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Tracking Emissions Associated with Energy Serving Load in the Regional Greenhouse Gas Initiative (RGGI) States

A Feasibility Study

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List of Terms

AB-32 — California's cap-and-trade program, created as a part of Assembly Bill 32 (AB-32).

Carbon Intensity — The carbon dioxide associated with an energy transaction, typically expressed in tons of carbon dioxide/megawatt hour.

Certificate — Tracking systems like GATS and GIS track both MWhs and attribute certificates that reflect the generation resources from which they were derived.

Control Area — The geographical area associated with an Independent System Operator or Regional Transmission Organization: e.g., New England ISO or PJM, respectively.

e-Tag — In order for electricity to cross a balancing area boundary, a North American Electric Reliability Corporation (NERC) energy tag (e-Tag) must be created. The e-Tag identifies an amount of power that at some future time will come from some specific source and go to a specific destination.

FJD — California's "First Jurisdictional Deliverer"(FJD) mechanism places a CO_2 emissions compliance requirement on parties that import power into California.

GATS — The Generation Attribute Tracking System in PJM.

GIS — The Generation Information System in New England ISO.

ISO — An Independent System Operator is a neutral and independent organization with no financial interest in electricity generating facilities that administers the operation and use of the transmission network business. This entity is often the same one that operates the wholesale electricity exchange market and the dispatch of power resources to meet utility and non-utility needs, or both. It may also be a separate entity.

LSE — Load Serving Entity, i.e., a retail electricity provider.

Load — Electricity use.

MW — Megawatt, a measure of electric generation capacity.

MWh — Megawatt hour, a measure of energy use.

PJM — A wholesale electricity market in the Midwest and Northeast, composed of parts or all of 14 states.

NE ISO — The wholesale market and Independent System Operator for New England.

NY ISO — The wholesale market and Independent System Operator for New York.

Non-RGGI Fossil — Smaller than 25MW generation in the RGGI region.

Non-RGGI Non-Fossil — Non-fossil generation in the RGGI region.

Non-RGGI PJM — Generation in PJM not subject to RGGI.

Portfolio — The collected generation resources with which an LSE serves load.

REC — Renewable Energy Certificate, one of the attribute certificates created and tracked by GATS and GIS.

Residual Mix — The average attribute mix in a system left over after all the REC trading is carried out and RECs are retired. Adjusted Residual Mix is residual mix further adjusted to exclude those resources (and related emissions) that RGGI would not want to include under an imports policy.

System Mix — In GATS, a type of certificate that is based on the emissions for a given control area.

RGGI-Affected — Generation subject to the RGGI cap-and-trade program, i.e., fossil generation 25 MW and larger.

RPS — Renewable Portfolio Standard.

Specified/Unspecified — Under California's FJD mechanism, a proposal for treating energy purchases where, unless an energy purchaser can meet certain unit-specific exceptions, purchases are characterized as system purchases and not from a specific generation unit. This approach is a recommended decision rule for RGGI regulators to alleviate the potential for gaming the tracking system being proposed.

Executive Summary

Introduction

This paper explores the capacity of two energy tracking systems currently operating in the RGGI region, the Generation Attribute Tracking System (GATS) in PJM and New England's Generation Information System (GIS), for the purpose of evaluating whether they have the capacity to track CO_2 emissions associated with energy consumption in the RGGI region. The paper introduces and describes energy attribute tracking systems (Section 1). It explains how they work with regard to renewable energy attributes, and then how they can be used to track a specific energy attribute, CO_2 (Sections 2 and 3). Finally the paper explores important data-related considerations and outlines various conclusions (Sections 4 and 5).

Section 1: Tracking Systems Introduced and Illustrated

High-Level Summary

- Today the GATS and GIS tracking systems produce various data on the energy and attribute transactions within their respective control areas, PJM and the New England ISO.
- GATS and GIS provide state regulators with reports that help ensure compliance with various renewable portfolio standard and retail bill disclosure laws.
- GATS and GIS utilize protocols for tracking imported energy and attributes associated with the two basic ways in which electricity is acquired: through unit-specific or system purchases.
- While currently not used for these purposes, GATS and GIS have the capacity, with the help of state energy and environmental regulators, to characterize energy use and emissions attributes for purposes of tracking CO_2 emissions associated with energy consumed in the RGGI region.

GATS and GIS were initially developed to support compliance with, among other things, state Renewable Portfolio Standard (RPS) and power source disclosure laws. GATS and GIS constitute important infrastructure available to RGGI regulators, with the capacity to track the generation and consumption of electrical energy in their respective control areas. Today, GATS and GIS are used primarily to track transactions associated with renewable energy. However, GATS and GIS can track *all* energy attributes for retail disclosure purposes, and some states already use GATS and GIS for this purpose.[1]

PJM's GATS and New England's GIS

Eight of the nine RGGI states are currently served by GATS and GIS, tracking systems maintained by PJM Interconnection and ISO New England respectively. Currently New York uses a manual tracking system and is not part of GATS or GIS. The New York ISO will be developing an automated tracking system, such as GATS, as a result of recent legislation. Further discussions of developments in the NY ISO are in Appendix B.

In order to appreciate how GATS and GIS might work to meet RGGI's tracking needs, this section outlines their capacity to track the purchase and sale of renewable energy, a generally recognized process. Using GATS as an example, this section illustrates how it:

(i) Tracks and reports the production, trading, and retirement of renewable energy certificates, or RECs; and

(ii) Treats energy attributes associated with the remaining non-renewable resources that are not traded or retired.

1 Maine and Delaware use GATS and GIS to track all energy attributes. Maine's electricity disclosure requirements are located at 35-A M.R.S. § 3203 and CMR 65-407-306. Delaware's are located at CDR 26-3000-3001. See Section 1 for more details.

Section 2:

Tracking Renewables and Sorting Out the Rest

High-Level Summary

- The GATS and GIS systems are essentially an assembly of generator and LSE accounts.
- A key feature of GATS and GIS is that they divide the electricity commodity that they track into two pieces: the generation "attribute" and the "electrons," i.e., MWhs.
- Generator accounts at the beginning of the reporting period hold attribute certificates created for all energy produced during the trading period.
- LSE accounts at the end of the trading period hold attribute certificates (e.g., renewable energy certificates, or RECs) purchased during the trading period.
- Attributes of all untraded certificates in generator accounts at the end of a trading period are aggregated to produce "residual mix certificates."
- Residual mix certificates are allocated at the end of the trading period to all LSEs that have fewer certificates than the number of MWhs of load that they served during the trading period.
- It is the tracking system's ability to identify and sort through the various resources and related attributes that RGGI could explore for its own purposes, to track emissions associated with energy imports into the region. However, using the process whereby the system develops a residual mix attribute has never before been used for compliance purposes in the manner being proposed here.
- While these systems have the capacity to track energy (and related attributes) produced and consumed, there are significant challenges that will need to be addressed to ensure that these systems are sufficiently robust to serve as data platforms for an effective imports policy.

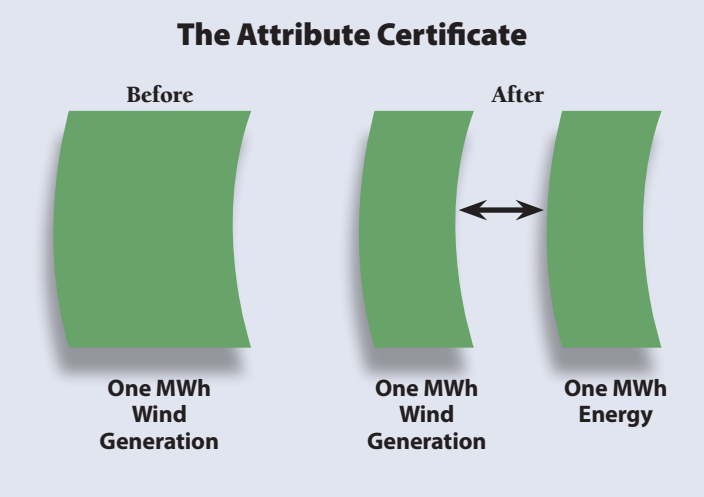
The manner in which the tracking systems characterize untraded attributes provides a process that RGGI could adapt for its own CO_2 tracking purposes. To understand exactly what that means, consider the following analogy. Everyone has had the experience of reaching in his or her pocket for a couple of quarters, but finding a handful of extraneous items like a paper clip, string, pennies, dimes, and nickels mixed in with the desired change. Just as one has to sort through those unwanted items to get at the 25-cent pieces, the tracking system can identify and net-out irrelevant generation resources in order to isolate those types of generation whose attributes (in this case, emissions) RGGI decides it would want to track.

Tracking System Fundamentals

Electricity suppliers subject to an RPS are typically required to present RECs equal to a percentage of the energy a company uses to serve its customers on an annual basis. A REC is equal to one megawatt hour of electricity generated by a qualifying renewable source.

ES Figure 1 illustrates how these tracking systems characterize a MWh of electricity and the related attributes. A key feature of GATS and GIS is that they divide the electricity commodity into two pieces: the generation attribute and the electrons. As shown below, GATS and GIS take a MWh of wind and characterize it as (1) a renewable energy certificate representing one MWh of wind generation, and also (2) an undifferentiated MWh of electric energy. Each is a commodity, and can be accounted for and traded independently of the other. This approach allows for "generation attributes to be 'unbundled' from and transacted independently from energy transactions, in a manner that encourages price transparency and liquidity."[2]

ES Figure 1



2 Grace & Wiser, 2002.

Because attribute certificates (e.g., RECs) are separated from the underlying electricity, GATS and GIS have the capacity to identify and track each MWh of generation, and consequently to substantiate attribute or certificate ownership claims. This happens as the certificate and attribute are transferred from the generation facility or control area to the entity (e.g., an LSE) that is purchasing either the energy or the certificate or both.

Unlike renewables generators, fossil and other generators do not trade the attributes associated with their energy production. While there is a relatively robust market for renewable resources and the corresponding RECs, there is not the same activity for attribute certificates associated with other types of resources. These attributes generally stay in generator accounts until the end of a tracking period.

Following the end of the trading period, all trading of certificates ceases, and all unretired (unclaimed, also called "unsettled") certificates are removed and retired automatically by the system as part of its residual mix calculation. The combined attributes of the pool of unclaimed residual generation are assigned to individual MWhs, which become "residual mix certificates," so that a residual mix certificate is a per-MWh average of the aggregate characteristics of all unsettled certificates. The attribute of each residual mix certificate is identical, and it is then assigned to each MWh of load in each LSE account that does not already have a retired certificate associated with it. At the end of the trading period, an LSE will have a portfolio composed of some amount of RECs and residual mix certificates.

It should be emphasized that developing a residual mix attribute is not simply a process of aggregating various generation attributes. As can be seen in ES Table 1, it is a process that occurs *after* attributes that have been traded have been removed from generator accounts through retirement.

ES Table 1

Residual Mix

System Mix	Residual Mix
All certificates produced in the wholesale market (i.e., all generation plus net imported generation), prior to being traded and retired	All certificates Minus: • Retired certificates (e.g., RECs)

Section 3:
Using GATS and GIS to Track CO_2 Emissions—Developing *Adjusted* Residual Mix

High-Level Summary

Developing an *adjusted* residual mix requires similar steps to those used to develop residual mix:

- First, an adjusted residual system mix is literally the average attribute mix left over after excluding the categories of generation sources that are:
  - Otherwise accounted for (i.e. *specified* transactions);
  - Would not be expected to be additional sources of CO_2 (e.g., PJM units in the states of Delaware and Maryland that are already subject to the program); and
  - Fossil resources not included under the current RGGI policy (e.g., smaller than 25 MW fossil units).
- Second, the CO_2 attributes of the adjusted residual mix certificate would be assigned to each MWh of load in each LSE account that does not already have a retired certificate associated with it.

This section explores two topics. First, it looks at how electricity is purchased, and why, for tracking purposes, that is significant. Second, it considers an extension of the residual mix concept to make further adjustments and isolate certain generation resources (and corresponding CO_2 emissions) serving load in the RGGI region.

Because the purpose of these tracking systems has been largely driven by the need to incent and account for renewable energy production and sales, there has been less emphasis on residual generation attributes or how the tracking systems work, or can work, in characterizing them. However, because the tracking systems have protocols for identifying all the resources being used within the system and their related attributes (including associated air emissions), GATS and GIS possess the capacity to identify CO_2 emissions associated with the power being consumed at the LSE level in the RGGI region. This includes energy from specific units, from system power in RGGI, and both unit-specific and system power from adjacent systems.

