

Emissions Leakage in RGGI: An Analysis of the Current State and Recommendations for a Path Forward

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Sheryl L. Musgrove
Geordi A. Taylor
Radina R. Valova
Karl R. Rábago

Pace Energy and Climate Center



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Abstract: Emissions leakage is a looming threat to the ongoing success of the Regional Greenhouse Gas Initiative (RGGI). Some leakage may be already occurring, and the risk of leakage is likely to increase as the RGGI emissions cap continues to decline. Successful reduction and prevention of leakage will require a combination of measures that build on existing approaches. The RGGI states should expand their existing energy efficiency efforts, increase their renewable and clean energy standards, and expand their voluntary renewable energy set-aside programs. RGGI should build on these existing efforts by extending coverage to fossil-fuel power plants located within the RGGI region with a capacity of under 25MW. RGGI should enhance the methodology it uses to monitor imports so that it more precisely tracks cross-border sources of leakage. RGGI should also extend the emissions cap to all electricity delivered to load serving entities (LSE) in the RGGI region so that it covers emissions associated with imported electricity. Finally, RGGI should seek to link with additional states or other jurisdictions.

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I. Introduction

Carbon cap-and-trade programs help to ensure that emissions reductions are achieved in the most efficient manner and at lowest economic cost. Because these programs impose an additional cost on regulated entities, they also create a risk of emissions leakage. Emissions leakage is broadly defined as activity or investment that directly or indirectly causes emissions to shift from a jurisdiction with carbon reduction regulations to jurisdictions with less or no regulation, or from a source within a jurisdiction that is subject to emissions regulation to a source within that jurisdiction that is not subject to regulation.¹ Specific to the Regional Greenhouse Gas Initiative (RGGI), leakage can occur from two potential sources: (1) an increase in imports of electricity produced outside of the RGGI region that results in a net increase in attributable, even if not local, carbon emissions, or (2) a shift of generation from regulated to unregulated generators located within the RGGI region that results in an increase in emissions from unregulated sources.

Leakage has environmental, economic, social, political, and health consequences. Leakage reduces the environmental effectiveness of emissions regulation to the extent that it causes a net increase in emissions. Leakage results in negative economic impacts if it leads to the avoidance of investment, relocation of investments, and shifting of production from within the regulated jurisdiction to outside the jurisdiction.² This shift in activity and/or investment reduces the regulated jurisdiction's economic output, employment, and taxable profits, and can lead to job losses, and negative impacts on livelihoods and communities.³ Further, if imported electricity is not subjected to the same or similar regulation as electricity generated within the jurisdiction,

¹ See Andrei Marcu et al., *Carbon Leakage: An Overview* (2015), Centre for European Policy Studies, at 1-2, available at <https://www.ceps.eu/publications/carbon-leakage-overview>.

² Andrei Marcu et al., at 3; World Bank Group, *Carbon Leakage: Theory, Evidence, and Policy Design* (2015) (World Bank Group Report), at 1-2, available at <http://documents.worldbank.org/curated/en/138781468001151104/pdf/100369-NWP-PUBLIC-ADD-SERIES-Partnership-for-Market-Readiness-technical-papers-Box393231B.pdf>; International Carbon Action Partnership (ICAP) & Partnership for Market Readiness (PMRI), *Emissions Trading in Practice: A Handbook on Design and Implementation* (2016) at 8, available at <https://openknowledge.worldbank.org/bitstream/handle/10986/23874/ETP.pdf?sequence=11&isAllowed=y>.

³ Marcu et al., at 3; World Bank Group Report at 1-2; ICAP & PMRI at 8.

the in-jurisdiction generation will be at a competitive disadvantage.⁴ Imported electricity can also displace or adversely impact the value of energy efficiency and incremental increases in clean energy generation from within the regulated jurisdiction. Finally, to the extent it results in an increase in fossil-fuel generation from generators located near residential areas, the emissions associated with leakage can result in negative health impacts in communities surrounding these generators. Those communities are most likely to be low-income communities or communities of color.⁵

The RGGI states monitor leakage risk by tracking imports and the emissions associated with those imports, and issue reports providing the results of that tracking. The most recent report, issued August 2016, tracks imports and associated emissions for 2012-2014.⁶ This Monitoring Report concludes (using a baseline period of 2006-2008) that net imports of electricity into the RGGI states increased by 34.0%.⁷ The same report indicates that average emissions from imports decreased by 1.0%.⁸ The Monitoring Report explicitly states that it does not provide indicators of emissions leakage, and that it instead merely tracks electricity generation in the RGGI region and imports of electricity into the RGGI region, along with the

⁴ Richard Cowart, *Addressing Leakage in a Cap-and-Trade System: Treating Imports as Sources* (2006), at 1, available at <http://www.raponline.org/wp-content/uploads/2016/05/rap-cowart-capandtradeleakage-2006-11.pdf>.

⁵ See *Joint Comments (36 Environment and Environmental Justice Organizations)* (filed August 3, 2017), available at https://www.rggi.org/docs/ProgramReview/2017/06-27-17/Comments/Additional_Joint_Environmental_Justice_Comments.pdf; *Joint Comments (5 Environmental Justice Organizations)* (filed July 17, 2017), available at https://www.rggi.org/docs/ProgramReview/2017/06-27-17/Comments/Joint_Environmental_Justice_Comments.pdf; Jeremy Deaton, *In Maryland, one community is taking a stand against environmental racism* (July 27, 2016), available at <http://grist.org/justice/in-maryland-one-community-is-taking-a-stand-against-environmental-racism/>; Martha Keating & Felicia Davis, *Air of Injustice: African Americans & Power Plant Pollution* (2002), at 3-4, 6-7, available at http://www.energyjustice.net/files/coal/Air_of_Injustice.pdf; Martha Keating, *Air of Injustice: How Air Pollution Affects the Health of Hispanics and Latinos* (2004), at 3, 28, available at http://www.catf.us/resources/publications/files/Air_of_Injustice_Latino.pdf; Brett Israel, *Coal Plants Smother Communities of Color: The Poor and Minority Communities Bear Most of the Health Burden from Coal-Fired Power Plants*, *Scientific American* (2012), available at <https://www.scientificamerican.com/article/coal-plants-smother-communities-of-color/>.

⁶ Regional Greenhouse Gas Initiative (RGGI), *CO₂ Emissions from Electricity Generation and Imports in the Regional Greenhouse Gas Initiative: 2014 Monitoring Report* (2016) (RGGI Monitoring Report), available at https://www.rggi.org/docs/Documents/Elec_Monitoring_Report_2014.pdf.

⁷ *Id.* at 4.

⁸ *Id.* at 18.

emissions associated with both.⁹ The Monitoring Report also states that it “should not be used to draw definitive conclusions about whether or not CO₂ emissions leakage has occurred, as it does not address the causes of observed trends among different categories of electric generation serving load” in the RGGI region.¹⁰

Although the Monitoring Report indicates that minimal leakage may be occurring, the methods used by the RGGI states to track imports and emissions attributable to those imports have weaknesses that RGGI needs to address. The Monitoring Report is also founded on a number of flawed assumptions. Further, even if leakage is not currently occurring, our analysis of non-RGGI electricity capacity that could serve the region suggests that the risk of leakage will increase significantly over the coming years as a declining emissions cap leads to higher allowance prices. This paper proposes an approach for enhancing the current methodology for tracking and attributing emissions to imported electricity, an essential foundation for leakage mitigation efforts.

Operational cap-and-trade programs have implemented various mechanisms for mitigating leakage. The most common mechanism is the allocation of free allowances to regulated entities. The concept is that free allowances eliminate the financial incentive to import less expensive but more polluting energy. This is the approach used in the European Union Emission Trading System (EU ETS). Another mechanism, used in California and Québec, is a border carbon adjustment, which seeks to impose the same regulatory cost on electricity imported from outside the jurisdiction as imposed on electricity generated from within the jurisdiction. This mechanism is designed to put imported energy on the same footing as domestic energy produced under the cap.

RGGI is addressing leakage risk through monitoring of imports, energy efficiency measures, and indirectly through renewable portfolio standards (RPS) or clean energy standards (CES) and voluntary renewable energy set-asides. Monitoring alone does not change the emissions characteristics of imported energy, but provides useful data to calibrate other leakage-reducing measures. Energy efficiency reduces leakage risk by reducing the demand for energy. Renewable and clean energy standards increase the availability of emissions-free domestic energy supply. Voluntary renewable energy set-asides can drive an increase in the availability of

⁹ *Id.* at 7.

¹⁰ *Id.* at 8.

emissions-free energy supply within the RGGI region and can also lead to reduced demand for fossil-fuel generated power in the region. These measures, often called “complementary measures,” are important for the success of a cap-and-trade program, and provide a good starting point, but are not sufficiently robust to prevent and reduce leakage moving forward.

Successful prevention and reduction of leakage in the RGGI region will require a combination of measures that build on existing approaches. The RGGI states should expand their existing energy efficiency efforts, increase their renewable and clean energy standards, and expand their voluntary renewable energy set-aside programs. RGGI should build on these existing efforts by extending coverage to fossil-fuel power plants located within the RGGI region with a capacity of under 25MW. RGGI should enhance the methodology it uses to monitor imports so that it more precisely tracks cross-border sources of leakage. RGGI also should extend the emissions cap to all electricity delivered to load serving entities (LSE) in the RGGI region so that it covers emissions associated with imported electricity. Finally, RGGI should seek to link with additional states or other jurisdictions.

II. RGGI

A. General Background

The Regional Greenhouse Gas Initiative is the first mandatory cap-and-trade program in the United States for carbon dioxide (CO₂) emissions from new and existing fossil-fuel power plants. The RGGI program regulates only power plants with a 25MW or greater capacity,¹¹ and consists of both individual state cap-and-trade programs and the linking of those individual programs to create a regional cap-and-trade program.

When RGGI was launched in 2009, it linked ten northeast and mid-Atlantic states: Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, and Vermont.¹² In 2011, New Jersey withdrew from RGGI, leaving nine

¹¹ See Regional Greenhouse Gas Initiative (RGGI), *Model Rule* (2013) (RGGI Model Rule) at 21, available at https://www.rggi.org/docs/ProgramReview/_FinalProgramReviewMaterials/Model_Rule_FINAL.pdf.

¹² Lucas Bifera, *Regional Greenhouse Gas Initiative*, Center for Climate and Energy Solutions (2013), available at <https://www.c2es.org/docUploads/rggi-brief-12-18-13-updated.pdf>; Regional Greenhouse Gas Initiative, *Memorandum of Understanding* (RGGI MOU), at 3, available at http://www.rggi.org/docs/mou_12_20_05.pdf.

states in RGGI as of January 1, 2012. However, New Jersey is expected to rejoin RGGI,¹³ and Virginia regulators have issued a proposal to join RGGI.¹⁴ Thus, RGGI may in the near future be expanded to link two additional states.

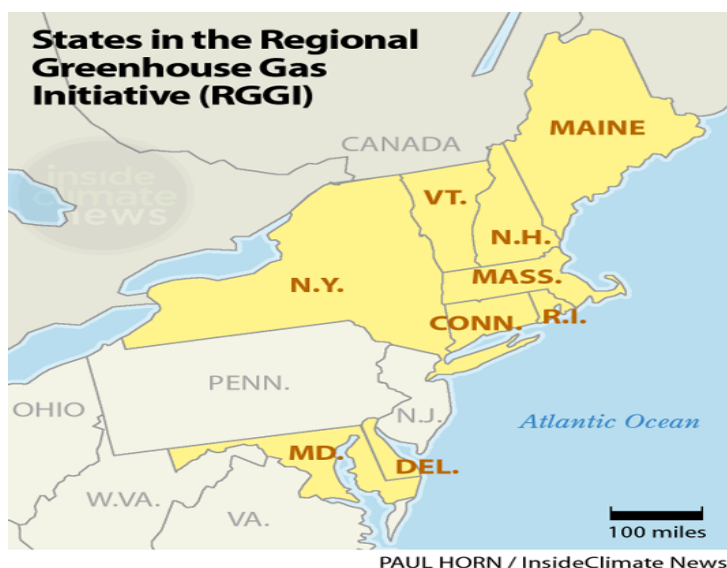


Image 1: There are nine northeast and mid-Atlantic states participating in RGGI.
Image source: Paul Horn/InsideClimate News.

Under RGGI, the linked states cooperatively establish an overall cap on the amount of CO₂ that covered fossil-fuel power plants located in the RGGI states can emit on a collective basis, and the rate at which that cap will decline. RGGI then issues tradeable CO₂ allowances at the level of the cap, with each allowance authorizing a power plant to emit one short ton of CO₂.¹⁵ At the end of each three-year compliance period, a power plant located in a RGGI state is required to obtain and surrender allowances equal to its emissions during that three-year period.¹⁶

B. Mechanisms in Place to Identify, Track, and Mitigate Leakage in RGGI

While the objective of the RGGI program is overall reduction in emissions, the RGGI states recognized from the beginning that implementation of the cap-and-trade program could result in leakage—increased imports of electricity from areas outside of the RGGI states, and an

¹³ See Gerald B. Silverman, *New Jersey Eyes Rejoining Northeast's Carbon Trading Program*, Bureau of National Affairs (September 8, 2017), available at <https://www.bna.com/new-jersey-eyes-n57982087637/>.

