowance distribution strategy.[21]

Importantly, it is possible that there would be a non-RGGI state seeking to participate in or link with RGGI in which affected units are owned by vertically-integrated utilities, and in which policy makers in the state may seek to (a) enable EGUs to trade with other EGUs in that state and with generators in RGGI, and (b) initially distribute allowances for free to those EGUs. This situation differs from that in most RGGI states (where EGUs tends to be merchant generators and where EGUs must acquire allowances through the RGGI auction or the secondary market). As a result, EGUs in RGGI may argue that they should have the same opportunity across trading states to access allowances on equal terms (that is, RGGI EGUs may request free allocation rather than the current auction mechanism).

We encourage RGGI states to overlook such differences in industry-structure and allowance-allocation methods as they consider what conditions, if any, to require in other states' plans in order to allow RGGI EGUs to trade with EGUs outside of RGGI boundaries. In other words, although the situation described above could lead to equity considerations across EGUs inside and outside of the RGGI states – in terms of accessing allowances at different prices (e.g.,

[21] The allocation of allowances to affected sources for free may represent a windfall for affected sources owned by merchant companies in competitive markets. But allocating allowances for free can also be done in a way that preserves the value of an allowance for public benefit. For example, in circumstances where allowances are allocated to regulated utility resources in vertically-integrated states, public utility commissions have often required that the value of the freely-allocated allowances be preserved for electricity ratepayers by reducing compliance costs or by returning revenues earned from the sale of excess allowances to customers through rate credits.

ranging from a zero acquisition price for some generators to a price established in competitive allowance auctions for others) – that difference does not necessarily lead to inefficiencies in a trading program that allows all of these EGUs to participate and in which the price/value/opportunity cost of an allowance is the same regardless of the initial distribution mechanism.

Even now, there are differences across RGGI states regarding the portion of allowances that are distributed to the market through RGGI allowances; and the agreement among RGGI states still allows individual states to retain the discretion to determine how to distribute allowances into the market. Enabling trading across a broader region in which there may be wider variation in allowance allocation mechanisms than exists in RGGI today would be consistent with the original program design for RGGI. We believe that the efficiency gains of supporting trading among EGUs in a broader region would not be undermined by these differences in allowance-allocation mechanisms or industry structure.

We encourage the RGGI states to continue with this fundamental element of the program design, enabling trading with states that use an auction or any other allowance-distribution approach.

In making this recommendation, we are mindful of the ways in which the allowance prices affect the price of electricity in RTO and non-RTO power markets. When a generator in a competitive wholesale market receives an allowance for free, it does not mean that that EGU will offer its supply with a zero price for CO_2-compliance costs. Rather, fundamental economic principles lead all EGUs to construct electricity offer prices that reflect the opportunity cost of a CO_2 allowance, which is equal to the value of an allowance in the market at the time it is used. This is true when a generator previously purchased an allowance at a price higher than its value in market at the time the allowance is used, or when the EGU received the original allowance at a lower price or for free. CO_2-allowance prices that show up in electric prices at any point in time reflect the then-current price of CO_2 allowances.

With this in mind, we encourage the RGGI states to focus on enabling an efficient emission-trading platform as a first-order design principle rather than focus on allowance distribution considerations.

Emission Allowance Tracking

RGGI states will need to have confidence that the administrative framework governing creation, monitoring, tracking, and retirement of a non-RGGI state's emission allowances has equivalent integrity to the framework within the RGGI program and RGGI states. RGGI should

make it easy for states to fully participate in RGGI allowance auctions and the secondary market and to have allowances tracked through RGGI COATS. Alternatively, non-RGGI states should be required to demonstrate substantial equivalence between internal state tracking programs and COATS in order to ensure that full fungibility with RGGI allowances transactions is being achieved.

Market Monitoring

A final consideration for states to take into account relates to market monitoring issues. Since the quarterly allowance auctions commenced in the fall of 2008 (just before the formal start-up of the RGGI program in 2009), the RGGI states have had many years of experience in the competitive performance of the auction itself. RGGI's auctions are conducted with the oversight of an independent market monitor, whose assessments have given the RGGI states confidence in the prices and allowance-disbursement outcomes resulting from the auctions. That market monitoring structure was established due to concerns of allowance hoarding, other forms of market manipulation that could affect compliance opportunities and cost, and competitiveness and efficiency of the allowance trading system.[22] Effective market monitoring has given RGGI states comfort about underlying market-power considerations in the central market for allowances.

If a state becomes a RGGI participant, the transactions of sources within that state would fall under the analytic framework of the RGGI market monitor. A different type of market monitoring may be important in a broader market in which EGUs in RGGI states have the opportunity to trade with EGUs in non-RGGI states. A situation in another non-RGGI state that gives allowances away according to some administrative rule rather than an auction, for example, would not give rise to the same kinds of market-power considerations that could arise from a centralized auction. By contrast, however, RGGI may want to ensure that whatever CO_2-allowance tracking program is adopted for EGUs in RGGI states and in other states includes appropriate transparency to detect hoarding practices that could affect and undermine the competitiveness of the secondary market for allowances. In short, to the extent that sources in non-RGGI states are allowed to transact freely with RGGI state sources, RGGI may want to ensure that any allowances used for compliance in RGGI states be subject to the same or similar monitoring requirements (especially in the secondary market) as in the RGGI program.

[22] For discussion of potential hoarding in allowance markets, see, Toman, "Understanding the Design and Performance of Emissions Trading Systems for Greenhouse Gas Emissions," RFF, 2003; and EPA, "A Guide to Designing and Operating a Cap and Trade Program for Pollution Control," 2003.

V. Conclusion

The RGGI states have deep experience in operating a mass-based, CO_2-allowance trading program. The states have administered a liquid and efficient trading market for allowances and have repurposed allowance auction revenues to effectively achieve economic benefits and meet public policy objectives.

Now in the second major phase of RGGI program review, the RGGI states are considering program changes in part related to the potential for the emergence of a broader CO_2 allowance trading market. This provides the RGGI states with the opportunity to shed light on the successes of mass-based CO_2 allowance trading and to open the door to expanded trading opportunities for power plants located inside and outside the RGGI states.

We encourage the RGGI states to take advantage of this opportunity to help facilitate the creation of a broad market for the trading of CO_2 emission allowances. Although we recognize that this is not the only objective that the RGGI states are considering in the current review process, our focus on these issues in this report reflects our view that proactive and timely attention to these questions may help the RGGI states and other states achieve better CO_2 emission-control programs.