First, however, before considering how adjusted residual mix can be used to characterize emissions associated with energy acquired by LSEs, this section briefly reviews various categories of resources available and how the tracking systems characterize transactions.

How the Tracking Systems Characterize Transactions

The tracking systems have adopted certain protocols for acquiring relevant transaction data to reflect the two basic ways in which imported electricity can be acquired: through unit-specific purchases or system purchases.

Transactions for Unit-Specific Energy

In the case where generation is imported into GATS or GIS on a *unit-specific* basis, the transaction requires a transmission system reservation and NERC e-tag.[3] In GATS, meter data is provided to the administrator in order to demonstrate that the generator actually produced the scheduled number of MWh during the relevant period (i.e., that month). In cases where the information is not provided, GATS creates "system mix certificates" for these imports, which reflect the "emissions for the source control area of the import" rather than emissions associated with the specific unit.

Transactions for System Energy

In order to characterize *system* imports, data on emissions and fuel sources must be given to the system administrator by an approved state environmental regulatory agency from within the GIS control area. For example, the Massachusetts Department of Energy and Environmental Protection provides the GIS administrator with the average emissions rate of control areas adjacent to New England. For certificates associated with imported system energy, all certificate fields other than "fuel source," "emissions," and "location" indicate "not applicable." Fuel source, emissions, and location certificate fields must be independently audited or based on averaged emissions and energy use estimates.

For example, Hydro-Quebec develops an annual summary of emissions rates for CO_2, NO_x, and SO_2 that is audited by a third party to ensure accuracy and transparency. Currently those emissions factors are used in GIS to characterize system imports from Quebec to New England. This process takes place administratively, and the data produced by Hydro-Quebec are likely to become the data in the tracking system that are reviewed by "an approved State environmental regulatory agency" to characterize system imports from Hydro-Quebec.

Thus, with the exception of imported electricity that could be bought under a unit-specific transaction (and would come with an e-tag reflecting that specific unit's emissions attributes, and would need metering data follow-up), certificates for attributes associated with imported system power would be assigned the system-average environmental attributes for the control area from which they are purchased.

If RGGI were to require all system purchases to be characterized as "unspecified," and to take on attributes associated with system power, an approach suggested by Grace and Wiser, the ability to manipulate emissions attributes would be diminished, if not entirely taken away. (For a more complete discussion of "Resource Shuffling," see Appendix 3.) Imports, therefore, would be unspecified unless one of the following three exceptions could be demonstrated by the LSE:

(1) An historical contract with a specific power plant, and delivery path into the region;
(2) A purchase of power from a new resource; or
(3) A purchase of incremental power at an existing generation plant.

Further Adjusting Residual Mix

As explained further below, this section explores an extension of the residual mix concept to make further adjustments and isolate certain generation resources (and corresponding CO_2 emissions) serving load in the RGGI region.

The proposal here, illustrated in Column 3 of ES Table 2 below, recommends that regulators expand upon the tracking systems' residual mix mechanism to:

(1) Identify those unspecified resources whose emissions a future RGGI load-side policy would want to capture in the adjusted residual mix calculation;[4]

3 For further discussion of the role of NERC e-Tags, see Appendix 1.

4 It should be noted that while an adjusted residual mix could exclude "specified resources," specified resources are not necessarily carbon-free, and the retirement of associated certificates would affect the overall carbon profile associated with that LSE.

ES Table 2

PJM Adjusted Residual Mix

1. GATS System Mix	2. Residual Mix	3. Adjusted Residual Mix
All certificates produced in the wholesale market (i.e., all generation plus net imported generation) prior to being traded and retired.	**All certificates** *Minus:* • Retired certificates (e.g., RECs) **Residual:** • RGGI-affected generation (e.g., already-covered MD and DE RGGI-affected generation); • Non-RGGI-affected generation (e.g., smaller than 25 MW fossil); • Non-fossil generation; and • Net imported generation (NY ISO, MISO).	**Residual Mix** (i.e., system mix minus retired certificates) *Minus:* • RGGI-affected generation (e.g., already-covered MD and DE RGGI generation); • Non-RGGI-affected generation (e.g., smaller than 25 MW fossil); • Net imported generation from adjacent RGGI system (e.g., NY ISO); and • Specified transactions.[5] **Adjusted Residual:** • Non-fossil generation; • Larger than 25 MW (non-RGGI fossil) generation; and • Net imported generation from adjacent non-RGGI system (e.g., MISO).[6]

(2) Exclude them; and
(3) Aggregate, in the form of adjusted residual mix, the remaining unspecified resources of generation whose emissions RGGI might want to recognize under a potential policy.

In order to first derive residual mix, the system today starts with all certificates produced in the wholesale market (i.e., all generation plus net imported generation) prior to any being traded and retired. (ES Table 3, column 1.) The system would then exclude all traded and retired certificates such as RECs. After this initial step, the attributes that are left over, i.e., a "PJM residual mix," would be composed of the following resources (ES Table 2, column 2, line 2):

- RGGI-affected generation (e.g., already covered MD and DE RGGI-affected generation);
- Non-RGGI-affected generation (e.g., smaller than 25 MW fossil);
- Non-fossil generation (e.g., nuclear power); and
- Net imported generation (NY ISO, MISO).

In order to identify resources whose CO_2 emissions would affect RGGI, the system would make further adjustments—i.e., exclude additional resources that are irrelevant to a potential expanded RGGI compliance policy. (See ES Table 2, column 3.) Consequently, the adjusted residual mix, i.e., the resources remaining after these further adjustments, would be composed of the following generation types:

- Larger than 25 MW (non-RGGI fossil) generation;
- Net imported generation from adjacent non-RGGI system (e.g., MISO); and
- Non-fossil generation.

The larger than 25 MW (non-RGGI) fossil generation would be included, since it is the same type of generation that RGGI currently regulates in-region. So would net imports from MISO, since MISO resources would come with carbon content. Because non-fossil generation (e.g., nuclear and hydro resources) comes with no carbon content but is part of the system mix, it is not adjusted out of the mix, and would remain.

5 Depending on their carbon intensity, specified transactions would be netted out of the adjusted residual mix, but would still incur an allowance obligation if retired by an LSE.

6 This would likewise apply to systems that are adjacent to the New England ISO.

Using Adjusted Residual Mix and Tracking Imported Power

To recap, tracking imported power this way is a multi-step process. The first part, just described, involves the characterization of the system mix after removal of both (a) the generation resources that regulators would not want to include for CO_2 compliance purposes, and (b) the generation resources that would be counted on a unit-specific basis.

The next step involves the proportional allocation of the residual CO_2 profile derived in step one, to all LSEs that have fewer certificates than the load they served—i.e., those that do not have a one-to-one match with the MWhs of load they have served.

An adjusted residual system mix is literally the average attribute mix left over after not only all the REC trading is carried out and RECs are retired (see ES Table 2, column 2), but also excluding the other attributes that would not be included under a policy (see ES Table 2, column 3). In the PJM illustration above, adjusted residual mix would exclude RGGI-affected generation (e.g., already covered MD and DE RGGI-affected generation); certain net imported generation (e.g., NY ISO); and non-RGGI-affected generation (smaller than 25 MW fossil). This would leave the attributes associated with larger than 25 MW (non-RGGI) generation; net imported generation from adjacent non-RGGI system (e.g., MISO); and non-fossil generation.

The second step of this process involves the assignment of residual mix attributes to each MWh of load in each LSE account that does not already have a retired certificate associated with it. The attribute of each adjusted residual mix certificate would be identical. In the PJM illustration, the CO_2 attributes associated with the adjusted residual mix certificate would be the combined attributes associated with, (a) the system's non-fossil generation, (b) larger than 25 MW (non-RGGI) fossil generation, and (c) net imported generation from adjacent non-RGGI system (e.g., MISO).

At the end of this process, the LSE portfolio would

Section 4: The Need for Appropriate Data

High-Level Summary

- RGGI regulators could encourage tracking systems to employ highly reliable data produced pursuant to 40 C.F.R. Part 75, where applicable.
- RGGI regulators could build upon their current audit authority in GIS—and, more important, their work history with tracking system administrators—to establish adequate regulator access to tracking system data and functions to be able to verify the accurate use of energy consumption data and related emissions data for purposes of a regulatory compliance program.
- RGGI regulators could consider coordinating tracking-system certificate production schedules and EPA's schedule for producing emissions data, by either:
  - Adopting a longer period between the time the electricity is generated and the time that the tracking system mints a certificate;
  - Establishing a true-up mechanism for the submission of all generator emissions information, to reflect the availability of more recent Part 75 data; or
  - Establishing a true-up mechanism for the submission of fossil resource information only, to reflect the availability of more recent Part 75 data.
- RGGI regulators could review current state laws, regulations, orders, and approvals related to GATS mandates to ensure that no modifications are necessary in order to adjust existing tracking system schedules and normalize them with the schedule for the production of EPA's Part 75 data.
- RGGI regulators could consider the potential suitability of newly developed emissions monitoring data from EPA produced pursuant to the CO_2 NSPS.
- In addressing challenges associated with characterizing emissions, RGGI regulators could continue to draw upon their experience in providing additional oversight for quality control and quality assurance purposes, including procedures for the certification and recertification of approved approaches to CO_2 monitoring from fossil plants, and accepted methods for determining fuel mix and emissions characteristics of provider resource portfolios based on market settlement data or other relevant market data.

have the same number of attribute certificates as it has MWhs. The attribute certificates would be a combination of attribute certificates it purchased and residual mix certificates that were assigned by the tracking system.

Net Emissions from Adjacent Control Areas

The process of identifying relevant resources and determining an adjusted residual mix emissions factor would work largely in the same way for the New York

Section 5: Conclusions

High-Level Summary

- The addition of a CO_2 monitoring and compliance requirement for imports can be expected to raise additional compliance issues for electric service providers. Companies will need to determine the best way to meet their compliance obligations based on the carbon intensity of their energy portfolios.
- Presuming that a carbon compliance obligation would necessitate the acquisition of RGGI allowances to reflect the carbon content of energy purchases, electric service providers should have a number of options to comply with this requirement, including:
  - Reducing carbon content of supply portfolios by identifying and requesting recognition for specified energy purchases;
  - Contracting with developers of lower-emitting generation;
  - Taking advantage of RGGI flexibility provisions, e.g., three-year control period and banking; and
  - Making greater investments in energy efficiency and other demand-side resources.
- There are a number of legal, regulatory, and administrative implications associated with developing a tracking system that can potentially support expanding the existing RGGI program to include emissions associated with the purchase of energy from outside the RGGI region.
- States would need to work with administrators at GATS, GIS, and the relevant tracking system authority in New York State to determine the changes necessary to the tracking systems in order for states to be able to regularly determine:
  - The amount of MWh each LSE uses to serve load in its service territory, and
  - The sources of that energy.
- Acquiring and populating the tracking systems with robust emissions data would be a central part of any such effort.
- Having sufficient access to the system for QA/QC purposes would also be necessary. States would need to confer with tracking system administrators in order achieve a level of access to processes and calculations that ensures state confidence in the soundness of the tracking systems.
- Each state would need to determine the extent of its authority to take necessary steps to expand its program.
- RGGI states should also consider whether or not their existing authority to implement electric supply portfolio standards for renewable or other resources might provide the authority to track emissions associated with such a compliance obligation.
- At a minimum, states would need to develop rules regarding:
  - The tracking of various transaction types; and
  - The methodology for calculating adjusted residual mix and other tracking system features, including:
    - Articulating the fields required to be added to the tracking system, and
    - Publishing the necessary reports that will need to be produced.
- Regulators and tracking system administrators should develop a standard set of protocols for regulator access to tracking systems, and for addressing quality assurance and quality control concerns that regulators will have in using these systems to track energy use.
- RGGI states should also consider what other specific standardized procedures they will need to develop if they choose to proceed and use these systems for tracking purposes.
- In addition, RGGI states would need to determine the degree to which individual state rules (statutes, regulations, orders, etc.) will need to be addressed, and assess potential effects that the recognition of these emissions would have on existing state emissions budgets.

ISO and New England ISO as it does for PJM. There is, however, one major difference that should be noted between PJM and the circumstances in these control areas. Unlike PJM, the ISOs in New York and New England do not contain a mixture of states that are and are not subject to RGGI.

The quality of data that is used in a tracking system is a key aspect of the environmental integrity of the tracking program and the ability of regulators to rely upon it. While GATS and GIS constitute effective systems for tracking energy use and related attributes, these systems will only be as precise as the data they are provided. In developing a tracking proposal for RGGI, it is important to assess the sources and quality of emissions data to ask whether this level of quality is acceptable; and, if necessary, how it might be improved.