¹⁴ See Sarah Rankin, *Virginia Regulators Approve Carbon Cap-and-Trade Plan*, Washington Post (November 16, 2017), available at https://www.washingtonpost.com/national/energy-environment/virginia-regulators-approve-carbon-cap-and-trade-plan/2017/11/16/271e0c36-cb4b-11e7-b506-8a10ed11ecf5_story.html?utm_term=.82ea21bf5fcb.

¹⁵ A short ton is equal to 2,000 pounds, as opposed to a long ton, which equals 2,240 pounds. See <https://www.eia.gov/tools/glossary/>.

¹⁶ See <http://rggi.org/design/overview>.

accompanying potential shift of emissions to areas outside of the RGGI region.¹⁷ The RGGI states included in the RGGI Memorandum of Understanding (MOU) several provisions aimed at ensuring that leakage did not undermine the effectiveness of the program. These provisions include requirements for a multi-state working group to consider potential options for addressing leakage; for ongoing monitoring and annual reporting of electricity imports into RGGI states; and for monitoring and reporting of whether any increase in emissions from electric generating units in non-participating states are attributable to the RGGI Program.¹⁸ If a determination is made that leakage is occurring, i.e., that “the Program has led to a significant increase in emissions from electric generating units outside the” RGGI region, the RGGI states are required to take measures to mitigate such increased emissions through “technically sound measures to prevent leakage from undermining the integrity of the Program.”¹⁹

In compliance with the MOU, the RGGI Emissions Leakage Multi-Staff Working Group (Leakage Working Group) convened and produced a report in 2007 (2007 Report) that provided a detailed proposal for leakage monitoring and analyzed options for addressing potential leakage.²⁰ The leakage mitigation options analyzed in the 2007 Report fall into three categories: (1) policies that reduce electricity demand; (2) policies that would directly address carbon emissions through a mechanism other than a cap, i.e., carbon adder and emissions rate mechanisms; and (3) policies that impose a cap on emissions associated with serving load.²¹ The 2007 Report did not make policy recommendations regarding these options but instead only provided a qualitative evaluation of the options.²² This evaluation provided a starting point for further discussions.

¹⁷ See RGGI MOU at 9. Leakage is a potential problem for regional cap-and-trade systems where surrounding jurisdictions may be sources of carbon-emitting electricity generation that could be sold into the cap-and-trade region, or where some emission sources within the cap-and-trade region are not covered by the cap regime. A comprehensive national carbon cap-and-trade system substantially reduces or eliminates the risk of leakage issues.

¹⁸ *Id.* at 9-10.

¹⁹ *Id.* at 10.

²⁰ RGGI Emissions Leakage Multi-State Staff Working Group, *Potential Emissions Leakage and the Regional Greenhouse Gas Initiative (RGGI): Evaluating Market Dynamics, Monitoring Options, and Possible Mitigation Mechanisms* (March 14, 2007) (2007 Leakage Report), available at https://www.rggi.org/docs/il_report_final_3_14_07.pdf.

²¹ *Id.* at 26-44.

²² *Id.* at 26.

In 2008, the Leakage Working Group issued its second report.²³ This 2008 Report provided recommendations regarding the three categories of policy options for addressing leakage that had been qualitatively analyzed in the 2007 Report. The 2008 Report noted that under the political environment at the time, it appeared that there was support for a national carbon cap-and-trade system and that such a system would likely eliminate or at least significantly minimize leakage risk; and that the RGGI states should prioritize leakage reduction measures that could be implemented more quickly than complex measures that would require additional time to develop.²⁴ The 2008 Report recommended that the RGGI states prioritize the policy options that seek to reduce electricity demand. Specifically, the report recommended aggressively increasing energy efficiency market transformation investment, and implementing complementary measures that would accelerate deployment of technologies and measures for end-use energy efficiency, such as updated building energy codes and standards, and energy efficiency standards for appliances and equipment.²⁵

As to options that would directly address carbon emissions—the carbon adder and emissions rate mechanisms—the report noted that each of the options in this category had significant challenges.²⁶ These options would require significant lead-time for development and implementation, and would require participation from both the energy and environmental agencies of each of the RGGI states.²⁷ Further, the effectiveness of these policy options in reducing leakage was uncertain, and implementation could have a significant impact on electricity rates to consumers without any guarantee of emission reduction benefits.²⁸

The third category of policy options would involve imposing a cap on emissions related to all electricity delivered in the RGGI states by a load serving entity (LSE).²⁹ The 2008 Report found that implementation of such a load-based cap presented significant challenges, both

²³ *Potential Emissions Leakage and the Regional Greenhouse Gas Initiative (RGGI): Final Report of the RGGI Emissions Leakage Multi-State Staff Working Group to the RGGI Agency Heads* (March 2008) (2008 Leakage Report), available at <http://www.rggi.org/docs/20080331leakage.pdf>.

²⁴ *Id.* at 24, 41.

²⁵ *Id.* at 17, 24, 41.

²⁶ *Id.* at 25-35.

²⁷ *Id.* at 35.

²⁸ *Id.* at 35.

²⁹ *Id.* at 35-41.

technical and administrative, and likely a long timeframe for development.³⁰ The report concluded that the effectiveness of a load-based cap in mitigating leakage was uncertain, and the implementation of the cap also could have significant impact on electricity rates to consumers without a guarantee of emission reduction benefits.³¹

The 2008 Report also recommended support of then RGGI-participant New Jersey's proposal to investigate two additional potential approaches for leakage mitigation: (1) an emissions rate mechanism, and (2) application of the RGGI cap to all emissions associated with serving load.³² The Report noted that any measures implemented as a result of such investigation "could facilitate broader regional implementation of such measures in the RGGI region if end-use energy efficiency measures prove insufficient as a leakage mitigation approach, or action toward the implementation of a federal cap-and-trade program is significantly delayed."³³

A major underpinning of the 2008 Report's recommendations was the assumption that a national cap-and-trade program would be implemented that would "eliminate or significantly mitigate potential emissions leakage."³⁴ Now, almost ten years later, a federal cap-and-trade program has not been implemented. With the 2017 changes in the federal administration, there has been significant backsliding on federal carbon emissions reduction policy; the Environmental Protection Agency has initiated a regulatory process to repeal the Clean Power Plan; and it is unlikely that a federal cap-and-trade program will be implemented in the foreseeable future.

The risk of leakage also is likely to increase as announced changes in the RGGI program—including an additional 30% decline in the emissions cap by 2030—take effect over the coming years.³⁵ These design changes are expected to reduce the number of excess allowances in the system, help prevent excess allowances from accumulating, stabilize the price of allowances, and provide pressure for allowance prices to increase over time. After years of

³⁰ *Id.* at 40.

³¹ *Id.* at 41.

³² *Id.* at 42.

³³ *Id.* at 42.

³⁴ *Id.* at 8, 41.

³⁵ Regional Greenhouse Gas Initiative, *RGGI States Announce Proposed Program Changes: Additional 30% Emissions Cap Decline by 2020* (August 23, 2017), available at https://www.rggi.org/docs/ProgramReview/2017/08-23-17/Announcement_Proposed_Program_Changes.pdf. Additional program changes include a full banked allowance adjustment to account for accumulated banked allowances, implementation of an emissions containment reserve, and modification to the cost containment reserve. *See id.*

weak allowance prices, quarterly auction allowance clearing prices doubled at the first auction following announcement of the program changes.³⁶ An increase in allowance prices will provide greater incentive for generators covered by RGGI to reduce emissions. This increase in allowance prices also will likely result in higher wholesale electricity prices from RGGI generators and in turn increase the risk that LSEs will seek to obtain electricity from generators not subject to RGGI regulation.

In light of the circumstances at the federal level, and the expectation that RGGI allowance prices will continue to rise, it is important to make a critical review of whether emissions leakage from the RGGI region is occurring, the risk of leakage moving forward, and the appropriate mechanisms for mitigating leakage.

III. Current State of Leakage under RGGI

RGGI currently covers fossil-fuel power plants with 25MW or greater generation capacity that are physically located in one of the RGGI states. These generators, referred to as RGGI sources or RGGI generators, provide only a portion of the electricity that serves demand in the RGGI region. The remainder of the electricity serving demand in the RGGI region is provided by what are referred to as non-RGGI sources or non-RGGI generators. Non-RGGI sources include (1) non fossil-fuel electricity generators (i.e. renewables and biomass), (2) fossil-fuel power plants with an installed capacity of under 25MW that are physically located in one of the RGGI states, and (3) fossil-fuel power plants of any size that serve RGGI region electricity load but are physically located outside of the RGGI states. Of importance for leakage analysis are the second and third categories of non-RGGI sources—fossil-fuel power plants located in the RGGI region that have generating capacities of under 25MW and fossil-fuel power plants of any size located outside the RGGI region that serve RGGI load.

An increase in electricity generation from non-RGGI sources serving load in the RGGI region causes emissions leakage if it is also accompanied by a net increase in emissions. The shifting of generation within the RGGI region from RGGI sources to non-RGGI sources can also have negative environmental and health impacts on already overburdened disadvantaged

³⁶ Potomac Economics, *Market Monitor Report for Auction 37* (2017) (RGGI Auction Report for Auction 37), available at https://www.rggi.org/docs/Auctions/37/Auction_37_Market_Monitor_Report.pdf.

communities. In determining whether leakage is occurring, and how to mitigate or prevent leakage, it is important to examine imports of electricity from non-RGGI sources located outside the RGGI region, and also any increase in the amount of electricity generated by non-RGGI sources located within the RGGI region.

The RGGI states seek to monitor leakage by tracking electricity generation from both RGGI sources and non-RGGI sources, including imports of electricity, and the emissions associated with that generation, and issue periodic leakage monitoring reports. The 2014 Monitoring Report, issued August 12, 2016, analyzes imports for the period 2012-2014, using a comparison baseline period of 2006-2008.³⁷ The conclusions reached by the Monitoring Report are the result of several years of gathering, organizing, and analyzing numerous data sets. The report reaches the following conclusions:

- Average annual demand for electricity in the RGGI states decreased by 4.2%
- Average annual generation from power plants located in the RGGI states decreased by 9.1%, while net imports of electricity into the RGGI states increased by 34.0%
- Average annual generation from RGGI sources decreased 19.9%, while emissions from RGGI sources decreased 35.7%
- Average annual generation from non-RGGI sources serving load in the RGGI region increased by 11.6%, while emissions from these non-RGGI sources decreased by 0.5%³⁸

The Monitoring Report explicitly states that it does not provide indicators of emissions leakage, and notes that it instead merely tracks electricity generation in the RGGI region, imports of electricity into the RGGI region, and the emissions associated with both in-region generation and imports.³⁹ The Monitoring Report also states that it “should not be used to draw definitive conclusions about whether or not CO₂ emissions leakage has occurred, as it does not address the causes of observed trends among different categories of electric generation serving load” in the RGGI region.⁴⁰

³⁷ RGGI Monitoring Report at 3-4.

³⁸ *Id.* at 3-6

³⁹ *Id.* at 7.

⁴⁰ *Id.* at 8.

As noted previously, emissions leakage can occur both as a result of electricity imports into the RGGI region and increased generation from non-RGGI generators located inside the RGGI states.

A. Electricity Imports

Three different transmission systems serve the RGGI states, and imports come into the RGGI region through all three of these transmission systems: PJM, NYISO, and ISO-NE. Historically, the largest share of electricity imports into the RGGI states can be traced to imports of electricity from PJM non-RGGI states into PJM RGGI states, followed by NYISO and ISO-NE imports from Québec (*see* Figures 1 and 2).

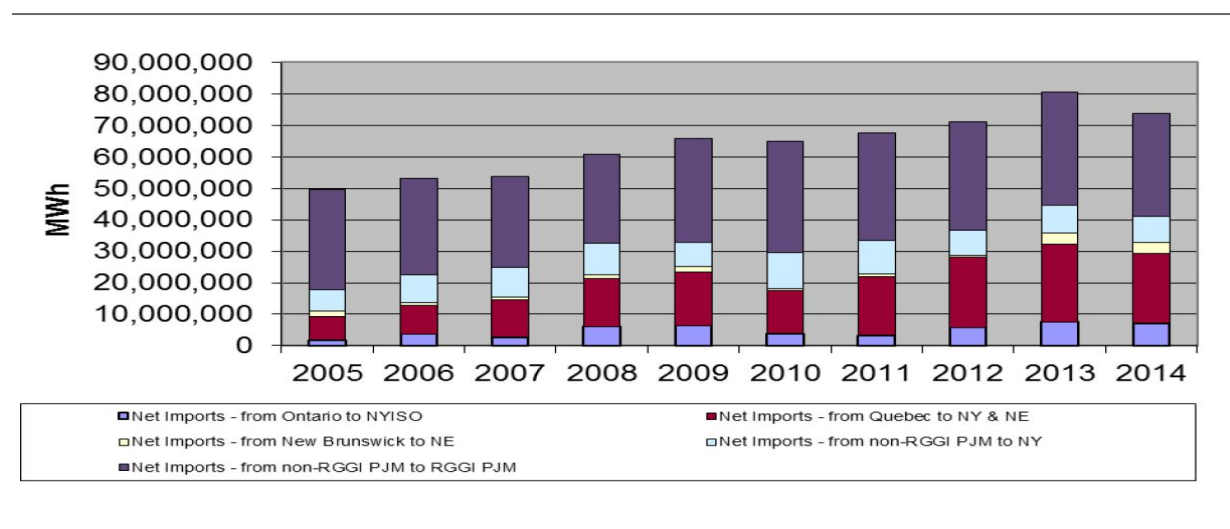


Figure 1: The largest share of electricity imports into the RGGI states came via non-RGGI PJM to RGGI PJM, Ontario to NYISO, and Québec to NYISO and ISO-NE. *Source: 2014 Electric Monitoring Report, Figure 9*

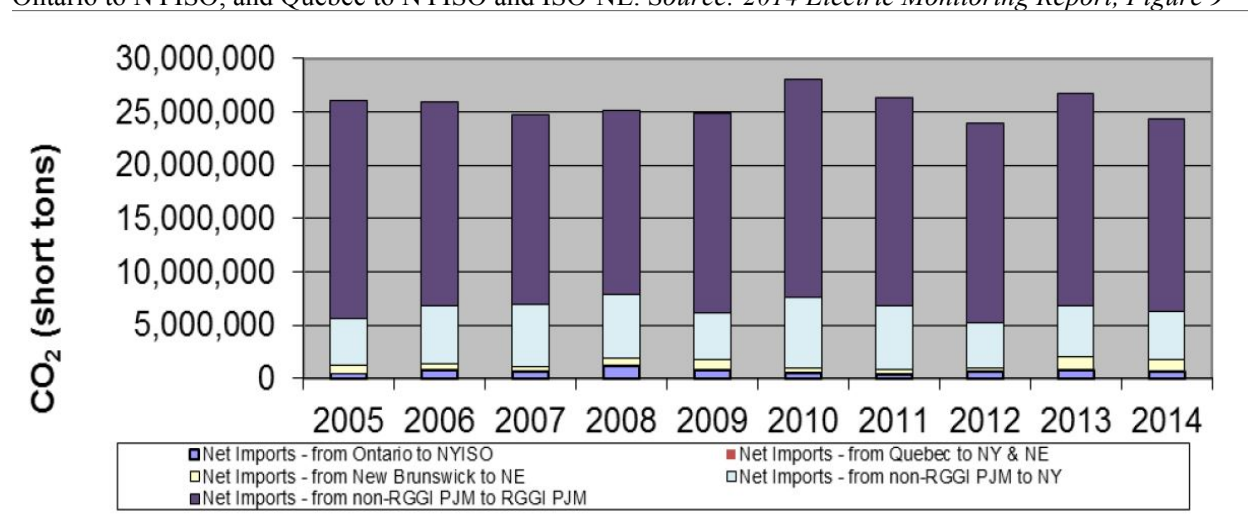


Figure 2: The emissions directly associated with electricity imported into the RGGI region were highest for non-RGGI PJM to RGGI-PJM. *Source: 2014 Electric Monitoring Report, Figure 10*

One of the key drivers for emissions leakage caused by imports is the cost of electricity generated inside of the RGGI region compared to the cost of electricity generated outside the region. This relative cost of electricity is in part determined by the price of RGGI allowances, but also by other market factors that impact the economics of importing electricity into the RGGI region. The market factors discussed in the RGGI Monitoring Report include transmission congestion charges, line-loss charges, power purchase agreements (PPAs), and reliability constraints.⁴¹ The Monitoring Report's conclusion that these market factors have the potential of mitigating emissions leakage is not entirely wrong but is slightly misguided, at least as to some of the market factors discussed.

1. Congestion Charges

Transmission congestion occurs when there is insufficient transmission capacity to deliver available electricity to the location of demand.⁴² Such congestion results in the dispatch of higher-cost electricity generation to meet the load, resulting in higher wholesale electricity price in the transmission-constrained area when compared with an unconstrained area.⁴³ Congestion charges can be imposed on imports and can negatively impact the economics of importing electricity from non-RGGI states.

The notion that congestion charges mitigate leakage is based on the premise that the extra charge for congestion, along with existing transmission charges, would act to erode the economic value of importing electricity and hence mitigate leakage risk. This premise in turn relies on two assumptions: (1) that wholesale power prices in a load zone in the RGGI region are uneconomical because the generators must now incorporate allowance prices into their operational costs, and (2) that there is insufficient transmission capacity available to import generation into load zones in the RGGI region. The first assumption is more likely to occur as the decline in the RGGI emissions cap, along with other program design elements, drives an anticipated increase in allowance price. However, the second assumption fails to consider that the continued deployment of customer-sited generation and other load-reducing measures could reduce transmission congestion and make it increasingly economical to import electricity from

⁴¹ *Id.* at 21-22.

⁴² *See id.* at 21; Bernard Lesieutre & Joseph Eto, *Electricity Transmission Congestion Costs: A Review of Recent Reports* (2003), available at https://energy.gov/sites/prod/files/oeprod/DocumentsandMedia/review_of_congestion_costs_october_03.pdf.

⁴³ RGGI Monitoring Report, *supra*, at 21-22; *see* Lesieutre & Eto, *supra*, at vi.

non-RGGI sources. It is unclear that congestion charges provide effective protection against leakage, particularly as the RGGI cap continues to decline and allowance prices increase over time.

2. Line-Loss Charges

Electricity transmission results in loss of a portion of the electricity transmitted, with the distance of transmission directly related to the amount of that loss. To account for this line loss, ISOs impose line-loss charges. Line-loss charges are levied by the ISO on a generator's bid in the wholesale market, and are based on the distance the generator's output must travel and the proportion of the electricity that will be lost during that transmission.⁴⁴ Line-loss charges can make imports that must be transmitted over long distances economically infeasible. For example, although it may be economically feasible for electricity generated by a power plant in Québec to be imported into New York, it likely will not be economically feasible for that Québec electricity to be imported into Maryland. Line-loss charges can thus conceivably act to mitigate leakage.



Image 2: Line-loss charges decrease the economic feasibility of importing electricity from generators located long distances from where the electricity will be consumed. It is unlikely, for example, that electricity generated in Ohio would be imported into the RGGI region.

Image source: www.ferc.gov

3. Power Purchase Agreements

Power-purchase agreements (PPAs) require the purchase of electricity from specific sources at specific pre-set times. The Monitoring Report concludes that the existence of long-term PPAs can mitigate emissions leakage by delaying the ability of power purchasers to respond

⁴⁴ Tom Overbye & Ross Baldick, *Power System Analysis: Economic Dispatch N/A*, available at http://users.ece.utexas.edu/~baldick/classes/369/Lecture_16.ppt.

to changes in market conditions.⁴⁵ For example, if allowance prices cause an increase in wholesale electricity prices, a load serving entity in a long-term PPA would be unable to replace its electricity source by bidding on cheaper, higher emission power sources until the PPA has expired.

PPAs mitigate emissions leakage at best over the short-term. The Monitoring Report relies on the long-term nature of a PPA to prevent market participants from procuring additional electricity from non-RGGI generators.⁴⁶ The primary idea with this line of thinking is that market participants bound by these agreements would not be able to react in the short-run and rely on non-RGGI generation. However, PPAs eventually expire, and the lack of in-depth analysis on the vintage of existing PPAs in the ISOs that transmit electricity into the RGGI region weakens considerably any reliance on PPAs as potential leakage mitigation measures.

4. Reliability Constraints

The Monitoring Report includes reliability constraints as another market factor that mitigates leakage.⁴⁷ There is some validity to this view because, to the extent that RGGI generating units provide ancillary services and needed generation capacity in a specific area of the electricity grid, these generation sources will be dispatched regardless of their asking price due to their role in contributing to network stability and reliability. As the development of variable power systems (renewables) continues, dispatchable generation in specific areas of an electricity grid will be deployed from any available source. These dispatchable sources could come in the form of RGGI or non-RGGI fossil-fuel power plants, battery storage, and other sources that will be further explored below.

5. Current Method for Determining Emissions Attributed to Imports

Despite the presence of market factors that are thought to mitigate leakage, and the historically low RGGI allowance prices during 2012-2014, the Monitoring Report's findings indicate a significant uptick in electricity imported into the RGGI region (34.0%), and a small decrease (1%) in emissions from those imports.⁴⁸ The methods used by the Monitoring Report to determine both the amount of electricity imported and the emissions attributed to those imports

⁴⁵ RGGI Monitoring Report, *supra*, at 22.

⁴⁶ Bob Reed, *Calculating the Cost of Congestion* (2003), available at http://www.nyiso.com/public/webdocs/markets_operations/committees/bic_espwg/meeting_materials/2003-07-02/cost_of_congestion.pdf.

⁴⁷ RGGI Monitoring Report, *supra*, at 23.

⁴⁸ *Id.* at 18.

have weaknesses, and these weaknesses may be resulting in significant under-reporting of both imports and the emissions attributed to those imports.

First, as the Monitoring Report acknowledges, although net electricity imports for ISO-NE and NYISO are based on tracking of actual electricity flows, this type of tracking for PJM is not possible because data on electricity flows between the different states served by PJM is unavailable.⁴⁹ Thus, the actual imports of electricity to the RGGI states served by PJM (Delaware and Maryland) must be inferred, introducing some level of uncertainty regarding imports to RGGI states through PJM.⁵⁰

Second, and more significantly, the emissions attributed to imported electricity are based on the system average emission rate for adjacent control areas,⁵¹ creating an additional unidentified degree of uncertainty in the imported emissions calculations. The imports from non-RGGI PJM to RGGI PJM, and Québec to the NYISO and ISO-NE represent the largest flows of imported electricity into the RGGI region. Fortunately, the emissions associated with imports from Québec are comparably low because of the province's predominantly low-emission power fleet. The level of uncertainty in attributing emissions to the imports from Québec is less troubling as a result. On the other hand, the generation mix in the entire PJM area (both RGGI and non-RGGI) is a more diverse mixture of fossil fuel, biomass, and renewable power plants, and has a comparatively high average emission rate.⁵² The combination of uncertainty regarding the amount of electricity imported through the PJM system, uncertainty about emissions attributable to the PJM imports, and the comparatively high emissions rate of generation in the PJM area indicates that the Monitoring Report may significantly understate the emissions attributable to these imports, and thus the amount of emissions leakage resulting from imports. The Monitoring Report determination that there was a 34% increase in imported electricity resulting in a reported 1% decrease in emissions may be the result of such understatement.

Access to additional and more granular data regarding electricity imported into the RGGI region, and the sources of those imports, would provide more certainty regarding the emissions associated with imported electricity and thus the amount of emissions leakage that is occurring.

⁴⁹ *Id.* at 12-13.

⁵⁰ *Id.* at 13.

⁵¹ *Id.* at 12.

⁵² EIA Form 860-Schedule 3 2016 Generator Data (2017).

As noted, PJM does not track electricity flows on a state-by-state basis, making more precise data on PJM imports currently unavailable.

B. Non-RGGI Sources Located in the RGGI Region

The Monitoring Report briefly acknowledges the possibility that higher allowance prices will create a financial incentive to increase reliance on non-RGGI generators located *outside* of the RGGI region, but provides no in-depth consideration of the potential of increased reliance on non-RGGI generators located *inside* the RGGI region. Specifically, there is no discussion in the Monitoring Report of the risk that electricity generation will be shifted from power plants subject to RGGI regulation to power plants that are located in the RGGI region but that are not subject to RGGI regulation because they have a capacity of under 25MW.

Because these under-25MW plants are located within the RGGI region, transmission congestion charges may not act as a deterrent to leakage, and line-loss penalties likely will not be relevant. Reliability constraints and higher wholesale prices offered by RGGI generators might make bids from the smaller generators more attractive. The Monitoring Report also appears to overlook the sizeable capacity of coal, natural gas, and petroleum power plants located in the RGGI states that fall within the under-25MW exclusion (*see* Figure 3).