The following data-related topics that are considered in this section include:

- Best available data;
- Current data requirements in GATS and GIS;
- Need to coordinate data production and tracking system schedules;
- Potential additional EPA data sources;
- Need for regulator access to tracking systems; and
- Data characterizing adjacent power systems.

RGGI is in a position to use existing energy tracking systems in the region to develop a platform that will allow it to track and account for all the energy use within the region. With this capacity in place, RGGI could then pursue the potential policy steps necessary to articulate a compliance obligation for emissions associated with the out-of-region electricity currently serving load in the RGGI region. As the discussion has shown, tracking carbon emissions with the use of GATS and GIS, while technically feasible, can be expected to pose a number of challenges for retail electric service providers and for regulators.

Some Implications for LSEs

This approach uses elements with which RGGI states and LSEs are already familiar, and combines them in new ways. LSEs in the RGGI region already track CO_2 for RGGI-affected units. This proposal would expand the tracking to imports from outside the RGGI region. The mechanics of tracking imports is something LSEs are familiar with, as they already use tracking systems as part of their compliance with various state renewable portfolio standards.

Tracking carbon emissions to support a compliance obligation for emissions associated with out-of-region adjacent system electricity that serves load in the RGGI region would, in large part, work similarly to the manner in which companies currently track their compliance with state renewable energy or other portfolio standards. At the end of a trading period, LSE accounts would reflect the amount of MWhs purchased to serve load, along with the number of relevant certificates either directly purchased or assigned from the adjusted residual mix to those system purchases.

Tracking emissions for compliance with a carbon obligation would also work similarly to the manner in which companies currently track their compliance with other state portfolio standards. The addition of a monitoring and compliance requirement for CO_2 can, however, be expected to raise a number of additional compliance issues for electric service providers. If an energy tracking program is adopted by RGGI states, then going forward, LSEs should be expected to be key stakeholders in the related planning and implementation processes to coordinate and establish similar protocols across the RGGI states.

In addition to participating in the development of the regulatory framework to implement a CO_2 tracking system, retail electricity providers will face additional challenges associated with an expanded RGGI compliance obligation. These challenges are, however, not out of the ordinary for LSEs. Just as companies today face some degree of uncertainty about the prices of RECs necessary for compliance with an RPS, going forward companies with a newly established CO_2 obligation will need to determine the best way to meet those requirements based on the types of energy transactions in which they engage.

Presuming that a CO_2 compliance obligation would necessitate the acquisition of RGGI allowances to reflect the carbon content of energy purchases, electric service providers should have a number of options to comply with this requirement. Where applicable, for example, LSEs can reduce the carbon content of supply portfolios by identifying and demonstrating specified energy purchases that they have made. They should also be able to reduce the carbon content of their portfolios by investing in the development of lower-emitting generation. They could,

further, make greater investments in energy efficiency and other demand-side resources to reduce the overall amount of energy in their supply portfolios. Finally, LSEs could benefit from current flexibility provisions afforded to RGGI generators, such as the ability to acquire allowances from other compliance entities and the ability to bank allowances.

Some Implications for State Regulators

The use of the GATS and GIS tracking systems to develop a platform to track and account for CO_2 emissions associated with all the energy use within the region will raise a number of legal, regulatory, and administrative issues. This section is not exhaustive, but endeavors to identify some of the major steps that states may need to take.

Adapting Tracking Systems

States will need to confer with the GATS and GIS administrators, and in New York State with the relevant tracking system authority, to determine the changes necessary to the tracking systems in order for states to be able to reasonably determine, (a) the amount of MWhs each LSE uses to serve load in its service territory, and (b) the various sources of that energy. As noted in the discussion above, acquiring and populating the tracking systems with useful emissions data, and allowing regulatory consultation in the system operation, will be important parts of such an effort.

State Authority

Each state would need to determine if authority exists to take necessary steps to expand its program to include a potential compliance obligation on emissions associated with imported electricity and the tracking modifications necessary to support it. It is beyond the scope of this paper to review each state's authorizing legislation. However, it is recommended that each state determine the extent of its current authority to participate in and administer the RGGI program, and the extent to which that authority would allow the state to extend the program to tracking LSE electricity transactions.

Additional Issues

In addition to assessing existing authority, states would need to develop rules regarding:

- The tracking of various transaction types, and protection against potential gaming of the system;
- The methodology and system changes necessary for calculating adjusted residual mix;
- The coordination of environmental data production and tracking system schedules;
- A standard set of protocols for regulators to be able to consult regularly with system operators, and to ensure quality assurance and quality control in data and system use of data; and
- Other specific standardized procedures that they will need to develop if they choose to proceed and use these systems for tracking purposes.

Conclusion

This proposal seeks to address an existing challenge regarding tracking CO_2 emissions from imports into the RGGI region with currently existing technology, the GATS and GIS tracking systems. We recognize that this is not without challenges, and would require concerted effort on the part of a variety of stakeholders. As RGGI seeks a means of tracking emissions associated with imports into the RGGI region, these tracking systems represent capacity that should not be overlooked.

Preface

In the mid-1990s when a number of state legislatures restructured their state's electricity industries, there grew an interest in being able to demonstrate compliance with generation attribute requirements, such as renewable portfolio standards and source disclosure policies, and to substantiate "green marketing" claims.[7] This led to the development of "attribute accounting and verifications systems."[8] "These systems help to uniquely associate the attributes of energy production from specific generators with the sales of specific electricity suppliers."[9]

Bundled and Unbundled

Two basic system models emerged at this time. The first is characterized as a "contract path model." This approach assumes that generation attributes are bundled with an electricity transaction. Under this approach, an LSE would substantiate a claim to certain attributes by tracking energy transactions "through all intermediaries back to the generator."[10]

The second model is characterized by the use of attribute certificates. This approach assumes that generation attributes can be *unbundled* from specific energy transactions. Transactions for attributes such as a sale of RECs can occur independently of transactions for energy. "This is accomplished through instruments that establish clear property rights and title to unbundled attributes," such as RECs for renewable resources, "or more generally as certificates when applying to all generation types within a market."[11]

Despite the actual movement of electrons across power systems according to the laws of physics, both models make assumptions about attributes and energy being produced and consumed. The bundled approach assumes that generation attributes and energy move between participants to an energy transaction. The unbundled approach allows for the separation of energy and attributes, but also for the eventual reconnection of attributes with a similar amount of energy consumed.

What do we mean when we say "tracking"?

The bulk of this paper focuses on PJM's Generation Attribute Tracking System (GATS) and the Generation Information System (GIS) used in the New England ISO. When the paper refers to "tracking," one should remember—since GATS and GIS are unbundled systems—that we are talking about attributes *and* about MWhs. First, GATS and GIS are capable of literally tracking attributes from generator to consumer. They do this in several ways, depending on whether there is a purchase and retirement of a specific attribute certificate, or the allocation of untraded certificates at the end of a trading period and their retirement.

Second, GATS and GIS also "keep track of" (i.e., account for) energy (MWhs) produced and consumed. While no systems, including GATS and GIS, follow the actual electrons from the point of generation to the point of consumption, one should not conclude that there is no connection between the energy generated and the energy consumed.

GATs and GIS do not *follow* electrons from the generator to the LSE; instead, they keep track of the number of

7 Grace & Wiser, 2002.

8 Id. at 3-4.

9 Id.

10 Id. Grace and Wiser note that there is a variant to this approach that "is an accounting and verification framework that simply requires retail suppliers to document 'control of generation' without accounting for system power transactions. The practical use of this approach is limited to states in which retail electricity suppliers are required to describe their generation mixes without detailed requirements on how to calculate that mix." Id. at 2 note 2.

11 Grace and Wiser note a third model, a hybrid of one and two which relies "on contract path tracking but allow[s] some degree of unbundling without distinct secondary markets for certificates, such as the 'conversion transaction' approach adopted in New York." Id. at 4.

MWhs produced by a generator and the number of MWhs consumed by an LSE. As noted by Grace and Wiser, when an LSE "offers attributes associated with its retail electricity sale, such a transaction suggests a definite nexus to retail sales, and is consistent with a retailer claim that 'this is where the supply that I purchase to serve your needs comes from' as well as 'this is where your money goes.'"[12]

This relationship of generation resources with energy consumption implies what Grace and Wiser refer to as a "conservation of attributes," i.e., a "correspondence of generation attributes in proportion (adjusted for losses)[13] to energy sales to end-users. Within some defined scope the quantity of energy and the quantity of attributes must be equal."[14]

12 Grace & Wiser, 2002, at 29-30.

13 Id. See discussion of line losses at page 36.

14 Id. at 30.

Section 1. Tracking Systems Introduced and Illustrated

High-Level Summary

- Today the GATS and GIS tracking systems produce various data on the energy and attribute transactions within their respective control areas, PJM and the New England ISO.
- GATS and GIS provide state regulators with reports that help ensure compliance with various renewable portfolio standard and retail bill disclosure laws.
- GATS and GIS utilize protocols for tracking imported energy and attributes associated with the two basic ways in which electricity is acquired: through unit-specific or system purchases.
- While currently not used for these purposes, GATS and GIS have the capacity, with the help of state energy and environmental regulators, to characterize energy use and emissions attributes for purposes of tracking CO_2 emissions associated with energy consumed in the RGGI region.

This section explores the capacity of two energy tracking systems operating in the RGGI region—the Generation Attribute Tracking System (GATS) in PJM and New England's Generation Information System (GIS)—for the purpose of demonstrating whether they have the capacity to track CO_2 emissions associated with energy consumption in the RGGI region. "Generation attributes include all of the characteristics of a power plant's production that differentiate it from undifferentiated (or 'commodity') electricity, for example, fuel type, air pollutant emissions, location or vintage."[15] Therefore, tracking systems have the capacity to be the mechanism by which RGGI could track, (1) existing CO_2 emissions in the RGGI region; and, if RGGI opted to expand its program, (2) CO_2 emissions associated with imports of non-RGGI electricity generation consumed within the RGGI region. These tracking systems have the potential to automate tracking of CO_2 emissions in the RGGI region and the rest of PJM.

While initially developed to support compliance with, among other things, state Renewable Portfolio Standard (RPS) and power source disclosure laws, GATS and GIS constitute important infrastructure available to RGGI regulators, with the capacity to track the generation and consumption of electrical energy in their respective control areas. With improvements, discussed further in sections 2 and 3, GATS and GIS could be used by regional energy and environmental regulators to track CO_2 emissions associated with energy consumption in the RGGI region.

Using GATS and GIS to track emissions associated with power imported into the RGGI region, as being proposed here, can be expected to place greater demands on these tracking systems than are currently being made. The tracking of emissions in this manner can also be expected to raise some significant challenges, including those related to ensuring data quality and availability, along with the coordination of schedules and regulator access to both energy tracking systems and emissions data tracking systems. While this paper concludes that using GATS and GIS to track CO_2 emissions associated with electricity imports into the RGGI region is technically feasible, none of these challenges, discussed in the following sections, will be insignificant, and each will need to be addressed by regulators going forward.

A. PJM's GATS and New England's GIS

As shown in Table 1 below, eight of the nine RGGI states are currently served by GATS or GIS, with the tracking systems maintained by PJM Interconnection and ISO New England respectively. Currently New York uses a manual tracking system and is not part of GATS or GIS. The New York ISO will be developing an automated tracking system, such as GATS, as a result of recent legislation. Further discussions of developments in the NY ISO are in Appendix B.