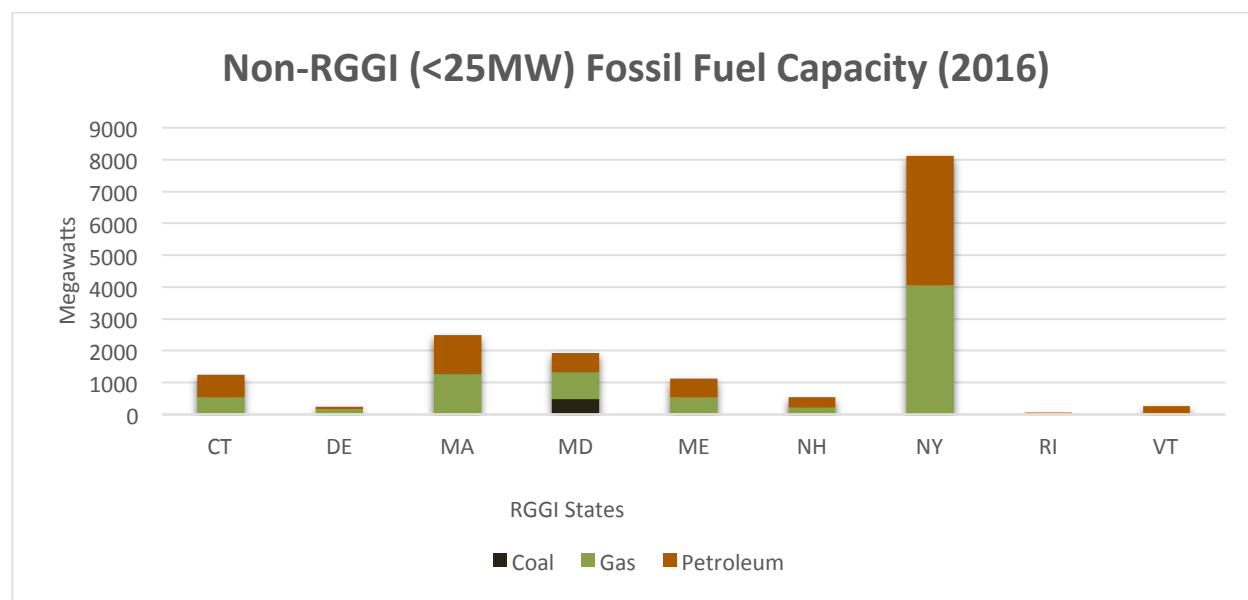


Figure 3: Fossil-fuel power plants in the RGGI region under 25MW may become favorable sources to meet electricity loads within RGGI in a market environment with higher allowance prices. *Source: EIA Form 860-Schedule 3 Generator Data 2016*

As previously noted, the changes in the RGGI program resulting from the 2016 Program Review are expected to drive increases in allowance price. As allowance price increases, operational costs for generators regulated by RGGI will increase.⁵³ Although RGGI compliance costs have only accounted for roughly 4% of the average wholesale electricity price offered by RGGI generators,⁵⁴ as allowance price increases, the cost of RGGI compliance will account for a larger percentage of wholesale electricity prices. Following the announcement of RGGI program design changes, the most recent quarterly auction for allowances saw the clearing price double, without any significant supply reductions.⁵⁵ This rise in allowance price will likely continue.

The significant potential for leakage from the under-25MW generators currently unregulated by RGGI cannot be underscored enough. Apart from a few New England states (Maine, Vermont, New Hampshire), RGGI states currently source a significant portion of their electricity from natural gas power plants (*see* Figure 4). As allowance prices increase, the economics of relying on the under-25MW in-region generators will likely become increasingly favorable, especially in load zones where out-of-region procurement is not attractive.

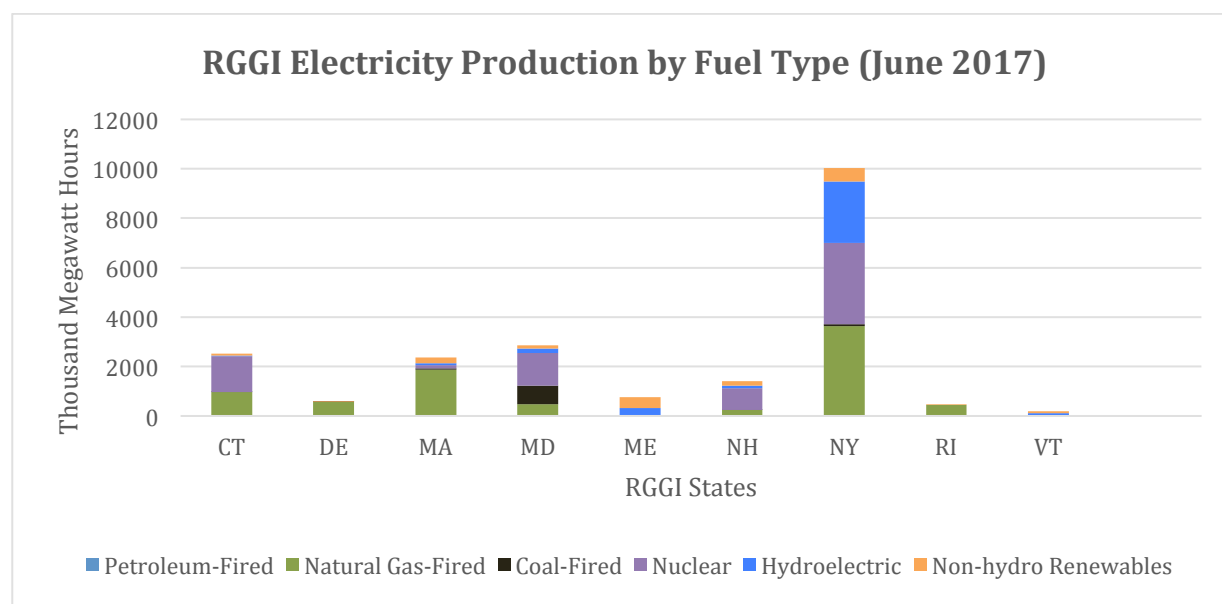


Figure 4: As of June 2017, some RGGI states have relied significantly on natural gas power plants to meet electrical demand within their borders. *Source: EIA Form 860-Schedule 3 Generator Data 2016*

⁵³ Nora Vogel, *RGGI States Announce Proposed Program Changes: Additional 30% Emissions Cap Decline by 2030* (2017), available at https://www.rggi.org/docs/ProgramReview/2017/08-23-17/Announcement_Proposed_Program_Changes.pdf.

⁵⁴ See RGGI Monitoring Report, *supra*, at 19.

⁵⁵ See RGGI Auction Report for Auction 37, *supra*.

To-date, non-RGGI procurement in the ISO-NE and NYISO generally has been from clean sources, resulting in reduced aggregate emissions from imports. However, the anticipated higher allowance prices may adversely impact emissions within these zones, especially New York and Massachusetts (*see* Figures 3 & 4). For perspective, if the petroleum (usually used for backup generation) and coal power plants are excluded from this discussion, New York, Maryland, and Massachusetts collectively possess an estimated 6100+ MW of gas power plants within their borders that are not regulated by RGGI. As higher allowance prices result in higher compliance costs to RGGI generators, there is a significant risk that generation will increasingly shift from RGGI generators to the under-25MW generators. This risk highlights the need for reform to cover the under-25MW generators located within the borders of the RGGI states.

The expectation that future allowance prices will be higher, combined with a sizeable aggregate capacity of under-25MW generators in the region, further increases the risk of leakage. The economic incentive of relying more on the smaller generating units may begin to match or outpace that of running larger plants that are subject to RGGI's cap. Also, since these under-25 MW generators are located within the same network, they may become increasingly attractive options for providing grid stability.

On a positive note, it appears that most of the non-RGGI in-region generators (i.e., the under-25 MW generators) are fueled by natural gas and thus will generally have lower CO₂ emissions rates in comparison to coal and petroleum plants. A combination of economic factors, environmental advocacy, and new generation has created an unfavorable environment for coal power plants in the ISO-NE and NYISO RGGI states. Since coal power plants are often used for baseload generation, it is unlikely that they would be used in a short-run responsive capacity like a gas plant.

On the other hand, petroleum-fired non-RGGI plants pose a leakage threat due to their operational flexibilities, which are similar to natural gas plants. Estimates of installed capacity for non-RGGI petroleum-fired plants located inside of RGGI states is nearly 8,000 MW, and represents roughly half of the fossil-fuel capacity of the under-25MW power plants located in the RGGI region (*see* Figures 5 and 6).

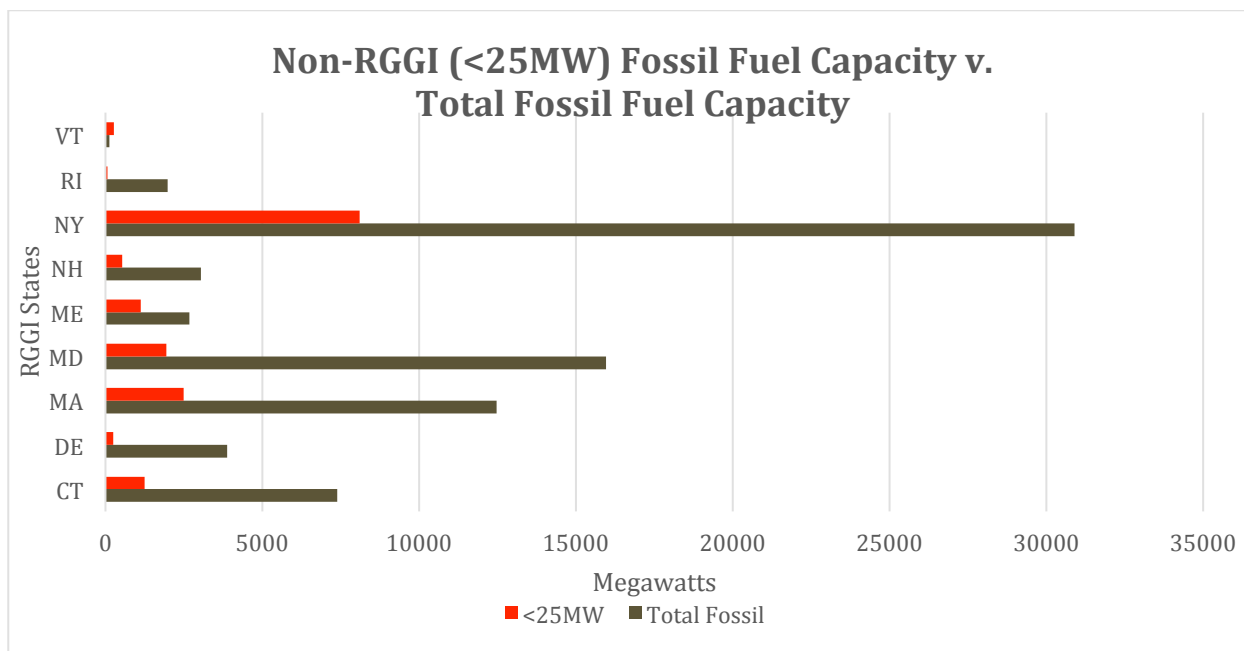


Figure 5: This chart shows the fossil-fuel capacity in each RGGI state that is comprised of the under-25MW generating units compared to the total fossil-fuel capacity of all generating units. *Source: EIA Form 860-Schedule 3 Generator Data 2016*

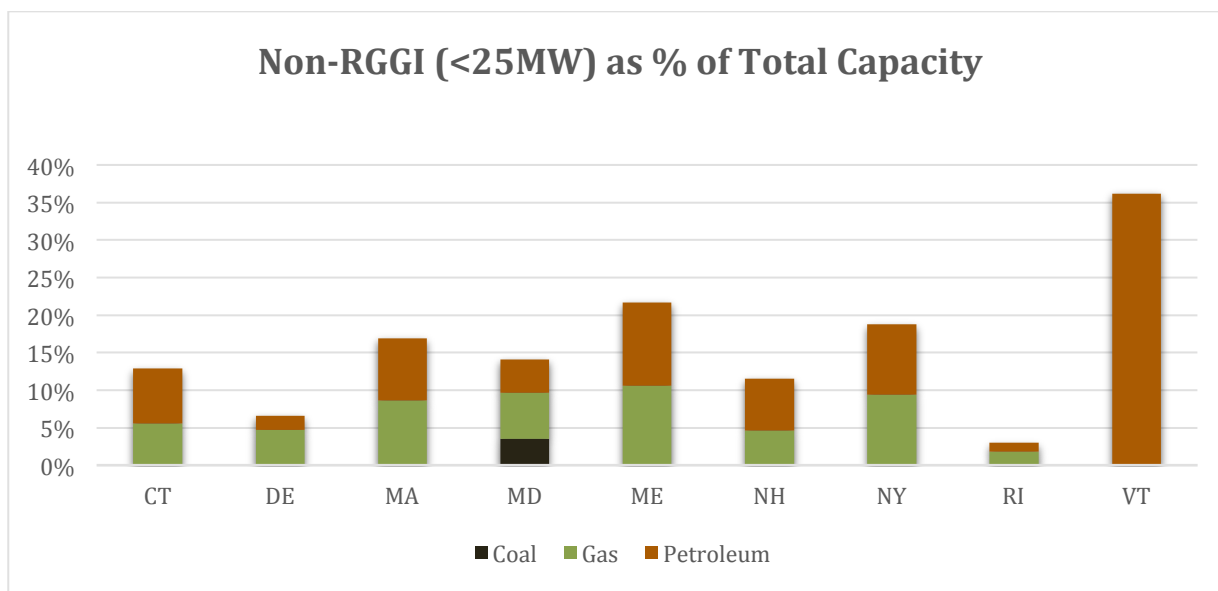


Figure 6: This chart shows the percentage breakdown (by fuel type) of the under-25MW generating units and what percentage share of the state's total capacity they comprise. *Source: EIA Form 860-Schedule 3 Generator Data 2016*

Nuclear power plants, and the potential retirements of those plants, are additional considerations in the leakage equation. Nuclear capacity installed in the RGGI region is

estimated to be over 11,000 MW.⁵⁶ There are plans to retire New York's Indian Point and Massachusetts' Pilgrim nuclear power stations.⁵⁷ These zero-emission power stations are expected to leave a gap of just over 2,700MW in capacity that will need to be sourced from other resources.⁵⁸ To put that in perspective, roughly 12% of the electricity generated in New York comes from Indian Point.⁵⁹ Ideally, system planners will ensure that there is adequate renewable energy capacity available to fill the gap in capacity resulting from these nuclear retirements. If not, the retirement of these plants may result in increased reliance on non-RGGI generators, and thus result in additional potential leakage.

IV. Improved Tracking of Imports and Associated Emissions

There is no centralized system dedicated to capturing, organizing, and reporting cross-border flows of electricity originating from fossil-fuel power plants not currently subject to RGGI regulation. While there has been significant cooperation between RGGI member states in this area, it is unreasonable to expect the same of neighboring states that share a regional transmission network (ISO) with the RGGI region. These neighboring states have no incentive to bear the administrative and programming costs of tracking emissions associated with electricity exports to RGGI states. However, a competitive data reporting mechanism—an Incentive-Driven Registry—could be designed that would create an incentive for fossil-fuel generators or related intermediary entities (such as retailers or marketers) to report cross-border deals for the procurement of electricity generated outside of the RGGI region to serve loads inside the RGGI region.

The Incentive-Driven Registry would be a digital registry that is open only to generators and intermediaries that operate in surrounding unregulated areas deemed to be within the

⁵⁶ Further analysis is required to assess how much of that capacity is operable after halting for maintenance, refueling, and failed safety checks.

⁵⁷ David Abel, *Costs Lead Officials to Pull Plug on Pilgrim*, Boston Global (October 13, 2015), available at <https://www.bostonglobe.com/metro/2015/10/13/entergy-close-pilgrim-nuclear-power-station-nuclear-power-plant-that-opened/fNeR4RT1BowMrFApb7DqQO/story.html>.

⁵⁸ See U.S. Energy Information Administration, *Nuclear and Uranium: Nuclear Reactor Capacity* (October 2016), available at <https://www.eia.gov/nuclear/reactors/reactorcapacity.html>; See also Geoffrey Haratyk, *Early Nuclear Retirements in Deregulated U.S. Markets: Causes, Implications, and Policy Options*, 110 Energy Policy 150, 151 (2017).

⁵⁹ U.S. Energy Information Administration, *Indian Point, Closest Nuclear Plant to New York City, Set to Retire by 2021* (2017), available at <https://www.eia.gov/todayinenergy/detail.php?id=29772>.

“leakage risk zone.” This zone would ideally be determined through a technical study that identifies the geographic point beyond which line-loss charges make importing of electricity into the RGGI region economically infeasible. The geographic area from which imports of electricity remain economically feasible would be deemed to be within the leakage risk zone. The registry would be open only to those generators, and intermediaries for generators, located in that zone.

The registry would be funded by RGGI proceeds. These proceeds would be used to pay for anonymized power plant data that identifies quantities generated (MWh), dealings with off-takers inside RGGI, and major operational changes such as installing additional turbines or re-powering with a different fuel type. Acquiring data that indicates the quantity generated by these unregulated plants, along with corresponding RGGI off-taker data, will enhance the methodology for tracking emissions associated with imports. Generators or intermediaries that contribute data could be provided assurance that the data will remain anonymized and would in turn be required to certify that the data provided is truthful and accurate. Data on operational changes is important because changes in fuel type and equipment used by generators impacts the emissions rate (CO₂/MWh) and thus the total emissions of the electricity generated and imported into the RGGI region.

Compensation to participants for providing the information in an organized format can be based either on a formula that provides a dollar value figure for batches (i.e. quantity, dates, time, etc.) or on a cents-per-point figure. Another potential method for incentivizing generators to provide the needed information is to provide them pre-auction allowances or price options. Since any individual, corporation, or generator can purchase allowances at auction, resale in the secondary market can be profitable.

Once the additional data on electricity imports and associated emissions is obtained, the RGGI states will need a tool to analyze the data to determine whether leakage is occurring and, if so, the extent and source of that leakage. Although many resources are available to track various aspects of electricity generation, there is very little available for tracking potential emissions leakage. The RGGI states must design a tool to use in accurately tracking leakage. A model upon which such a tool could be based is the Generation Attributes Tracking System (GATS) used in various ISOs. GATS is a trading platform that tracks power generation attributes and enables participants in various market classes (homeowners, businesses, electricity brokers, etc.) to trade renewable energy certificates. This system could be expanded or replicated to focus solely on

intermediary entities and generators who enter into contracts with each other to serve loads inside RGGI, and to supplement that information with the data provided by the Incentive-Driven Registry. This supplemental data is essential for accurate tracking of leakage—while the ISOs have data for the *quantity* of electricity placed on their lines, it might be difficult for ISOs to ascertain which megawatt hours (and associated emissions) can be attributed to RGGI. The proposed Incentive-Driven Registry provides the additional information necessary to cease using system averages of emissions and to rely on more granular emissions determinations in monitoring and analyzing leakage.

V. Leakage Mitigation Mechanisms in Other Jurisdictions

Because cap-and-trade programs almost universally come with a risk of emissions leakage, jurisdictions that implement these programs commonly adopt mechanisms to mitigate leakage. The most commonly used mechanisms are free allowance allocation and border carbon adjustments, both of which have had some level of success in mitigating leakage.

A. Free Allowance Allocation

To date, the most common approach for reducing leakage risk, and the primary approach used by the European Union Emissions Trading System (EU ETS), is the provision of free allowances.⁶⁰ Free allowances can be allocated to regulated entities through grandfathering, a periodic update approach, or a benchmark approach.

Under the grandfathering approach, the allowances are allocated based on a firm's historic emissions.⁶¹ This approach has the advantage of being relatively easy to administer, and can ease the process of introducing a cap-and-trade program. The approach provides regulated entities with an incentive to reduce emissions intensity—by abating its emissions, the entity decreases the number of allowances it is required to surrender; the entity can then sell surplus allowances and use the proceeds from the sale to pay for the costs incurred in taking abatement

⁶⁰ World Bank Group Report, *supra*, at 38. Free allocation is also used in all seven of China's ETS pilots. See Jeff Swartz, *China's National Emissions Trading System: Implications for Carbon Markets and Trade* (2016) at 14, available at http://www.ieta.org/resources/China/Chinas_National_ETIS_Implications_for_Carbon_Markets_and_Trade_ICTSD_March2016_Jeff_Swartz.pdf.

⁶¹ Martin et al., *On the Empirical Content of Carbon Leakage Criteria in the EU Emissions Trading Scheme*, 105 *Ecological Economics*, 78, 78 (2014); World Bank Group Report, *supra*, at 38.

measures.⁶² On the other hand, the grandfathering approach violates the polluter pays principle,⁶³ and creates a risk of windfall profits to entities provided free allowances. Further, the leakage protection provided by this approach is relatively weak and has the downside of perhaps providing an incentive to maintain, and not reduce, emissions intensity. The grandfathering approach has been a popular approach in the early phases of ETS programs, and was used during the initial phases of the European Union Emissions Trading System (EU ETS), Korea's ETS (for most of the sectors covered), and for some of the Chinese ETS pilots.⁶⁴ These ETS programs eventually transitioned from grandfathering to the update approach.

Under the update approach, the emissions allocated to an entity are initially set based on the entity's actual emissions, and each entity in the sector is allocated a portion of the total allowances based on their production output.⁶⁵ These allocations are then updated periodically to increase or decrease the allocations provided to each entity, with the updates most commonly based on the entity's actual output or emissions intensity.⁶⁶ The update approach is relatively easy to administer. However, by linking future allocations with current emissions intensity, the update approach provides a perverse incentive to firms to maintain their emissions intensity at higher levels, and reduces what would be an otherwise strong incentive to take action to reduce emissions intensity.⁶⁷ On the other hand, this approach provides greater protection against leakage than the grandfathering approach.⁶⁸ The update approach has been used in the first two phases of the EU ETS, in Korea, and in some of the Chinese ETS pilots.⁶⁹

Another approach for allocation of free allowances is benchmarking.⁷⁰ With benchmarking, allocation of allowances is based on a sector-level benchmark on emissions rather than on current or historic emissions intensity of each entity. The emissions allowances are then allocated to individual entities based on each entity's percentage of total historic emissions.⁷¹ The benchmark approach eliminates in large part the perverse incentive provided by

⁶² World Bank Group Report, *supra*, at 42.

⁶³ Martin et al., *supra*, at 78

⁶⁴ World Bank Group Report, *supra*, at 42; Martin et al., *supra*, at 78-79.

⁶⁵ World Bank Group Report, *supra*, at 38.

⁶⁶ *Id.*

⁶⁷ *Id.* at 43, 44.

⁶⁸ *Id.* at 44.

⁶⁹ *Id.* at 38, 43.

⁷⁰ *Id.* at 45.

⁷¹ *Id.* at 46.

grandfathering because the benchmark is set based on an industry-wide emissions level rather than an individual entity's emissions.⁷² A benchmark approach provides an incentive for emissions abatement by severing the link between the regulated entity's own emissions and the amount of its current and future allowance allocations.⁷³ On the other hand, administering a benchmark system can be complex, creates a risk of entities lobbying for higher benchmarks or allocation methods, can result in windfall profits, and provides relatively weak protection against leakage.⁷⁴ The EU ETS is employing the benchmark approach in its Phase 3.⁷⁵ Under the system used in the EU, sectors deemed to have the greatest leakage risk exposure receive higher shares of free allowances. Those sectors at the greatest risk of leakage can receive up to 100% of their allowances for free; for other sectors, the percentage of allowances received for free are gradually reduced during Phase 3, beginning with 80% free allowances in 2013 and declining to 30% in 2020.⁷⁶

While free allocation may be appropriate for the initial phases of an ETS, and appears to provide some leakage protection for ongoing systems, such as the EU ETS, the leakage protection is relatively weak and comes at the expense of reduced auction proceeds and the continued subsidization of pollution by entities at the expense of the public.⁷⁷ If free allocation is chosen, benchmarking rather than grandfathering should be used—benchmarking severs the link

⁷² *Id.* at 46.

⁷³ *Id.* at 48. A similar approach of benchmarking uses a predetermined benchmark of overall sector emissions intensity, but then changes the individual firm allowance based on individual firm emissions intensity – if emissions intensity increases, so does the level of allowance allocation and vice versa. *Id.* at 49. Variants of this approach are used in California, New Zealand, and for some sectors in Korea, as well as a Chinese ETS. Although this approach can provide stronger leakage protection and preserves incentives to reduce emissions intensity, the approach can also decrease the certainty of actual emission reduction, is complex to administer, and carries high administrative costs. *Id.* at 50.

⁷⁴ *Id.* at 48. A similar approach of benchmarking uses a predetermined benchmark of overall sector emissions intensity, but then changes the individual firm allowance based on individual firm emissions intensity—if emissions intensity increases, so does the level of allowance allocation and vice versa. *Id.* at 49. Variants of this approach are used in California, New Zealand, and for some sectors in Korea, as well as a Chinese ETS. Although this approach can provide stronger leakage protection and preserves incentives to reduce emissions intensity, the approach can also decrease the certainty of actual emission reduction, is complex to administer, and carries high administrative costs. *Id.* at 50.

⁷⁵ *Id.* at 46.

⁷⁶ See https://ec.europa.eu/clima/policies/ets/allowances/leakage_en.

⁷⁷ Martin et al., *supra*, at 79-81.

between the firm's own historical emissions and its free allowance allocation, providing an increased incentive to reduce emissions intensity.⁷⁸

B. Border Carbon Adjustments

A border carbon adjustment (BCA) involves imposing a carbon regulation on imports (or providing a rebate to exporters).⁷⁹ A BCA effectively extends the effects of carbon regulation to entities outside of the regulated region by imposing the impact of the regulation on imported electricity in the same manner as the regulation applies to electricity generated within the regulated region. Imposing the cost of compliance on all electricity distributed to end users located in the regulated region without regard to location of generation levels the playing field so that firms with lower emissions intensity can outcompete firms with higher emissions intensity, and provides an incentive for all firms selling electricity into the region to reduce emissions intensity.⁸⁰ Using a BCA approach thus has the effect of imposing the constraints of carbon regulation outside the borders of the regulated jurisdiction, helping to eliminate competitive disadvantage of in-state regulated generators, and may also encourage the expansion of carbon emission regulation to additional jurisdictions.⁸¹

BCA often is discussed as a means of mitigating leakage, and modeling of the BCA approach indicates that it is an effective leakage reduction mechanism.⁸² However, this

⁷⁸ Some of the RGGI states already provide a limited number of free allowances through clean energy set-aside accounts. For example, Connecticut has a Combined Heat and Power Useful Thermal Energy Set-Aside Account; and Maryland has a Clean Generation Set-Aside Account. *See* http://www.rggi.org/docs/CO2AuctionsTrackingOffsets/Allocation/States_Set-Aside_Accounts.pdf. A recent report by the Regional Economic Studies Institute discusses Maryland's use of its Clean Generation Set-Aside (CGSA) to provide free allowances to in-state natural gas combined cycle generators, and suggests that leakage risk can be reduced by eliminating the CGSA set-aside and instead creating a new set-aside through which free or reduced cost allowances are provided to all of Maryland's in-state natural gas generators. *See* Regional Economic Studies Institute, *Modeling of CO₂ Emissions and Leakage Under Various CO₂ Allocation Schemes* (August 30, 2017), at 1, 6, 24. The allocation of free allowances as a leakage mitigation measure is not recommended because it reduces auction proceeds and results in the continued subsidization of generator pollution. Preferred alternative leakage mitigation measures are discussed *infra*, at Section VI.