15 Grace & Wiser, 2002, at 1.

Table 1

RGGI States, GATS, and GIS

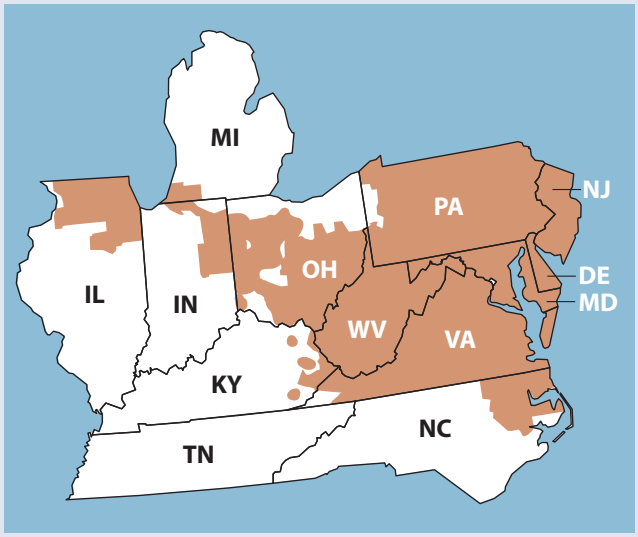
State	RGGI	GIS	GATS
Connecticut	●	●	
Delaware	●		●
Maine	●	●	
Maryland	●		●
Massachusetts	●	●	
New Hampshire	●	●	
New York	●		
Rhode Island	●	●	
Vermont	●	●	
Illinois			●
Indiana			●
Kentucky			●
Michigan			●
New Jersey			●
North Carolina			●
Ohio			●
Pennsylvania			●
Tennessee			●
Virginia			●
Washington, D.C.			●
West Virginia			●

i. GATS

GATS is a regional electronic tracking system for electricity generation that is administered by PJM-Environmental Information Services (EIS), a subsidiary of PJM. (See Figure 1.)[16] PJM-EIS provides reporting and tracking services for both emissions and energy generation data from registered facilities. For owners of registered generation, GATS tracks the generator's output for the issuance of the applicable certificates. GATS also tracks the ownership of those certificates through to their end use by an LSE for state RPS compliance or other use. These certificates represent the attributes of generation, and are traded separately from megawatt hours (MWhs) of electricity.

Figure 1

Map of PJM Zone [17]



Certificates produced in GATS enable regulators to track fuel sources, emissions, vintage, asset identification, generator location, state program and Green-e eligibility, RGGI status, and import characteristics, where applicable.[18] GATS also tracks RPS eligibility and other specific information relevant to the different compliance rules and regulations of each state within its footprint.

Generators, LSEs, traders, and purchasers can register with GATS. Generation data are entered on a month-to-month basis, with the previous month's data required to be entered before the end of the current month. Certificates are automatically generated for the previous month's generation on the last business day of the current month, and are traded or retired on a month-to-month basis.

16 PJM, headquartered in Valley Forge, PA, represents one of the largest competitive wholesale electricity markets in the world, with over 750 utility members. As illustrated in Figure 1, PJM coordinates the movement of wholesale electricity to all or parts of Delaware, Indiana, Illinois, Indiana, Kentucky, Maryland, Michigan, New Jersey, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia, and Washington, DC. In 1997 PJM became a fully independent organization, and received FERC approval as an independent system operator. The GATS tracking system is mainly supplied with generation data directly from PJM.

17 FERC, 2010.

18 PJM Environmental Information Services, 2011.

Generators located outside the PJM-Interconnection area that supply electricity to LSEs within the PJM area for a state program must be pre-approved by a state agency in at least one of PJM's control area states. Generation data can be manually entered into the database by approved account holders for the registered generation facility, or by the state agency that pre-approved the generator. Verification of claims related to energy produced and generation attributes is left up to the state agency that pre-approves the facility.[19]

GATS requires the retirement of certificates prior to the end of the annual reporting period. Annual settlement of certificates and trading for all accounts occurs in February for the previous report-period year.

ii. GIS

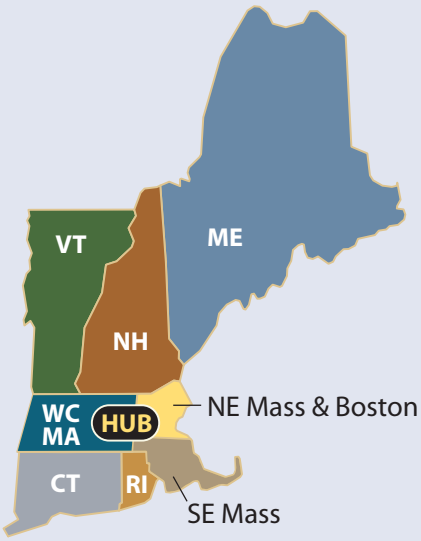
Like GATS, GIS is an electronic tracking system that contains generation information for each individual registered generation facility within ISO-New England, or that otherwise participates in this system.[20] (See Figure 2.) GIS creates generator-specific certificates that embody the relevant generation attributes that can be necessary to demonstrate compliance with regulatory obligations, or to substantiate claims within the voluntary market.

Generators, LSEs, and other traders and purchasers can register with GIS,[21] and certificate transactions may be conducted by account holders during the trading period for that specific certificate, which begins when the certificate is created and ends two months later. Information provided in GIS certificates includes the location, month, and year of generation, emissions, eligibility for individual state RPS mechanisms, RGGI status, Green-e eligibility status, and other information that varies by the state in which the energy is generated.[23]

Unit-specific imports into the ISO New England control area require a NERC e-Tag.[24] For system imports, data on emissions and fuel sources must be given to GIS administrators by an approved state environmental regulatory agency from within the GIS control area.[25] For certificates associated with imported system energy, all fields other than "fuel source," "emissions," and "location" indicate "not applicable." Average fuel source and emissions for system imports certificates come from one of three locations: (1) independently audited data, (2) federal emissions data sources, or (3) a local environmental agency (e.g., Environment Canada).

Figure 2

Map of NEPOOL Zone ISO-New England [22]



Zones

- Maine
- Vermont
- New Hampshire
- West Central Massachusetts
- Northeast Massachusetts
- Southeast Massachusetts
- Connecticut
- Rhode Island

B. How GATS and GIS are Currently Used

Tracking systems are generally policy-neutral, but have varied policy applications.[26] Currently GATS and GIS are used primarily to track market activity associated

19 PJM Environmental Information Services, 2011.

20 ISO-New England is headquartered in Holyoke, MA, and serves the six New England states (see Figure 2). Initially formed as the New England Power Pool (NEPOOL) in 1971 to foster cooperation and coordination among the six states it serves, it was intended to ensure a dependable supply of electricity. An independent system operator called ISO-New England was approved by FERC in 1997. In 2005, FERC designated ISO-New England as the regional transmission organization for the New England region. The GIS tracking system is mainly supplied with generation data by ISO-New England.

21 New England Power Pool Generation Information System, 2011.

22 FERC, 2010.

23 New England Power Pool Generation Information System, 2011.

24 For an explanation of NERC e-Tags, see Appendix 1.

25 GIS Operating Rule 2.7(b).

26 These tracking systems were designed to facilitate voluntary markets for "green" power, generation source disclosure requirements, and renewable energy portfolio standards. Grace & Wiser, 2002, at 1.

with RECs—more precisely, the movement of attribute certificates associated with transactions for their sale or transfer. This activity represents only a small fraction of all the energy bought and sold in the region.

GATS and GIS are also used by electricity providers to meet fuel-mix disclosure requirements, for example in Delaware and Maine.[27] Delaware fuel-mix disclosure requirements direct electricity suppliers to file a quarterly report with the utility commission using fuel-mix information. Suppliers are required to provide, among other things, "total amount of electricity (kWh or MWh) supplied to each Retail Electric Customer class," and "fuel resource mix by percentage for each resource."[28]

Maine electricity providers are required by law to provide their residential and small commercial consumers with a label containing "fuel mix and emissions characteristics."[29] Specifically, for service in Maine within the ISO New England's control area, the provider's resource portfolio must be "determined based on GIS certificates."[30] For service within Maine's "Maritimes control area," the provider's resource portfolio is to be "determined using market settlement data or other relevant market data that match generating resources of a provider to the load obligation of that provider no less frequently than on a 12-month basis."[31]

In order to track all generation attributes, GATS and GIS produce a certificate for each MWh of electricity generated. In order to meet state RPS and disclosure policies, GATS and GIS require certain data to be included on each certificate associated with a MWh of energy produced. Data fields on GATS certificates include:

- Fuel Sources
- RPS Eligibility
- Emissions
- Vintage
- Location of Generation Unit
- Green-e Energy Eligibility
- Import Characteristics (if applicable)[32]

While the GATS rules do not require the designation of RGGI status on a certificate, GATS identifies RGGI units, and also produces several reports related to RGGI units in GATS and the RGGI region.[33] Data fields on GIS certificates[34] include:

- Fuel Source
- RPS or APS[35] Eligibility
- Emissions
- Labor Characteristics
- Vintage
- Asset information[36]
- Location of generating unit
- Green-E Eligibility

27 Maine's electricity disclosure requirements are located at 35-A M.R.S. § 3203 and CMR 65-407-306. Delaware's are located at CDR 26-3000-3001.

28 CDR 26-3000-3001. Section 7.

29 CMR 65-407-306, section 2B.

30 Id. Section 3.a.

31 Id. See also section 3.c., Portfolio Characteristics. "For service within the ISO-NE control area, fuel mix and emission characteristics shall be determined based on GIS certificates. For service within the Maritimes control area, fuel mix and emission characteristics shall be those associated with generating units for unit specific entitlements or contracts and the system mix for system entitlements or contracts." According to Section 5.c., "emission characteristics of the resource portfolio shall be determined based on GIS certificates," for service within the ISO-NE control area. For service within the Maritimes control area, the regulations allow for emissions calculations to be based on the "most accurate available data."

32 GATS Rule 8.6. "Data Fields Carried on Each Certificate."

33 GATS Operating Rules, Revision 7, 2011, Appendix E:
- "RGGI – Load, Generation, Imports/Exports" (total PJM RGGI Region load, total RGGI Region Generation and total imports and export into/from the RGGI Region. This report will show for each RGGI state as well as a total for all RGGI states);
- "RGGI – CO_2 Emissions" (CO_2, MWh, and weighted average emission rate [in lbs. CO_2/MWH] for the RGGI-affected units, unaffected small fossil fuel-fired RGGI-region); and
- "RGGI – Total CO_2 Emissions" (CO_2 Emission in Tons for the entire RGGI Region in PJM and then each individual RGGI State in PJM).

34 GIS Rule 2.4.

35 I.e., Alternative Energy Portfolio Standard.

36 Including generator identification number as reported to the US EPA under the Acid Rain program.

- Third Party Meter Reader
- Status under Regional Greenhouse Gas Initiative.[37]

C. Tracking System Data and Reports

Both tracking systems provide numerous reports on the data they collect and the movement of certificates they track. GIS makes available reports to regulatory agencies, as provided for in GIS Rule 5.3.[38] New England regulators have access to various quarterly and annual reports, by a password-restricted Internet portal.[39] Information available in these reports to regulators includes:

- All GIS generators categorized by fuel source;
- Retail LSEs with GIS accounts, identified by name and categorized by state(s) for which they hold subaccounts;
- Total MWh of energy generated in the control area during the reporting period;
- Total MWh of energy imported into the control area from each adjacent control area during the reporting period; total number of certificates created during the reporting period; allocation of certificates among retail load in each state during the reporting period, categorized by fuel source;
- Total number of renewable certificates created during the reporting period; average, in pounds, of each of the emissions listed in Appendix 2.4 (including CO_2)[40] that is attributable to load in each state as a result of the certificate allocation during the reporting period;
- For each GIS Generator (other than Class III Cogeneration Resources), the pounds of each of the emissions listed in Appendix 2.4 for such reporting period; and
- Total MWh of energy exported from the control area into each adjacent control area during the reporting period.

GATS, likewise, makes numerous reports available including a monthly, a quarterly, and an annual PJM System Mix report.[41] The "Quarterly System Mix Report," for example, is broken down by individual fuel type, or for a combination of all fuel types, for each quarter.[42] The "PJM Residual Mix" report shows the makeup of the residual mix as defined by the GATS operating rules.[43]

GATS also produces a report entitled "Total Certificates Allocated to Load by State," which provides a view of certificate allocation to load, by state and fuel percentage; and a report entitled "Total Emissions by Generator," which shows total emissions in pounds, by generating unit and fuel type, for the given month and year selected.[44] "Total Emissions by Generator" also provides the source of emissions data, including GATS user, EPA data, or default data by fuel type.[45]

While these tracking systems are generally thought of as renewables tracking systems, they in fact both produce and

37 I.e., either:
- Generating Unit in New England Control Area that is subject to RGGI requirements ("RGGI-affected");
- Generating Unit in New England Control Area that is not RGGI-affected solely because it has a generating capacity under 25 MW;
- Generating Unit in New England Control Area that is not RGGI-affected because of its fuel source, regardless of its generating capacity; or
- Generating Unit not in New England Control Area.

38 The rules designate "Energy Regulatory Agencies," and include: Connecticut Department of Public Utility Control, Maine Public Utilities Commission, Massachusetts Department of Public Utilities, Massachusetts Department of Energy Resources, New Hampshire Public Utilities Commission, Rhode Island Public Utilities Commission, Vermont Public Service Board, and Vermont Department of Public Service. The rules also designate "Environmental Regulatory Agencies," including: Connecticut Department of Environmental Protection, Maine Department of Environmental Protection, Massachusetts Department of Environmental Protection, New Hampshire Department of Environmental Services, Rhode Island Department of Environmental Management, and Vermont Agency of Natural Resources.