⁷⁹ World Bank Group Report, *supra*, at 54. Alternatively a rebate could be provided to exporters. *See id.*
⁸⁰ *Id.* at 42, 54.

⁸¹ *Id.* at 54; Samuel Newell et al., *Pricing Carbon into NYISO's Wholesale Energy Market to Support New York's Decarbonization Goals* (August 10, 2017), at 23, available at http://www.nyiso.com/public/webdocs/markets_operations/documents/Studies_and_Reports/Studies/Market_Studies/2017-09-06_Brattle_Study_Overview.pdf.

⁸² *See* World Bank Group Report, *supra*, at 55 and citations therein. The modeling indicates that use of a BCA mechanism may reduce leakage by an average of 6%-12%.

mechanism has been implemented only by California and Québec, perhaps because of administrative difficulties in determining the carbon emissions to assign to imports. For example, the program operator must decide whether to assign emissions based on an individual generation unit, based on the emissions of all generation units owned by the exporting entity, based on the emissions of all generation units in the state (or province) from which the electricity is being exported, or based on the emissions of all electricity transmitted by the Independent System Operator (ISO) through which the electricity is imported into the regulated region.⁸³ As discussed below in relation to RGGI, it is essential that the BCA be structured so that imports are not treated unfairly—fair treatment of imports is necessary to avoid a potential improper interference with interstate commerce.

California uses a form of CBA to mitigate leakage related to its cap-and-trade program. California imposes carbon emission liability on all electricity delivered in the state, regardless of whether it is generated within the state or imported. California imposes the obligation to comply on a “First Deliverer of Electricity,” defined as “an owner or operator of an electricity generating facility in California or an electricity importer.”⁸⁴ Under this system, the emissions associated with imported electricity are calculated based on the sum of both unspecified sources and specified sources of electricity.⁸⁵ A source is designated as “specified” only if it is from a generator for which electricity confidently can be tracked such as, for example, because it is under a long-term contract for delivery of electricity to California.⁸⁶ Adjustments to an importer’s compliance obligation are then made for verified eligible renewable sources, and for imported electricity that is either (1) from regions with a linked cap-and-trade program, or (2) both imported and exported within the same hour.⁸⁷ Tracing emissions from imports back to individual generation units, and imposing a charge on those emissions, provides an incentive to out-of-state generators who seek to export electricity to California to abate their emissions. However, it also provides an incentive to those out-of-state generators to either under-report emissions or divert relatively dirtier power generation to other markets and provide relatively

⁸³ *See id.* at 55.

⁸⁴ 17 CCR §§ 95802(147), 95811(a), (b).

⁸⁵ 17 CR § 95852(b)(1)(B); Justin Caron et al., *Leakage from Sub-National Climate Policy: The Case of California’s Cap-and-Trade Program*, *The Energy Journal* (April 2015), at *6.

⁸⁶ 17 CCR § 95802(354); Newell et al., *supra*, at 14; Caron et al., *supra*, at *6.

⁸⁷ 17 CCR § 95852(b)(3)-(5); Caron et al., *supra*, at *5-6.

cleaner power generation to California.⁸⁸ The shifting of resources is known as “resource shuffling” and is prohibited under California’s regulation.⁸⁹ This prohibition seeks to prevent a reduction in emissions compliance obligation for imports unless there is a corresponding reduction in net carbon emissions.⁹⁰

VI. Recommendations for Mitigating Leakage in RGGI

The RGGI states recognized from the beginning that implementation of the cap-and-trade program created a significant risk of leakage. The results of the most recent Monitoring Report indicate that minimal leakage may be occurring and that the risk of leakage may be significantly understated, as discussed in more detail *supra*, in Section III. To ensure the integrity of the RGGI program, and ensure that RGGI is resulting in overall emissions reductions, the RGGI states must take policy action to mitigate any leakage that is occurring, and to reduce the risk of leakage in the future. This policy should seek to deter leakage without undermining the benefits of the cap-and-trade program and the incentive that the program creates for emissions abatement.⁹¹ The policy should also seek to employ leakage mechanisms that are stringent enough to be effective while remaining politically acceptable.⁹² The policy should encourage the RGGI states to expand complementary measures that reduce overall demand for electricity and drive development of renewable energy generation in the region. The policy should also seek to reduce any competitive disadvantages that the RGGI program may have created.⁹³

A. RGGI Leakage Mitigation Efforts to Date

To date, the RGGI states’ leakage mitigation efforts have been limited to monitoring imports and deploying complementary policy measures, such as energy efficiency programs, and

⁸⁸ Newell et al., *supra*, at 13.

⁸⁹ 17 CCR § 95852(b)(2). “Resource shuffling,” is defined as “any plan, scheme, or artifice undertaken by a First Deliverer of Electricity to substitute electricity deliveries from sources with relatively lower emissions for electricity deliveries from sources with relatively higher emissions to reduce its emissions compliance obligation.” 17 CCR § 95802(336).

⁹⁰ Ontario takes a similar approach to addressing leakage by imposing compliance requirements on electricity importers. Ontario imposes an assumed default marginal CO₂ emissions rate on imports, with the default rate based on the region from which the import originated. Importers are then required to acquire and surrender allowances sufficient to cover those assumed emissions. Newell et al., *supra*, at 24.

⁹¹ World Bank Group Report, *supra*, at 3.

⁹² *Id.* at 3-4.

⁹³ *Id.* at 43.

renewable energy portfolio standards (RPS) or clean energy standards (CES). These complementary policy measures have been broadly adopted, and are an accepted and valuable component of an emissions reduction program.

Looking first to energy efficiency, the RGGI states have reinvested a significant portion of RGGI allowance proceeds into energy efficiency, with 58% of collective reinvestment dedicated to energy efficiency since the RGGI program was launched.⁹⁴ These reinvestment efforts have had a significant impact. Seven of the RGGI states fall within the top eleven best-performing states in the nation in the area of energy efficiency.⁹⁵ Taken together, the RGGI states have achieved 20.6 million MWh in energy savings and \$4.6 billion in energy bill savings over the lifetime of the efficiency improvements.⁹⁶ Further, electric demand in the RGGI states has fallen, with a 4.2% decrease in average annual electricity demand in 2012-2014 based on a baseline period of 2006-2008.⁹⁷

Energy efficiency remains an essential complementary measure for reducing emissions as well as a tool for mitigating leakage, and the RGGI states should continue to build on their successes in this area. The RGGI states should adopt an explicit focus on energy savings in both low-income households and in affordable multifamily housing, and should develop a common goal to allocate a percentage of auction proceeds to energy efficiency and load reduction programs in these sectors. Both low-income households and affordable multifamily housing represent significant untapped potential for achieving incremental efficiency gains, and have

⁹⁴ Regional Greenhouse Gas Initiative, *The Investment of RGGI Proceeds Through 2014* (2016) (RGGI Proceeds Report), available at https://www.rggi.org/docs/ProceedsReport/RGGI_Proceeds_Report_2014.pdf.

⁹⁵ ACEEE 2016 Energy Efficiency Scorecard, Table 2 at p. 8, available at <http://aceee.org/sites/default/files/publications/researchreports/u1606.pdf>. The top 11 states, in order, are: California and Massachusetts (tied for 1st place), Vermont, Rhode Island, Connecticut and New York (tied for 5th place), Oregon, Washington, Maryland, Minnesota, and Maine. Of the remaining RGGI states, New Hampshire ranked 21 and Delaware ranked 22. *Id.*

⁹⁶ See RGGI Proceeds Report, *supra*, at 2. New York and New Hampshire are exceptions to the sound practice of channeling all RGGI proceeds into reinvestment. These states have channeled a portion of RGGI proceeds into their respective general funds. In 2009, New York transferred \$90 million of its RGGI proceeds into its general fund; in 2010, New Hampshire transferred \$3.1 million of its RGGI proceeds into its general fund. See *id.* at 30, 33. This channeling of RGGI proceeds into a state's general fund reduces investment into the energy efficiency programs that have reduced electricity demand and helped to mitigate leakage.

⁹⁷ RGGI Monitoring Report, *supra*, at 3.

largely been underserved due, in part, to financing barriers.⁹⁸ State energy agencies and individual utilities should develop ramped-up programs, using RGGI funds, to provide access to up-front energy efficiency and weatherization financing, as well as other funding support mechanisms.

The RGGI states should also set common goals relating to deploying Combined Heat and Power (CHP) in affordable multifamily housing. High-efficiency CHP with strict emissions standards can provide significant energy savings and serve as a resiliency tool in the event of electrical outages, during which low-income communities are often the hardest hit.⁹⁹ CHP deployment includes a number of related considerations, such as the role of natural gas in fueling CHP installations. The RGGI states should avoid expanding natural gas infrastructure for the sake of deploying CHP, and should target CHP deployment only in areas where gas lines are already in place.

The RGGI states also have implemented RPS or CES programs.¹⁰⁰ An aggressive RPS/CES program can act to reduce leakage by increasing the availability of renewable energy generation in the electricity supply, and by setting a minimum percentage of the state's energy supply that must come from renewable or clean sources.¹⁰¹ It is important to keep in mind, however, that RPS/CES programs are designed to promote renewable energy development and

⁹⁸ See Energy Programs Consortium, *Multifamily Energy Efficiency: Reported Barriers and Emerging Practices* (November 2013), at 13-14, available at http://aceee.org/files/pdf/resource/epc_%20multifamily_housing_13.pdf; Kate Johnson & Eric Mackres, *Scaling up Multifamily Energy Efficiency Programs: A Metropolitan Area Assessment*, at iii, 13, available at <http://aceee.org/sites/default/files/publications/researchreports/e135.pdf>; Ariel Dreobl & Lauren Ross, *Lifting the High Energy Burden in America's Largest Cities: How Energy Efficiency Can Improve Low Income and Underserved Communities* (April 2016), at 6 available at http://energyefficiencyforall.org/sites/default/files/Lifting%20the%20High%20Energy%20Burden_0.pdf.

⁹⁹ See Environmental Protection Agency & State and Local Climate and Energy Program, *Energy Efficiency and Renewable Energy in Low-Income Communities: A Guide to EPA Programs* (2015), available at https://www.epa.gov/sites/production/files/2016-03/documents/epa_low_income_program_guide_508_2-29-16.pdf; Robert Walton, *New DOE Accelerators Target CHP, Low-Income Clean Energy* (May 17, 2016), available at <http://www.utilitydive.com/news/new-doe-accelerators-target-chp-low-income-clean-energy/419328/>.

¹⁰⁰ See Center for Climate and Energy Solutions, *Renewable and Alternate Energy Portfolio Standards*, available at <https://www.c2es.org/us-states-regions/policy-maps/renewable-energy-standards>; Center for the New Energy Economy, *State Renewable Portfolio Standards Hold Steady or Expand in 2013 Session*, available at <http://www.aeltracker.org/graphics/uploads/2013-State-By-State-RPS-Analysis.pdf>.

¹⁰¹ Neal Cabral, *The Role of Renewable Portfolio Standards in the Context of a National Carbon Cap-and-Trade Program*, 8 Sustainable Development Law & Policy 13, 13 (2007), available at <http://digitalcommons.wcl.american.edu/cgi/viewcontent.cgi?article=1147&context=sdlp>.

increase diversity in the electric supply.¹⁰² These programs are not direct emission reduction programs, and although a high RPS/CES requirement can lead to short term emissions reductions, these programs do not provide a carbon-price signal and thus do not drive long-term emissions reductions unless specifically structured to do so.¹⁰³ When RPS/CES programs are implemented along with a cap-and-trade program, and aggressive energy efficiency measures, the combination can result in significant emissions reductions and significant increases in renewable energy generation resources beyond that required by the RPS/CES program.¹⁰⁴

The complementary measures used by RGGI states to address leakage have been successful in reducing electric demand in the RGGI region and increasing the availability of renewable energy resources.¹⁰⁵ These measures also have likely played a role in reducing leakage risk. As the RGGI cap continues to decline, and the RGGI program strengthens, the risk of leakage will increase and these complementary measures are not likely to be sufficiently robust, standing alone, to mitigate leakage.¹⁰⁶ The RGGI states should continue to support, promote, and expand these important complementary measures, but the states must go beyond these measures in designing an effective leakage mitigation policy moving forward.

B. Expanding Voluntary Renewable Energy Set-Aside Programs

The RGGI states should strengthen and expand their voluntary renewable energy set-aside programs. These set-aside programs provide an additional complementary tool for increasing renewable energy generation in the RGGI region and decreasing the demand for fossil-fuel generation.

The RGGI program allows, but does not require, participating states to implement an allowance set-aside for voluntary renewable energy purchases in the region.¹⁰⁷ All of the RGGI

¹⁰² *Id.* at 13.

¹⁰³ Bird et al., *Evaluating Renewable Portfolio Standards and Carbon Cap Scenarios in the U.S. Electric Sector*, National Renewable Energy Laboratory (2010), at 25-26, available at <https://www.nrel.gov/docs/fy10osti/48258.pdf>. For example, modeling indicates that a 25% RPS, when combined with energy efficiency measures, could have the same impact in emissions reduction as a cap-and-trade program over the short term of approximately 10 years. Over the long term, however, an RPS/CES does not influence investment decisions. *Id.*

¹⁰⁴ *Id.* at 26.

¹⁰⁵ *See id.* at 25-26; Cabral, *supra*, at 13.

¹⁰⁶ *See* World Bank Group Report, *supra*, at 61-62; Cowart, *supra*, at 3.

¹⁰⁷ *See* RGGI Model Rule, subpart XX-5.3(j) (revised December 23, 2013), available at http://www.rggi.org/docs/ProgramReview/FinalProgramReviewMaterials/Model_Rule_FINAL.pdf.

states, except for Delaware, have chosen to exercise this option by implementing a voluntary renewable energy set-aside program.¹⁰⁸ States that have implemented a set-aside program allocate to a voluntary renewable energy set-aside account a pre-determined number of allowances from the state's allowance budget.¹⁰⁹ Voluntary purchasers of renewable electricity can submit an application to their state's regulating agency (again, except for Delaware) documenting purchases of renewable energy, and request that allowances be retired to account for the voluntary purchases.¹¹⁰ To qualify for a set-aside program, the renewable energy must be generated in one of the RGGI states, the purchaser must be located in a RGGI state with a voluntary renewable energy set-aside (i.e., any RGGI state except Delaware), and neither the generator nor the purchaser can use the renewable energy to meet another regulatory mandate, such as an RPS or CES.¹¹¹

The voluntary renewable energy set-aside programs are an important component of RGGI and the voluntary renewable energy market. Voluntary purchasers of renewable energy are generally motivated by a desire to reduce carbon emissions beyond that required by regulations, creating what is known as regulatory surplus. The set-aside programs provide an opportunity for voluntary purchasers in the RGGI region to realize this goal by retiring allowances to account for their voluntary renewable purchases, and thereby ensuring regulatory additionality for the renewable energy generation.

By ensuring that voluntary purchasers of renewable energy have the opportunity to realize their goal of creating regulatory surplus, the set-aside programs encourage the demand for, and drive the development of, additional in-region renewable energy generation. As in-region renewable energy generation and in-region voluntary purchases of renewable generation increase, the in-region demand for fossil-fuel generation should decrease. Decreased in-region demand for fossil-fuel generation should, in turn, reduce the amount of electricity produced by

¹⁰⁸ See Regs. Conn. State Agencies section 22a-174-31(a)(89), (f)(4)(A)(i), (f)(7)(A); 06-096 Code of Maine Rules, Chapter 156 (B)(140), (F); Code of Maryland Regulations 26.09.02.08; 310 Code of Massachusetts Regulation 7.70(5)(c)(1)(b); 6 Compilation of Codes, Rules and Regulations of New York 242-5.3(c); New Hampshire Code Admin. Rules Env-A 4606.10(b), 4606.11(b); Rhode Island Admin. Code 25-4-46:46.4(h)(1), (2); Vermont Public Service Board, *RGGI Auction Procedures and Voluntary Renewable Energy Set-Aside Program* (April 2, 2014), available at http://puc.vermont.gov/sites/psbnew/files/doc_library/rggi-order-2014.pdf.

¹⁰⁹ *Ibid.*

¹¹⁰ *Ibid.*; See RGGI Model Rule XX-1.2(by), XX-5.3(j).

¹¹¹ See *ibid.*

in-region fossil-fuel generators and reduce emissions from these generators, thereby reducing the number of allowances these generators need to comply with RGGI. The resulting decrease in the cost of compliance should reduce the wholesale cost of in-region generated electricity and thus reduce the risk of emissions leakage.¹¹²

The RGGI states should strengthen and expand their voluntary renewable energy set-aside programs. The RGGI states should strengthen the programs by increasing awareness of the opportunities the programs provide in creating regulatory surplus, and streamlining the mechanisms for retiring allowances through voluntary purchases of renewable energy.¹¹³ The RGGI states should expand the set-aside programs to cover renewable energy generated in the RGGI-region but sold outside the region.¹¹⁴ These and other changes to the set-aside programs¹¹⁵ have the potential of reducing the risk of emissions leakage by driving additional in-region renewable energy development, reducing fossil-fuel energy demand, and reducing compliance costs for RGGI-generators.

C. Expanding RGGI to Cover Smaller Generation Units

The RGGI states should expand RGGI to include new or existing power plants under 25MW in capacity. Expanding to these smaller generation units could have a significant impact on both reducing emissions and addressing general health and environmental justice concerns. These non-RGGI generators represent a significant portion of in-region generation. In 2014, of the approximately 300 million MWh of electricity generated in the RGGI region, non-RGGI generators produced about 164 million MWh, while RGGI generators produced only 136 million MWh.¹¹⁶ This means that 54.6% of in-region generation is attributable to generators currently excluded from RGGI. Although generation from these in-region non-RGGI units is

¹¹² Although the reduction in allowances available to fossil-fuel generators resulting from the voluntary renewable energy set-asides has the potential of increasing allowance prices, the reduction in fossil-fuel energy demand and resulting decrease in the number of allowances required for compliance by these generators should more than offset any impact of higher allowance prices.

¹¹³ See Center for Resource Solutions and Pace Energy and Climate Center, *Voluntary Renewable Energy and the Regional Greenhouse Gas Initiative (RGGI): Solutions for Positive Interactions and Greater Impact* (September 5, 2017), for additional suggested methods for expanding the set-aside program, available at <https://resource-solutions.org/wp-content/uploads/2017/10/PACE-II.pdf>.

¹¹⁴ *Id.*

¹¹⁵ See, generally, *id.*

¹¹⁶ See RGGI Monitoring Report, *supra*, at Appendix C, p. 45, Table 8, available at https://www.rggi.org/docs/Documents/Elec_Monitoring_Report_2014.pdf.

comparatively cleaner than generation from RGGI units,¹¹⁷ generation and emissions from these non-RGGI units have been increasing, indicating that within-region leakage is occurring.¹¹⁸ By 2014, the amount of electricity produced by the non-RGGI in-region generators had increased by about 11 million MWh over the 2006-2008 average baseline of 153 million MWh.¹¹⁹ This represents a 6.6% increase in reliance on these non-RGGI in-region generators, and an associated 3.3% increase in emissions.¹²⁰ Further, there are facilities that operate multiple generation units that fall under the 25MW exclusion. The use of these excluded smaller generation units is likely to continue to increase as emission allowance prices rise over time, representing a source of potential increased leakage.

Non-RGGI in-region generators also create significant environmental justice and health impacts. These smaller plants tend to be located in or near poor communities and communities of color.¹²¹ Further, as is the case in Sunset Park, Brooklyn, New York, facilities can have multiple generating units that individually fall under 25MW, but when combined have a capacity of several hundred MWs. These generators, which have no RGGI incentive to reduce emissions, produce not only carbon emissions, but also co-pollutants such as nitrogen oxides, sulfur dioxide, and particulates, which negatively impact the health of the low-income communities and communities of color located in close proximity to the generators.¹²² The negative health impacts include increased rates of asthma, pneumonia, bronchitis, lower and upper respiratory illnesses, cardiovascular disease, cancer, and premature deaths.¹²³ Expanding RGGI to cover the under-

¹¹⁷ In 2014, non-RGGI in region generators had an emissions rate of 236 lbs CO₂/MWh compared with RGGI generators, which had an emissions rate of 1,302. *See id.*

¹¹⁸ As discussed *supra*, in Section III, weaknesses in the methodology used in the RGGI Monitoring Report may be downplaying the existence and extent of leakage.

¹¹⁹ *Id.*

¹²⁰ *Id.* It is worth noting that the emissions rate from these non-RGGI in region generators has slightly declined. *Id.*

¹²¹ Brett Israel, *Coal Plants Smother Communities of Color*, Scientific American (November 16, 2012), available at <https://www.scientificamerican.com/article/coal-plants-smother-communities-of-color/#>; Joseph Lam, *Coupling Environmental Justice with Carbon Trading* (2012), 12 Sustainable Dev. L. & Pol'y 40, 43.

¹²² Union of Concerned Scientists, *Environmental Impacts of Natural Gas* (n.d.), available at <http://www.ucsusa.org/clean-energy/coal-and-other-fossil-fuels/environmental-impacts-of-natural-gas#.WdGundOGNE4>.

¹²³ Luis Cifuentes, et al., *Hidden Health Benefits of Greenhouse Gas Mitigation*, 293 Science 1257 (2001); Mark Fischetti, *The Human Cost of Energy: Fossil fuels exact the biggest toll in terms of lives lost*, Scientific American (2011), available at <https://www.scientificamerican.com/article/the>

25MW generators will act to reduce within-region leakage, incentivize these smaller generators to reduce emissions, and potentially reduce the negative health impacts of electricity generation on overburdened and disadvantaged communities.

D. Border Carbon Adjustment—Subjecting Imports to the Effects of the Cap

The RGGI states should also consider implementing a border carbon adjustment (BCA). Of the leakage mitigation mechanisms used by carbon cap-and-trade programs in other regions, a BCA approach appears to be most effective in terms of both incentivizing abatement and preventing leakage.¹²⁴

The recommended BCA would impose the effects of the emissions cap on all fossil-fuel generated electricity serving demand in the RGGI region. This puts imports on a level playing field with in-region generation. Load serving entities (LSE) that import electricity should be required to obtain and surrender allowances to cover the emissions associated with the imports.¹²⁵

In designing and implementing the BCA, LSEs in the RGGI region should be required to ensure that allowances have been surrendered for the emissions associated with their entire power supply. Generators can be required to certify to the LSE that in-region generation is in compliance with the allowance requirement. For imports, the certification of compliance can be through the generator, the marketer, or through the LSE itself.¹²⁶

If properly designed, this extension of the cap to cover imports helps to eliminate any competitive disadvantage created by the RGGI cap-and-trade program, significantly reduces the risk of emissions leakage, and maintains the incentive for generators to reduce emissions. Extending the cap to cover imports may even open the door to eventual expansion of RGGI membership to additional states, or the implementation of cap-and-trade programs in other

[-human-cost-of-energy/](#); Michelle Manion, et al., *Analysis of the Public Health Impacts of the Regional Greenhouse Gas Initiative*, Abt Associates (2017), at 8-10, 38, available at <http://abtassociates.com/AbtAssociates/files/7e/7e38e795-aba2-4756-ab72-ba7ae7f53f16.pdf>.

¹²⁴ See Ian Sue Wing & Marek Kolodziej, *The Regional Greenhouse Gas Initiative: Emission Leakage and the Effectiveness of Interstate Border Adjustments*, Regulatory Policy Program, Harvard University John F. Kennedy School of Government (2008), at 24-25 (noting that border adjustment measures used in conjunction with a cap-and-trade program can be effective at neutralizing leakage and listing studies), available at <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.227.484&rep=rep1&type=pdf>.

¹²⁵ Cowart, *supra*, at 3-4.

¹²⁶ *Id.* at 5.

jurisdictions. The cap extension must, however, be properly designed to avoid improper interference with interstate commerce. Specifically, the RGGI states will need to ensure that all electricity delivered to the RGGI region's LSEs is treated in the same way, whether that electricity is generated within the RGGI region or is imported from outside the region.

Under the Commerce Clause of the U.S. Constitution, states are effectively prohibited from improperly interfering with interstate commerce, from seeking to place themselves at a competitive advantage, or from economically isolating themselves.¹²⁷ A state does, however, retain broad authority to protect its citizens and its natural resources as long as the state “does not needlessly obstruct interstate trade or attempt to ‘place itself in a position of economic isolation.’”¹²⁸ As long as the state regulation seeks to further a legitimate interest, and does not unreasonably discriminate against out-of-state interests, the regulation should withstand challenge under the Commerce Clause.¹²⁹

Applying the RGGI cap to imported electricity is reasonably necessary and will help to reduce carbon emissions, which in turn provides environmental, health, and climate benefits. Applying the cap to imported electricity also does not unreasonably discriminate against imported electricity. To the contrary, the current system, which does not include imports of electricity, actually discriminates in favor of imported electricity and against in-region generators of electricity.¹³⁰ Treating emissions from imports on the same basis as emissions from RGGI-generators evens this currently uneven playing field, and has a non-discriminatory intent and effect, and thus would not violate the Commerce Clause.¹³¹

Extending the RGGI program to cover imports will require the RGGI states to develop a mechanism for assigning emission levels to imports. As noted *supra*, in Section III, data that allows accurate determination of both the amount of imports and the emissions associated with imports is lacking, and the approach used by the RGGI states for monitoring imports and emissions attributed to those imports is not sufficiently robust. This is particularly true for

¹²⁷ See *Maine v. Taylor*, 477 U.S. 131, 151 (1986).