39 GIS Rule 5.3(a). They also have audit authority under GIS Rule 2.5(e)(v.).

40 Id. at Part 3 of Appendix 2.4.

41 GATS Operating Rules, 2011.

42 Id.

43 Id. "Residual Mix" is discussed more fully in sections 2, 3, and 4 below.

44 Id.

45 Id.

publish data related to all energy generation produced and imported into their respective control areas, as well as data related to load claimed by retail electric providers.

D. Energy Transactions

Reflecting the two basic ways in which electricity can be acquired, through unit-specific or system purchases, the tracking systems have adopted protocols for acquiring relevant transactional data.[46] According to the GATS Operating Rules, "all Energy imported into the PJM Control Area must be accounted for through the creation of Certificates for the amount of such imported Energy."[47] GATS rules recognize that the "vast majority of imported Energy is not unit-specific," and that for these non-unit specific imports, GATS creates "system mix certificates" and places them into an account of the party importing the energy.[48]

In the case where energy is imported into PJM on a unit-specific basis, the transaction requires a transmission system reservation and NERC e-tag.[49] Meter data is provided to the GATS administrator in order to prove that the generator actually produced the scheduled number of MWh during the relevant period (i.e., that month). In cases where the information is not provided, GATS creates system mix certificates for these imports. They reflect the "emissions for the source control area of the import" rather than emissions associated with the specific unit.[50]

GATS "settles" its certificates once a year.[51] During this process, all trading of certificates for that trading period ceases. "Residual mix certificates" (discussed more fully in sections 2 and 3) are created based on the aggregation of attributes associated with "unsettled," i.e., untraded certificates. In GATS, residual mix certificates are defined as a type of certificate that is created at the end of the trading period, with attributes "equal to the average of all unsold/unused certificates, i.e., certificates that have not been transferred."[52] These certificates are then "allocated proportionately to all LSEs who have fewer Certificates than the load they served (i.e., do not have a one-to-one match with the MWh of load they served)."[53]

GIS has a similar process.[54] At the end of each trading

46 While these systems have protocols and acquire relevant data, this does not mean that they are availing themselves of the best attribute (i.e., emissions) data. For RGGI to rely on these systems for tracking emissions, this would need to occur. Data needs are discussed more fully in Sections 3 and 4.

47 GATS Operating Rules, 2011.

48 Id. "System mix certificates" should not be confused with either the "residual mix" or the (proposed) "adjusted residual mix certificates" that are discussed in this paper. According to the definition section of the GATS Operating Rules, a system mix certificate is a "type of Certificate that is based on the emissions for a given control area. These Certificates are created for Emergency Imports and Imports that are not associated with a Generating Unit registered in the GATS. The emissions for the source control area of the import are used on the System Mix Certificate."

49 For further discussion of NERC e-tags, see Appendix 1.

50 With respect to the source of the emissions data, the GATS rules indicate that "[e]ach Certificate associated with Imported System Energy will reflect the most recently available overall mix of fuel sources and emissions of the source Control Area. Certificate fields for each adjacent Control Area shall be based on the average of the emissions and fuel source data for such Control Area as included in the most recent year's data in the EPA's E-GRID software."

51 Id. According to the rules, the annual settlement date is the end of February for the certificates that were created in the prior year.

52 Definition of "Residual Mix Certificate," GATS Operating Rules, page 16.

53 Id.

54 See GIS Rule 2.7. "All Energy imported into the New England Control Area must be accounted for through the creation of Certificates for the amount of such imported Energy." 2.7(a). Emissions and fuel source data for unit-specific deliveries of power is to be provided by one of the New England State environmental regulatory agencies. In an effort to ensure quality of the data, the GIS rules require the certificate fields associated with system energy imported from an adjacent control area to be based "(i) on independently audited data for such Control Area, or (ii) on the average of the emissions and fuel source data for such Control Area as included in the most recent year's data in the EPA's E-GRID software or Air Data database, adjusted to reflect the latest available imports to and exports from such Control Area, or (iii) on data obtained by such Environmental Regulatory Agency from a local environmental regulatory agency for such Control Area."

period, all certificate trading for certificates created in that period ceases. With certain exceptions, all certificates are retired and the GIS administrator issues its quarterly reports.[55] In both systems, once a certificate is retired, it no longer exists for purposes of the tracking system.

E. Observations

Today, GATS and GIS are used primarily to track transactions associated with renewable energy. However, GATS and GIS can track all energy attributes for retail disclosure purposes. States including Delaware and Maine use GATS and GIS for this purpose. GATS and GIS produce numerous reports on the energy and attribute transactions within their respective control areas. While not currently used for these purposes, GATS and GIS, have the mechanisms and the capacity, with the help of state environmental regulators, to characterize energy use and emissions attributes associated with various energy transactions, including imports of electricity from areas outside the RGGI region.

55 New England Power Pool Generation Information, 2011, Rule 3.4. "Retirement of Certificates; Residual Mix." Rule 3.4 identifies other categories of certificates that can be held beyond the close of the trading period.

Section 2. Tracking Renewables and Sorting Out the Rest

High-Level Summary

- The GATS and GIS systems are essentially an assembly of generator and LSE accounts.
- A key feature of GATS and GIS is that they divide the electricity commodity that they track into two pieces: the generation "attribute" and the "electrons," i.e., MWhs.
- Generator accounts at the beginning of the reporting period hold attribute certificates created for all energy produced during the trading period.
- LSE accounts at the end of the trading period hold attribute certificates (e.g., renewable energy certificates, or RECs) purchased during the trading period.
- Attributes of all untraded certificates in generator accounts at the end of a trading period are aggregated to produce "residual mix certificates."
- Residual mix certificates are allocated at the end of the trading period to all LSEs that have fewer certificates than the number of MWhs of load that they served during the trading period.
- It is the tracking system's ability to identify and sort through the various resources and related attributes that RGGI could explore for its own purposes, to track emissions associated with energy imports into the region. However, using the process whereby the system develops a residual mix attribute has never before been used for compliance purposes in the manner being proposed here.
- While these systems have the capacity to track energy (and related attributes) produced and consumed, there are significant challenges that will need to be addressed to ensure that these systems are sufficiently robust to serve as data platforms for an effective imports policy.

A. Introduction

In order to appreciate how GATS and GIS might work to meet RGGI's tracking needs, the following discussion first outlines their capacity to track the purchase and sale of renewable energy certificates, because REC tracking is the most commonly understood. Using GATS as an example, this section illustrates how it:

(1) Tracks and reports the production, trading, and retirement of RECs, and

(2) Treats energy attributes associated with the remaining non-renewable resources that are not traded or retired.

This section concludes that the manner in which the tracking systems characterize untraded attributes provides a process that RGGI could adapt for its own CO_2 tracking purposes.

An Analogy

Before proceeding, it is important to understand just what is meant by "the manner in which the tracking systems characterize untraded attributes," in order to appreciate how this this might provide a process that RGGI could adapt for its own CO_2 tracking purposes. Consider the following analogy. Everyone has had the experience of reaching in his or her pocket for a couple of quarters, but also finding a handful of extraneous items like a paper clip, string, pennies, dimes, and nickels mixed in with the desired change. Just as one has to sort through those unwanted items to get at the 25-cent pieces, the tracking system can likewise identify and net-out irrelevant generation resources in order to isolate those types of generation whose attributes (in this case, emissions) RGGI decides it wants to track.

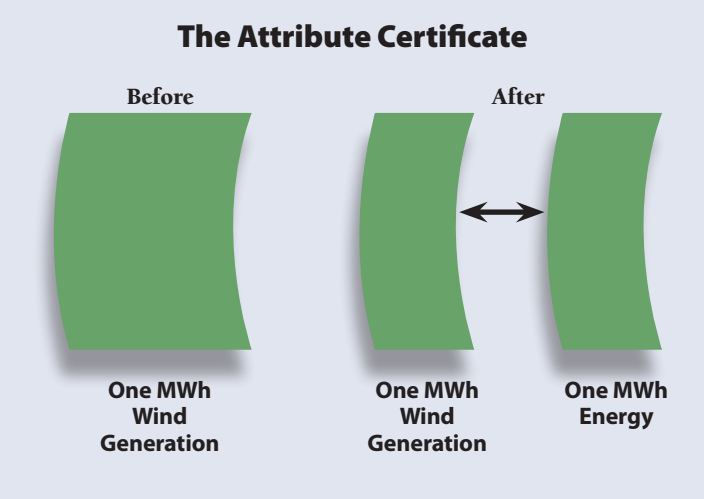
B. Tracking System Fundamentals

In a state with an RPS, electricity suppliers are typically required to present RECs equal to a percentage of the energy a company uses to serve its customers on an annual basis.[56] A REC is equal to one megawatt hour of electricity generated by a qualifying renewable source.[57] As a simple example, if a company with one thousand MWhs of load were subject to a 3% RPS, the company could comply by acquiring and retiring 30 RECs.

Figure 3 illustrates how these tracking systems characterize a MWh of electricity and the related attributes. A key feature of GATS and GIS is that they divide the electricity commodity into two pieces: the generation attribute and the electrons.[58] As shown below, GATS and GIS take a MWh of wind and characterize it as, (1) a REC representing one MWh of wind generation and also (2) an undifferentiated MWh of electric energy. Each is a commodity and can be accounted for and traded independently of the other. This approach allows for "generation attributes to be 'unbundled' from and transacted independently from energy transactions, in a manner that encourages price transparency and liquidity."[59]

Because attribute certificates (e.g., RECs) are separated from the underlying electricity, GATS and GIS have the capacity to identify and track each MWh of generation and consequently substantiate attribute or certificate ownership claims. This happens as the certificate and attribute are transferred from the generation facility or control area to the entity (e.g., an LSE) purchasing either the energy or certificate or both.

Figure 3



An LSE's portfolio may be composed of some renewable resources like solar, wind, and geothermal, along with resources produced by fossil fuels such as coal, natural gas, and oil. In simple terms, the tracking systems keep tabs on the production of energy, MWh by MWh.[60] In the case of renewable energy, the systems produce the RECs that are initially stored in generator accounts. So, for example, as a wind project produces energy in a given month, the tracking system produces RECs and places them in the

56 In lieu of complying with RECs, LSEs can also be required to pay an alternative compliance fee.

57 States vary in the type of data they track for RPS compliance and other uses. The tracking systems have the capability to track more data than an individual state may require. Thus, the tracking systems have broad utility across a number of different state policies.

58 As described in detail at Appendix 2, New York State's current tracking system relies on a process that does not separate energy and attributes the way that GATS and GIS do. GATS and GIS rely on tradable certificates, while New York and California use what is referred to as an "auditable contract path." For further definition of these two types of tracking system, see "Environmental Marketing Guidelines for Electricity," National Association of Attorneys General Environmental Marketing Subcommittee of the Energy Deregulation Working Group, December 1999 (NAAG Guidelines).

New York regulators have recently been authorized to develop a tracking system using tradable certificates. The language of bill number S 3872C18, recently signed into law in New York State, recognizes this important distinction in its outline for an approach to energy tracking that is similar to the approach adopted by GATS and GIS: "'Generation attribute certificates' shall mean the environmental, vintage and other attributes associated with the generation of kilowatt-hours and/or megawatt-hours of electrical energy. Generation attribute certificates shall exist as a commodity separate and apart from kilowatt-hours and/or megawatt-hours." See http://open.nysenate.gov/legislation/bill/S3872C-2011.

59 Grace & Wiser, 2002, at 3.

60 GATS, for example, relies upon meter information from the PJM Market Settlement System. See e.g., GATS Operating Rules at page 13. "The system will collect information on all generation resources, all MWh and kWh produced, and all load served within the PJM Control Area." Id. See note 94 below. For fuel mix and emissions disclosure purposes, LSEs in GATS must acquire an equal amount of certificates to the amount of load they serve.

wind generator's account.

The systems are used to then track the sale of RECs by generators to LSEs and the subsequent transfer of the RECs from generator accounts to LSE accounts. An LSE with an RPS requirement can purchase a REC, and the system moves the certificate from the generator account into the LSE account. For purposes of RPS compliance, the LSE will then have to retire the REC. Once a REC is retired, it can no longer be traded.

Considered from the perspective of one of these tracking systems, a market for electricity and electricity attributes is an aggregation of the activity over a given period in all generator accounts and all LSE accounts. While some produce electricity from renewable resources, others produce electricity using fossil and other fuels. Like the renewable generators, these other generators also collect attribute certificates in their accounts, and these certificates reflect the attributes associated with each MWh of electricity that they produce.[61]

However, unlike renewables generators, the other generators do not trade the attributes associated with their energy production. Although there is a relatively robust market for renewable resources and the corresponding RECs, there is not the same activity for attribute certificates associated with other types of resources. These attributes stay in generator accounts until the end of the tracking period, when the tracking system takes action. At the end of a trading period, tracking systems are able to characterize all of the non-renewable energy that is produced, and also the quantity of energy that has been used by individual LSEs.[62] The tracking systems do this through a process whereby they develop what is known as "residual system mix," literally the average attribute mix left over after all the REC trading is carried out and RECs are retired.

In more specific terms, following the end of the trading period, all trading of certificates ceases and all unretired (unclaimed, also called "unsettled") certificates are removed and retired automatically by the system as part of its residual mix calculation. The combined attributes of the pool of unclaimed residual generation are assigned to individual MWhs, which become "residual mix certificates," so that a residual mix certificate is a per-MWh average of the aggregate characteristics of all unsettled certificates. The attribute of each residual mix certificate is identical, and it is then assigned to each MWh of load in each LSE account that does not already have a retired certificate associated with it. So, at the end of the trading period, an LSE will have a portfolio composed of some amount of RECs and residual mix certificates.

C. "An Illustration of System Fundamentals"

The discussion that follows provides a simplified illustration of how GATS and GIS work, from the design of generator and load-serving entity accounts through the trading, tracking, and trueing-up residual mix process to account for all attributes in the system. This section looks briefly at sources of energy, then at illustrations of how generators and LSEs operate within the tracking systems.

i. Sources of Generation

The RGGI region is overlaid on three different wholesale market control areas that are managed by regional transmission operators or independent system operators (ISOs). The following table illustrates the sources of generation that are serving these areas in the RGGI region.[63] Using Table 2 and the resources in PJM as an illustration, the following discussion will explain in a simplified manner how generator and LSE activity is tracked.

Over a given period, the various generators in PJM will

61 For the content of GATS and GIS certificates, see notes 27-31 and accompanying text.

62 Not all states rely on the tracking systems to ascertain the energy used by LSEs. For example, in New Hampshire, LSEs provide the NH Commission with sales data in a publicly available filing, the NH Form One. In Massachusetts, the Department of Energy Resources (DOER) does not use the tracking system's "energy used by LSE," because monthly meter adjustments for November and December spill over into January and February, when RPS compliance is required annually. DOER relies upon confidential load data supplied to DOER by utilities.

63 The nomenclature for different generation types is adopted from RGGI studies, including, "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, pp. 7, 8, 20, 29-35. See also RGGI 2009 Monitoring Report, 2011. Data from Appendix 1 Summary of Data Sources, Tables 2, 3, 4. It should be noted that there are also net imports from non-RGGI/non PJM balancing authorities.

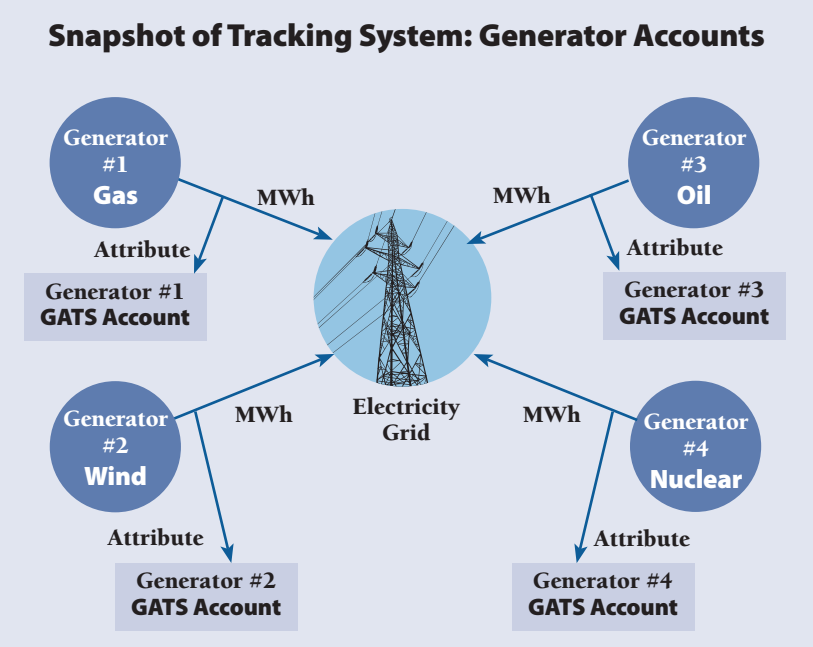
Table 2

Sources of Generation Serving the RGGI Region

PJM	New York	New England
Net imports (Non-RGGI PJM)	Net imports (Non-RGGI PJM)	Net imports (New York)
Net imports (ISO New York)	Net imports (Quebec, Ontario,)	Net imports (Quebec)
Net imports MISO	Net imports (ISO New England)	Net imports (New Brunswick)
RGGI-affected units	RGGI-affected units	RGGI-affected units
Non-RGGI units (smaller than 25MW fossil fuel)	Non-RGGI units (smaller than 25MW fossil fuel)	Non-RGGI units (smaller than 25MW fossil fuel)
Non-RGGI units (non-fossil fuel)	Non-RGGI units (non-fossil fuel)	Non-RGGI units (non-fossil fuel)

produce energy, and this energy and related attributes will be tracked by GATS. This would include non-RGGI units (non-fossil fuel: e.g., renewables and nuclear power), non-RGGI units (smaller than 25MW fossil fuel), and RGGI-affected units themselves (e.g., 25MW and larger fossil from Maryland and Delaware). Energy consumed in PJM is also provided from the New York ISO. Generators in PJM states other than Maryland and Delaware (non-RGGI PJM) also produce energy consumed in the region. Systems adjacent to PJM, such as the Midwest ISO (MISO), may also be responsible for net imports into PJM during the relevant time period.[64]

Figure 4



ii. Generator Accounts Illustrated

As shown in Figure 4, GATS contains generator accounts. For each MWh of energy that a generator produces and puts into the system (represented by the circle in the center), GATS places a certificate reflecting the generator's attributes into the generator's account. As the trading period begins , each generator receives, according to this illustration, its respective certificates for gas, wind, oil, and nuclear.

iii. LSE Accounts Illustrated

Figure 5 depicts several LSEs with their own accounts acquiring RECs. These LSEs may be subject to RPS or environmental disclosure requirements. As LSEs purchase RECs, GATS can account for the purchases and place these RECs into each LSE's account, enabling the LSE to demonstrate compliance for the relevant accounting period. In accounting for the movement of a REC from a generator to an LSE, the tracking system ensures that the REC is counted just once, and that its ownership lies with only one account holder.

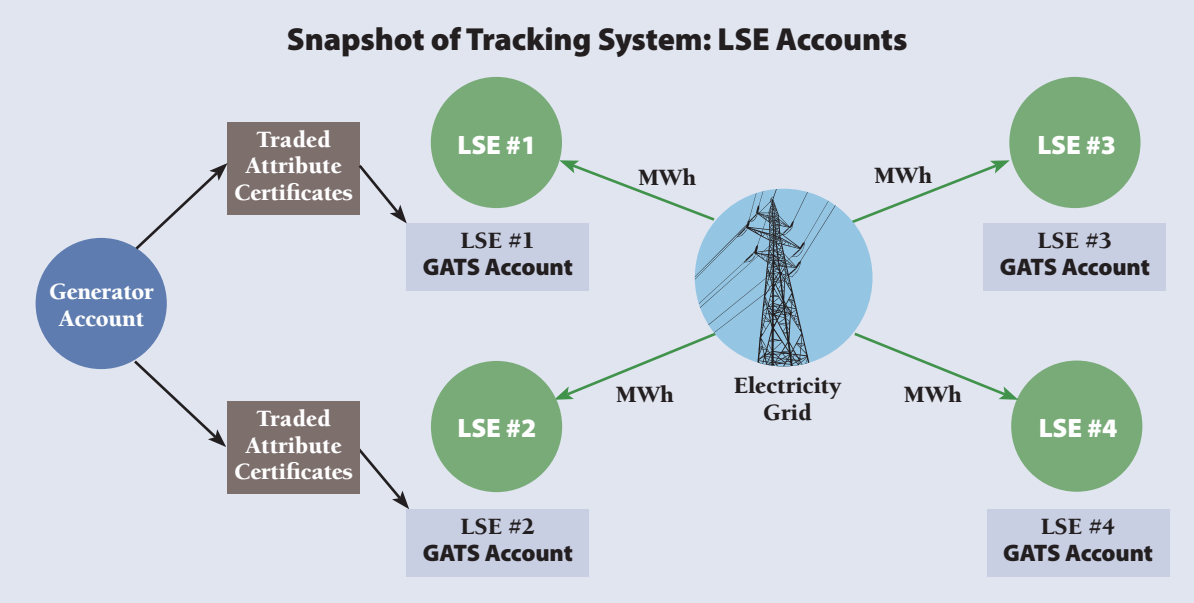
In Figure 5, each LSE acquires MWhs of energy, while LSEs #1 and #2 also acquire and store RECs. As generators produce energy and attribute certificates (including RECs), LSEs purchase

64 For further discussion of net generation sources into PJM, see discussion below at page 37.

energy and RECs.[65] Had they bought them from Generator #2 from Figure 4 above, the certificates would have been moved from Generator #2's account into the accounts of LSE #1 and LSE #2.

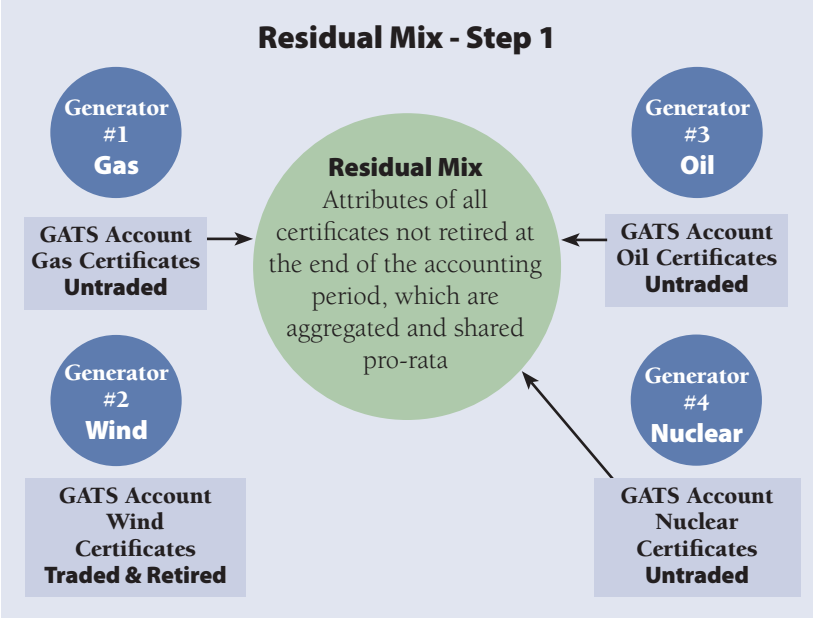
Figure 5 also shows LSEs acquiring MWhs of energy. GATS keeps track of the MWhs of electricity that an LSE purchases. However, because the tracking system separates the attribute from the MWh, as illustrated above in Fig. 3, the MWh at this point is undifferentiated and has no attribute associated with it.[66]

Figure 5



This changes, however, as the tracking system produces attributes for those remaining MWhs. At the end of the accounting period when all trading has stopped, GATS calculates an aggregate attribute reflecting the average of all attribute certificates that remain in all the generator accounts—in other words, attribute certificates that have not been traded and retired. The result of this aggregation process is called "residual mix."