¹²⁸ *Id.* at 151.

¹²⁹ See *id.*; see also *United Haulers Ass'n, Inc. v. Oneida-Herkimer Solid Waste Mgmt. Auth.*, 550 U.S. 330, 345 (2007) (“We hold that the Counties’ flow control ordinances, which treat in-state private business interests exactly the same as out-of-state ones, do not ‘discriminate against interstate commerce’ for purposes of the dormant Commerce Clause”).

¹³⁰ See Cowart, *supra*, at 7.

¹³¹ See *United Haulers Ass'n*, 550 U.S. at 345; *Taylor*, 477 U.S. at 151; see also Cowart, *supra*, at 7.

imports from the PJM.¹³² If imports are not to be a vehicle for leakage, the RGGI states must design an approach that is sufficiently robust to provide reliable emissions data and an incentive for generators to reduce the emissions associated with the electricity it exports to the RGGI states, while avoiding resource shuffling.

One potential approach is to attribute emissions based on the marginal emissions rate (MER) at appropriate nodes where power enters the region.¹³³ This approach would be relatively simple to implement, and would likely reduce the risk of leakage. However, this approach would not provide an incentive to generators to reduce the emissions intensity of their electricity because it would treat high emission imports and low emissions imports the same.¹³⁴ Further, this approach would be relatively easy for NYISO markets and perhaps for the ISO-NE markets, but would be difficult for PJM because the needed information is not currently available.¹³⁵ To obtain the necessary data, an incentive-based approach, such as the Incentive-Driven Registry discussed *supra*, in Section IV, could be used to provide more specific data on the imports.

Another potential approach is to attribute emissions to imports based on the emissions of specific generation resources. This would provide an incentive to generators to decrease emissions, but creates a problem of determining the resource from which the imported electricity came.¹³⁶ If the import is from a new resource, the existence of which depends on a contract with in-region purchasers, tracing the import to the resource is relatively easy.¹³⁷ Attributing emissions to specific existing generation resources is not as easy, and could create a risk of

¹³² PJM has recently proposed a carbon-pricing framework that would be applied to carbon-emitting suppliers of electricity at the wholesale level, with the price reflected in wholesale market prices. See PJM, *Advancing Zero Emissions Objectives through PJM's Energy Markets: A Review of Carbon-Pricing Frameworks*, (August 23, 2017), at 1, available at <http://pjm.com/~media/library/reports-notices/special-reports/20170502-advancing-zero-emission-objectives-through-pjms-energy-markets.ash>. NYISO has also recently proposed a carbon-adder, which would similarly impose a price on carbon that would be reflected in the wholesale market price. See Samuel Newell, et al., *Pricing Carbon into NYISO's Wholesale Energy Market to Support New York's Decarbonization Goals* (August 10, 2017), available at http://www.nyiso.com/public/webdocs/markets_operations/documents/Studies_and_Reports/Studies/Market_Studies/Pricing_Carbon_into_NYISOs_Wholesale_Energy_Market.pdf. Discussion of the pros and cons of carbon pricing at the ISO level is beyond the scope of this paper. However, if an ISO that serves the RGGI region implements a carbon-pricing mechanism, a border carbon adjustment should be designed to take that mechanism into account.

¹³³ Newell et al., *supra*, at 24.

¹³⁴ *Id.*

¹³⁵ *Id.*

¹³⁶ *Id.*

¹³⁷ *Id.*

resource shuffling. That is, a generator would have an incentive to allocate its comparatively lower emissions generation to the RGGI region, and its relatively higher emissions generation to a jurisdiction that does not have carbon regulation. The result of such allocation is a “greenwashing” of power sales to the RGGI region.¹³⁸ To avoid this resource shuffling, the imports from existing resources could be deemed to have the characteristics of the *average* of all power generated in the exporting area.¹³⁹ Missing but needed data for this approach could be obtained through an Incentive-Driven Registry. This approach would be relatively easy to administer but would decrease the incentive for generators with comparatively high emission rates to reduce emissions.

Properly designed, an extension of the RGGI cap to cover imported electricity would significantly reduce the risk of emissions leakage, reduce or eliminate the competitive disadvantage of RGGI generators, and drive further emissions reductions.

E. Expanding RGGI Through Linking

Expanding RGGI to additional states, or linking RGGI with other cap-and-trade programs, can also help to mitigate leakage. Linking occurs when a cap-and-trade program in one jurisdiction or region allows the entities it regulates to use allowances issued by a cap-and-trade program in another jurisdiction or region to meet compliance obligations. As noted previously, RGGI consists of both individual state cap-and-trade programs, and the linking of those individual programs. RGGI already links nine individual programs and may link additional state programs in the near future. Although linking appears to be more beneficial if the linking jurisdictions are in close geographic proximity,¹⁴⁰ linking can also be beneficial between jurisdictions located in different geographic regions, as demonstrated by the California-Québec linking in the Western Climate Initiative,¹⁴¹ which will soon expand to include Ontario.¹⁴²

¹³⁸ Cowart, *supra*, at 6.

¹³⁹ *Id.*

¹⁴⁰ See Matthew Ranson & Robert Stavins, *Linkage of Greenhouse Gas Emissions Trading Systems: Learning from Experience*, Harvard Project on Climate Agreements, Harvard Kennedy School (2014), at 7-8, available at http://www.belfercenter.org/sites/default/files/files/publication/es-02_ranson-stavins7.pdf at 7-8.

¹⁴¹ See Environmental Defense Fund, *6 Successes from California and Québec's Third Year of Cap and Trade*, available at <http://blogs.edf.org/climatetalks/2016/02/19/6-successes-from-california-and-Quebecs-third-year-of-cap-and-trade/>.

Linking can provide numerous benefits. First and foremost, linking additional jurisdictions can reduce emissions leakage risks and concerns of competitive disadvantage. Linking can also provide increased access to a variety of abatement options and the ability to achieve emissions reductions at a lower cost.¹⁴³ Linking can increase liquidity through creation of a larger carbon market; enhance cooperation and influence between jurisdictions or regions; and improve predictability and reduce volatility in allowance prices.¹⁴⁴ Linking may also reduce administrative and transactional costs by providing for shared procedures, costs and perhaps even infrastructure.¹⁴⁵ For example, California and Québec conduct joint emission allowance auctions, which allows for the sharing of administrative costs related to the auction process.¹⁴⁶

Linking also comes with disadvantages. Linking can increase an individual jurisdiction's control and regulatory flexibility, requiring compromise in cap-and-trade design in order to reach a consensus and/or make linking programs sufficiently aligned, and raise sovereignty concerns.¹⁴⁷ Linking may also result in increased emissions within one or more of the linked jurisdictions and the loss or reduction of local co-benefits.¹⁴⁸

To be effective, there must be a certain level of harmonization between the linking cap-and-trade programs. For example, the linking programs should consider aligning their emissions reduction targets; methods of allowance distribution; standards for monitoring, reporting, and verification (e.g., the integrity of the respective cap-and-trade programs); the mechanisms they use for cost containment and emissions containment; rules and limits on offsets or credits; and

¹⁴² See Environmental Defense Fund, *Western Climate Initiative Expands: Ontario to Join California-Québec Carbon Market*, available at <http://blogs.edf.org/climatetalks/2017/09/22/western-climate-initiative-expands-ontario-to-join-california-Québec-carbon-market/>.

¹⁴³ Christian Flachsland & Ottmar Edenhofer, *To Link or Not to Link: Benefits and Disadvantages of Linking Cap-and-Trade Systems*, 9 *Climate Policy* 358, 359-364 (2009); Ranson & Stavins, *supra* at 2; ICAP & PMRI at 13, 155-56; ¹⁴³ Alexander Eden, Charlotte Unger, William Acworth, Kristian Wilkenning, & Constanze Hauge, *Benefits of Emissions Trading*, International Carbon Action Partnership (2016), at 22-23, available at https://icapcarbonaction.com/en/?option=com_attach&task=download&id=389.

¹⁴⁴ Flachsland & Edenhofer, *supra*, at 364; Ranson & Stavins, *supra*, at 2; ; ICAP & PMRI, *supra*, at 13, 155-56; Eden, et al., *supra* at 22-23.

¹⁴⁵ Flachsland & Edenhofer, *supra* at 364; Ranson & Stavins, *supra* at 2; ; ICAP & PMRI at 13, 155-56; Eden, et al., *supra* at 22-23.

¹⁴⁶ Michael Lazarus, et al., *Options and Issues for Restricted Linking of Emissions Trading Systems* (2015), at 4-7, available at https://icapcarbonaction.com/en/?option=com_attach&task=download&id=279.

¹⁴⁷ Flachsland & Edenhofer, *supra* at 364-65; ; ICAP & PMRI, *supra*, at 13, 158-59.

¹⁴⁸ *Ibid.*

the relative technical and institutional capacities of the linking programs.¹⁴⁹ The programs may also need to have somewhat similar emissions profiles in their energy sector, or at minimum take into account any difference in those profiles when designing the link between the programs.

VII. Conclusion

RGGI has been a successful tool for ensuring that carbon emissions in the participating states are reduced in an efficient and cost-effective manner. To build on this success, and maintain the integrity of the RGGI program, the participating states must ensure that they have in place robust and effective leakage monitoring, assessment, and mitigation measures.

The most recent RGGI monitoring report's conclusions indicate that emissions leakage is not a significant concern, but there are weaknesses in the methodology used and the assumptions relied on in reaching those conclusions, raising concerns about the level of leakage that may already be occurring. While there are several sub-topics yet to be explored in assessing leakage (e.g., modeling shifts to non-RGGI plants), there are clear areas of concern that the RGGI states should act to address. Most importantly, RGGI should seek to increase the accuracy of its tracking of imports and associated emissions through the development of a registry, such as the Incentive-Driven Registry proposed in this paper, that will allow the gathering of more granular data about imports and emissions. Use of a registry for data acquisition will avoid reliance on state agencies in adjacent areas, outside of the program. A registry, or another similar mechanism, combined with ongoing cooperation between RGGI member states, is crucial to accurately track and assess emissions leakage.

Power plants subject to RGGI regulation have benefited from low allowance prices such that their wholesale market bids have not yet been significantly impacted. With the recently announced RGGI program changes, this reality will likely soon change, as allowance prices are expected to rise. Increased allowance prices are likely to result in higher market bids by RGGI generators and, when combined with the abundant supply of capacity unregulated by RGGI

¹⁴⁹ Michael Lazarus, et al., *Options and Issues for Restricted Linking of Emissions Trading Systems* (2015) at 4, 7, available at https://icapcarbonaction.com/en/?option=com_attach&task=download&id=279; Christian Flachslund & Ottmar Edenhofer, *To Link or Not to Link: Benefits and Disadvantages of Linking Cap-and-Trade Systems*, 9 *Climate Policy* 358, 359-363 (2009), at 364; Ranson & Stavins, *supra*, at 7.

within the same network, will likely result in increased risk of both within-region leakage and cross-border leakage.

The RGGI state's leakage mitigation efforts to date have been limited to monitoring of electricity imports and targeting auction proceeds for energy efficiency improvements. Indirect leakage mitigation also results from implementation of RPS/CES programs and the voluntary renewable energy set-aside programs. The RGGI states' energy efficiency efforts have been successful in reducing electric demand in the RGGI region, and the RPS/CES programs have increased the availability of renewable energy resources in the region. The voluntary renewable energy set-aside programs may drive development of additional renewable energy in the RGGI region and decrease demand for fossil-fuel generated electricity. These complementary measures likely have also played a role in reducing leakage risk. As the RGGI cap continues to decline, and the RGGI program strengthens, the risk of leakage will increase and these complementary measures are not likely to be sufficiently robust, standing alone, to mitigate leakage. The RGGI states should continue to support and promote these important complementary measures, but must go beyond them in designing an effective leakage mitigation policy moving forward.

Successful leakage mitigation requires measures that address both within-region leakage and cross-border leakage. To address in-region leakage, RGGI should be expanded to cover fossil-fuel power plants located within the region that have a capacity of under 25MW. Expanding coverage to smaller generators will incentivize these generators to reduce emissions, and potentially reduce the negative health impacts of electricity generation on overburdened and disadvantaged communities. To address cross-border leakage, the RGGI states should extend the cap to cover all electricity delivered to load serving entities in the RGGI region. Finally, the RGGI states should seek to link with additional states or other jurisdictions.

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Pace Energy and Climate Center
Elisabeth Haub School of Law
Pace University
78 North Broadway, E-House
White Plains, New York 10603
www.law.pace.edu/energy