Figure 6



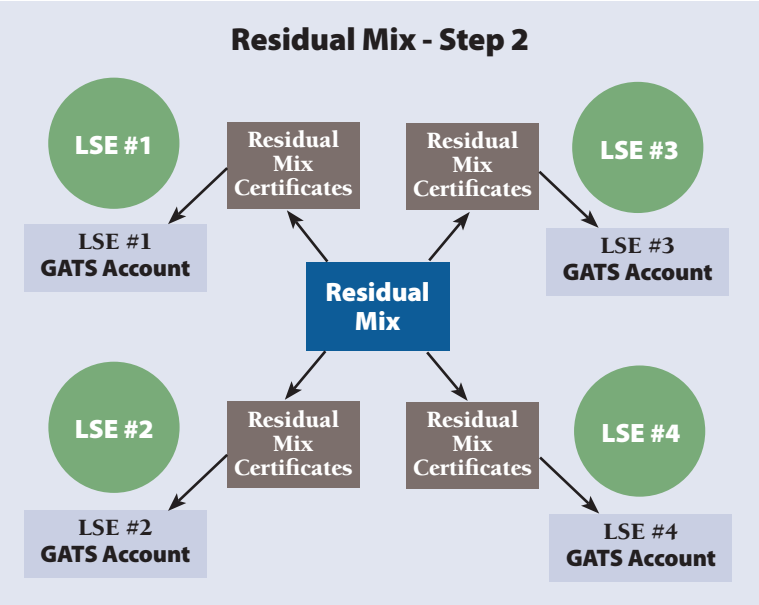
iv. Residual Mix Illustrated—Step One

Figure 6 is a simplified illustration of the first step of this residual mix process. It shows the aggregation of attributes from Generator #1's gas production, Generator #3's oil production, and Generator #4's nuclear production. Note that, without an arrow coming from Generator #2's account, certificates associated with Generator #2's wind production are assumed to have been traded and retired by LSEs. Therefore, in this case, no wind attributes are reflected in the residual mix.

65 While energy generators and LSEs, respectively, produce and consume electricity in real time, the term "keeping track" should not be construed as a real-time process. It means that records accounting for the transactions represented by the purchases of energy and attributes are kept by these systems according to their respective schedules.

66 It should be noted, however, that not all states rely upon the capacity of these tracking systems to track MWhs of electricity purchased by LSEs. This is discussed further at Sections 3 and 4.

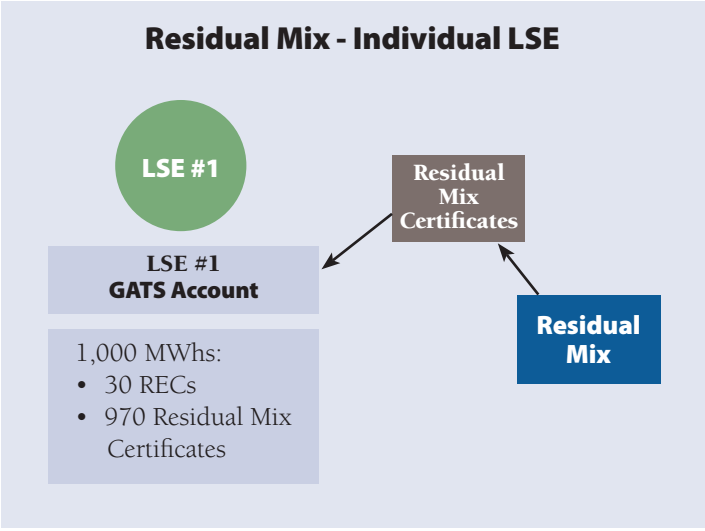
Figure 7



v. Residual Mix Illustrated—Step Two

The next step in the process involves the tracking system's assignment of the residual mix attribute to all non-retired/non-banked certificates owned by LSEs in the system. The LSE receives the number of residual mix certificates that is the difference between the number of non-residual mix certificates in the LSE account and the LSE's claimed load. (See Fig. 7). In other words, all the energy for which the LSE has not acquired RECs (or other certificates[67]) is trued-up with a residual mix attribute that reflects the overall mix of the system after the resources that were traded have been removed.

Figure 8



vi. Assignment of Residual Mix Illustrated

What follows, as seen in Figure 8, is a simplified illustration of such an assignment. An LSE that has 1,000 MWh of load and complies with a 3 percent RPS obligation would have to secure and retire 30 RECs. To reflect the remaining energy in its portfolio, GATS would assign it 970 residual mix certificates to cover the attributes of the remaining MWhs of load in the LSE's portfolio.

As can be seen in these illustrations, the generation that is produced in PJM is accounted for both in terms of MWhs and attributes. Attribute certificates that are not traded and retired get aggregated into residual mix, and the system allocates the number of residual mix certificates that is the difference between the number of non-residual mix certificates in the LSE account and the LSE's claimed load.

It should be emphasized that developing a residual mix attribute is not simply a process of aggregating various generation attributes. As can be seen in Table 3, it is a process that occurs after attributes that have been traded have been removed from generator accounts through retirement.

As can be seen in these illustrations, the generation that is produced in PJM is accounted for both in terms of MWhs and attributes. Attribute certificates that are not traded and retired get aggregated into residual mix, and the system allocates the number of residual mix certificates that is the difference between the number of non-residual mix certificates in the LSE account and the LSE's claimed load.

It should be emphasized that developing a residual mix attribute is not simply a process of aggregating various generation attributes. As can be seen in Table 3, it is a process that occurs after attributes that have been traded have been removed from generator accounts through retirement.

67 It should be noted that, while the discussion in this paper has focused on REC trading, states have various portfolio standards (e.g., the Massachusetts Alternative Energy Portfolio Standard), all of which rely upon tracking systems like GATS and GIS, and the trading of various types of certificates. Thus, for example, certificates representing waste-to-energy resources would be excluded from a residual mix calculation if they were retired by an LSE.

Table 3

Residual Mix	
System Mix	**Residual Mix**
All certificates produced in the wholesale market (i.e., all generation plus net imported generation) prior to being traded and retired	All certificates Minus: • Retired certificates (e.g., RECs)

D. Observations

Because an attribute certificate is created for each MWh produced, GATS and GIS can identify and account for, as directed, each attribute certificate. As explained in the next section, it is the tracking system's ability to identify and sort through the various attribute certificates that RGGI could explore for its own purposes, to track emissions associated with energy imports into the region.

It should be recognized that residual mix has never before been used for compliance purposes in the manner being proposed here. It should also be noted that, while these systems have the capacity to account for the energy (and related attributes) produced and consumed, there are significant challenges that will need to be addressed to ensure that these systems are sufficiently robust to serve as data platforms for an effective imports policy. As the next sections explore the capability of GATS and GIS to track CO_2 emissions, this paper also identifies and analyzes some of the challenges related to this approach.

Section 3. Using GATS and GIS to Track CO_2 Emissions—Developing *Adjusted* Residual Mix

High-Level Summary

Developing an *adjusted* residual mix requires similar steps to those used to develop residual mix:

- First, an adjusted residual system mix is literally the average attribute mix left over after excluding the categories of generation sources that are:
  - Otherwise accounted for (i.e. *specified* transactions);
  - Would not be expected to be additional sources of CO_2 (e.g., PJM units in the states of Delaware and Maryland that are already subject to the program); and
  - Fossil resources not included under the current RGGI policy (e.g., smaller than 25 MW fossil units).
- Second, the CO_2 attributes of the adjusted residual mix certificate would be assigned to each MWh of load in each LSE account that does not already have a retired certificate associated with it.

A. Introduction

The discussion in the prior section provides a simplified description of how a tracking system like GATS or GIS works. It illustrates the fundamental interaction between generator and LSE accounts, and shows how, once a REC trading period is closed (and those certificates are netted out of all other generation resources), the system allocates the unclaimed generation attributes among LSEs through the residual mix process.

Because the purpose of these tracking systems has been largely driven by the need to incent and account for renewable energy production and sales, there has been less emphasis on residual generation attributes or how the tracking systems work, or can work, in characterizing them. However, because the tracking systems have protocols for identifying all the resources being used within the system and their related attributes (including associated air emissions), GATS and GIS possess the capacity to identify CO_2 emissions associated with the power being consumed at the LSE level in the RGGI region. This includes energy from specific units, from system power in RGGI, and both unit-specific and system power from adjacent systems.

Before considering how adjusted residual mix can characterize emissions associated with energy acquired by LSEs, this section briefly reviews various categories of resources available. Because a leakage mitigation policy could create an incentive to represent energy purchases as less carbon-intensive than they actually are, it is important to be able to characterize not only the source of energy production but also the manner in which the power is purchased.

B. How the Tracking Systems Characterize Transactions

The tracking systems have adopted certain protocols for acquiring relevant transaction data to reflect the two basic ways in which imported electricity can be acquired: through unit-specific purchases or system purchases. According to the GATS Operating Rules, "all Energy imported into the PJM Control Area must be accounted for through the creation of Certificates for the amount of such imported Energy."[68] GATS rules recognize that the "vast majority of imported Energy is not unit-specific," and that for these "non-unit specific imports," GATS creates system mix certificates and places them into an account of the party importing the energy.[69]

68 GATS Operating Rules, 2011

69 See note 43.

In the case where generation is imported into GATS or GIS on a *unit-specific* basis, the transaction requires a transmission system reservation and NERC e-tag.[70] In GATS, meter data is provided to the administrator in order to demonstrate that the generator actually produced the scheduled number of MWh during the relevant period (i.e., that month). In cases where the information is not provided, GATS creates system mix certificates for these imports that reflect the "emissions for the source control area of the import" rather than emissions associated with the specific unit.[71]

In order to characterize system imports, data on emissions and fuel sources must be given to the system administrator by an approved state environmental regulatory agency from within the GIS control area. For example, the Massachusetts Department of Energy and Environmental Protection provides the GIS administrator with the average emissions rate of control areas adjacent to New England.[72] For certificates associated with imported system energy, all certificate fields other than "fuel source," "emissions," and "location" indicate "not applicable." Fuel source, emissions, and location certificate fields must be independently audited or based on averaged emissions and energy use estimates.

Using the Hydro-Quebec system as an example, Hydro-Quebec develops an annual emissions rates summary for CO_2, NO_x, and SO_2 audited by a third-party to ensure accuracy and transparency. Currently those emissions factors are used in GIS to characterize system imports from Quebec to New England. This process takes place administratively, and the data produced by Hydro-Quebec are likely to become the data in the tracking system that are reviewed by "an approved State environmental regulatory agency" to characterize system imports from Hydro-Quebec.[73]

Thus, with the exception of imported electricity that could be bought under a unit-specific transaction (and would come with an e-tag reflecting that specific unit's emissions attributes), certificates for attributes associated with imported system power would be assigned the system-average environmental attributes for the control area from which they are purchased.

Table 4 illustrates data sources associated with ISO-specific tracking scenarios that RGGI regulators could expect to encounter going forward, if RGGI were to use GATS and GIS as its tracking platforms. Each category corresponds to an ISO in the RGGI region and illustrates the likely sources of energy available to an LSE, depending on its location. Each category of energy source will come with its own emissions data challenges. Data quality will vary depending on their location, regulator access, and quality of emissions information.

Table 4

Example Sources of Emissions Data

LSE Location	Sources of Energy
Maryland	**PJM** ***Net Imports:*** New York ISO, and other adjacent regions
New York	**NY ISO** **Net Imports:** New England ISO, PJM, Ontario, Quebec
Massachusetts	**New England ISO** ***Net Imports:*** New York ISO, Quebec, and New Brunswick

C. Preventing the Mischaracterization of Energy Purchases

In 2002, Grace and Wiser recognized that, due to the increase in what they termed "cross-border transactions" for electricity and related attributes, it would be necessary for regulators to develop "approaches to defining valid transaction structures and accounting treatments … that meet the needs of policymakers, regulators, and markets for verification, credibility, and compatibility."[74] Furthermore,

70 For further discussion of the role of NERC e-Tags, see Appendix 1.

71 GATS Operating Rules, 2011. With respect to the source of the emissions data, the GATS rules indicate that "[e]ach Certificate associated with Imported System Energy will reflect the most recently available overall mix of fuel sources and emissions of the source Control Area. Certificate fields for each adjacent Control Area shall be based on the average of the emissions and fuel source data for such Control Area as included in the most recent year's data in the EPA's E-GRID software."

72 GIS Operating Rule 2.7(b)

73 This description is based upon an interview between author and Hugo Levert of Hydro-Quebec.

74 Grace & Wiser, 2002, at 1-2.

they state:

> In the absence of established methods to properly account for such cross-border attribute sales, it will be challenging for regulators to verify unique attribute claims. It will also be challenging for regulators to limit transactions that appear to achieve compliance but that in reality do not meet the underlying policy objectives. … Further complicating matters, accounting and verification systems are evolving independently and at a different pace in different regions, states, and provinces.[75]

They recognize that tracking system rules need to pay greater attention to these types of transactions.

> [W]ithout any restrictions on the ability to export attributes, some regulators responsible for disclosure or EPS requirements have expressed legitimate concerns that market participants could exploit gaps in their rules or the underlying accounting systems by engaging in sham transactions solely for the purpose of "green washing" a disclosure label or evading the intent of an EPS requirement.[76]

According to Grace and Wiser, the first step in mitigating this potential could be accomplished by "[s]tarting with the *presumption that any export of non-renewable attributes would be considered a sham and prohibited* unless a non-sham purpose could be demonstrated to a market monitor."[77] They contend that "[e]xports of anything else besides a blend representing the system mix would require a permit showing that the transaction is not a sham."[78]

D. California's Approach

In implementing First Jurisdictional Deliverer (FJD), California regulators have considered addressing this potential problem by requiring "first deliverers" (i.e., LSEs and power aggregators) to characterize their out-of-state energy purchases as "unspecified" transactions: i.e., system power rather than power from a specific generator.[79] California also provides several exceptions to this rule, allowing deliverers to characterize transactions as "specified" in three cases, where there is:

(1) An historical contract with a specific power plant, and delivery path into California;
(2) A purchase of power from a new resource; and
(3) A purchase of incremental power at an existing generation plant.

With specified transactions, because the generator is identified, it is relatively easy to assign emissions to the energy acquired in the transaction. On the other hand, with unspecified transactions, California makes certain assumptions about the generation profile and related emissions in an adjacent power system, and adopts a default emissions factor to apply to those purchases.

E. A Similar Approach for RGGI

By requiring all system purchases to be characterized as unspecified, and to take on attributes associated with system power—an approach suggested by Grace and Wiser—the ability to manipulate emissions attributes is diminished, if not entirely taken away. (For a more complete discussion of "Resource Shuffling," see Appendix 3.)

If similar requirements were adopted in RGGI, the ability to mischaracterize attributes of system energy purchases likewise would be removed. Imports, therefore, would be unspecified unless one of following three exceptions could be demonstrated by the LSE:

(1) An historical contract with a specific power plant, and delivery path into the region;
(2) A purchase of power from a new resource; or
(3) A purchase of incremental power at an existing generation plant.

Companies in the RGGI region seeking to demonstrate that their transaction involved one of these three scenarios would need to do so with attribute certificates for each MWh for which they are making the claim. In this manner, specified claims could be accounted for by individual LSEs, and the attributes could be removed from the residual mix just as RECs that have been traded and retired are removed. This approach would allow the LSE to claim the unit-specific resources it has acquired and, due to the acquisition of certificates, those would not be reflected in the residual mix.

75 Grace & Wiser, 2002. Citations omitted.

76 Id. at "Text Box 3. Export Eligibility: Addressing Green Washing, Sham Transactions and Gaming."

77 Id.

78 Id.

79 See Murtishaw, 2011.

Table 5

PJM Adjusted Residual Mix		
All certificates produced in the wholesale market (i.e., all generation plus net imported generation) prior to being traded and retired.	**All certificates** ***Minus:*** • Retired certificates (e.g., RECs)	**Residual Mix** (i.e., system mix minus retired certificates) ***Minus:*** • RGGI affected generation (e.g., already-covered MD and DE RGGI generation); • Non-RGGI-affected generation (e.g., smaller than 25 MW fossil); • Net imported generation from adjacent RGGI system (e.g., NY ISO); and • Specified transactions.[82]
	Residual: • RGGI-affected generation (e.g., already-covered MD and DE RGGI affected generation); • Non-RGGI-affected generation (e.g., smaller than 25 MW fossil); • Non-fossil generation; and • Net imported generation (NY ISO, MISO).	***Adjusted Residual:*** • Non-fossil generation; • Larger than 25 MW (non-RGGI fossil) generation; and • Net imported generation from adjacent non-RGGI system (e.g., MISO).[83]

F. Further Adjusting Residual Mix

As explained further below, this section of the paper explores an extension of the residual mix concept to make further adjustments and isolate certain generation resources (and corresponding CO_2 emissions) serving load in the RGGI region.

The proposal here, illustrated in Column 3 of Table 5, recommends that regulators expand upon the tracking systems' residual mix mechanism to:

(1) Identify those unspecified resources whose emissions a future RGGI load-side policy would not want to capture in the adjusted residual mix calculation;
(2) Exclude them; and
(3) Aggregate in the form of adjusted residual mix the remaining unspecified resources of generation whose emissions RGGI might want to recognize under a potential policy.

As noted in the prior section, and continuing to use PJM as an example, in order to first derive residual mix, the system today starts with all certificates produced in the wholesale market (i.e., all generation plus net imported generation) prior to any being traded and retired. (Table 5, column 1). The system would then exclude all traded and retired certificates, such as RECs. After this initial step, a PJM residual mix would be composed of the following resources (Table 5, column 2, line 2):

- RGGI-affected generation (e.g., already-covered MD and DE RGGI-affected generation);
- Non-RGGI-affected generation (e.g., smaller than 25 MW fossil);
- Non-fossil generation (e.g., nuclear power); and
- Net imported generation (NY ISO, MISO).

In order to identify resources whose CO_2 emissions would affect RGGI, the system would make a further adjustment, excluding additional resources that are

82 Depending on their carbon intensity, specified transactions would be netted out of the adjusted residual mix, but would still incur an allowance obligation if retired by an LSE.

83 This would likewise apply to systems that are adjacent to the New England ISO.

irrelevant to a potential expanded RGGI compliance policy. (See Table 5, column 3.)

Like the process described in the pocket-change analogy, GATS would exclude RGGI-affected generation (e.g., already-covered MD and DE RGGI generation).[84] Net imports from NY ISO should also be excluded for the same reason. Since RGGI does not cap emissions from non-RGGI-affected generation (e.g., generation in the region that is smaller than 25 MW fossil), that category might also be excluded.[85] RGGI should also further adjust residual mix by excluding "specified transactions," i.e., those transactions treated as exceptions to the rule that system power must be treated as unspecified power. Consequently, the adjusted residual mix—i.e., the resources remaining after these further adjustments—would be composed of the following generation types:

- Larger than 25 MW (non-RGGI fossil) generation;
- Net imported generation from adjacent non-RGGI system (e.g., MISO); and
- Non-fossil generation.

Fossil generation larger than 25 MW (non-RGGI) would be included because it is the same type of generation that RGGI currently regulates in-region. So would net imports from MISO, since MISO resources would come with carbon content. Because non-fossil generation (e.g., nuclear and hydro resources) comes with no carbon content but is part of the system mix, it is not adjusted out of the mix and would remain.

G. Using Adjusted Residual Mix and Tracking Imported Power

Tracking imported power this way is a multi-step process. The first part, just described, involves the characterization of the system mix after removal of both (a) the generation resources that regulators would not want to include for CO_2 compliance purposes, and (b) the resources that would be counted on a unit-specific basis. The next step involves the proportional allocation of the actual CO_2 profile, as derived in step one, to all LSEs that have fewer certificates than the load they served: i.e., those that do not have a one-to-one match with the MWhs of load they have served.

The same two-part process would apply in establishing residual mix to identify the carbon intensity of the imported energy-serving load. First, an adjusted residual system mix is literally the average attribute mix left over after not only all the REC trading is carried out and RECs are retired (See Table 5, column 2), but also excluding the other attributes that would not be included under a policy (see Table 5, column 3). In the PJM illustration above, adjusted residual mix would exclude RGGI-affected generation (e.g., already covered MD and DE RGGI-affected generation); certain net imported generation (e.g., NY ISO,); and non-RGGI-affected generation (smaller than 25 MW fossil fuel). This would leave the attributes associated with larger than 25 MW (non-RGGI) generation, net imported generation from adjacent non-RGGI system (e.g., MISO), and non-fossil generation.

The second step involves assigning adjusted residual mix to each MWh of load in each LSE account that does not already have a retired certificate associated with it. The attribute of each adjusted residual mix certificate would be identical. The CO_2 attributes associated with the adjusted residual mix certificate would be the combined attributes associated with, (a) the system's non-fossil generation, (b) larger than 25 MW (non-RGGI) fossil generation, and (c) net imported generation from adjacent non-RGGI system (e.g., MISO).

H. Net Emissions from Adjacent Control Areas

The process of identifying relevant resources and determining an adjusted residual mix emissions factor would work largely in the same way for the New York ISO and New England ISO. There is one major difference between the circumstances in these control areas and PJM that should be noted: unlike PJM, the ISOs in New York

84 GATS is able to identify these resources based on recommendations made by RGGI staff in 2008. RGGI put this change into place pursuant to staff recommendations in the 2007 and 2008 leakage reports. See RGGI, "Potential Emissions Leakage," 2008. See also GATS Subscriber Meeting Presentation, 2009, and PJM "State of the Market Report" 2011.

85 For a further discussion of this point, see the analysis of "Other Data" in Section 4 and "Resource Shuffling" in Appendix 3.

and New England do not contain a mixture of states that are subject to RGGI and those that are not.[86]

I. Observations

Developing an adjusted residual mix requires similar steps to those used to develop residual mix. First, an adjusted residual system mix would be the average attribute mix left over after netting out those categories of generation that regulators decide are appropriately excluded—for example, specified purchases, smaller than 25 MW fossil units, and Delaware and Maryland units already subject to the program. Second, the CO_2 attributes of the adjusted residual mix certificate would be assigned to each MWh of load in each LSE account that does not already have a retired certificate associated with it.

86 It should be noted that the NY ISO and NE ISO also have energy imports from adjacent wholesale power systems that are not subject to RGGI. These imports are a mixture of system and unit-specific imports. A discussion related to non-US systems is found in the next section.

Section 4. The Need for Appropriate Data

High-Level Summary

- RGGI regulators could encourage tracking systems to employ highly reliable data produced pursuant to 40 C.F.R. Part 75, where applicable.
- RGGI regulators could build upon their current audit authority in GIS—and, more important, their work history with tracking system administrators—to establish adequate regulator access to tracking system data and functions to be able to verify the accurate use of energy consumption data and related emissions data for purposes of a regulatory compliance program.
- RGGI regulators could consider coordinating tracking-system certificate production schedules and EPA's schedule for producing emissions data, by either:
  - Adopting a longer period between the time the electricity is generated and the time that the tracking system mints a certificate;
  - Establishing a true-up mechanism for the submission of all generator emissions information, to reflect the availability of more recent Part 75 data; or
  - Establishing a true-up mechanism for the submission of fossil resource information only, to reflect the availability of more recent Part 75 data.
- RGGI regulators could review current state laws, regulations, orders, and approvals related to GATS mandates to ensure that no modifications are necessary in order to adjust existing tracking system schedules and normalize them with the schedule for the production of EPA's Part 75 data.
- RGGI regulators could consider the potential suitability of newly developed emissions monitoring data from EPA produced pursuant to the CO_2 NSPS.
- In addressing challenges associated with characterizing emissions, RGGI regulators could continue to draw upon their experience in providing additional oversight for quality control and quality assurance purposes, including procedures for the certification and recertification of approved approaches to CO_2 monitoring from fossil plants, and accepted methods for determining fuel mix and emissions characteristics of provider resource portfolios based on market settlement data or other relevant market data.

A. Introduction

The quality of data that is used in a tracking system is a key aspect of the environmental integrity of the tracking program and the ability of regulators to rely upon it. While GATS and GIS constitute effective systems for tracking energy use and related attributes, these systems will only be as precise as the data they are provided. In developing a tracking proposal for RGGI, it is important to assess the sources and quality of emissions data to ask whether this level of quality is acceptable; and, if necessary, how it might be improved.

The following data-related topics are considered here:

- Best available data;
- Current data requirements in GATS and GIS;
- Need to coordinate data production and tracking system schedules;
- Potential additional EPA data sources;
- Need for regulator access to tracking systems; and
- Data characterizing adjacent power systems.

B. The Best Data

RGGI's initial design and coverage of fossil generation 25MW and greater was largely predicated on the availability

of data provided by US EPA under the Clean Air Act's Title IV Acid Rain Program.[87] The emissions monitoring rules for this program are found in federal regulations at 40 C.F.R. Part 75, and the data produced pursuant to these regulations are often referred to as "Part 75 data." Under Title IV:

> *Each source must continuously measure and record its emissions of SO_2, NO_x, and CO_2, as well as heat input, volumetric flow, and opacity. In most cases, a continuous emission monitoring (CEM) system must be used.*[88]

The universe of Title IV generators corresponds largely but not entirely to the 25 MW and larger category of resources currently covered by RGGI.

Part 75 data are not only used for Title IV purposes. RGGI has already appropriated this data source, and uses it to populate CO_2 emission information contained in its own CO_2 Allowance Tracking System (COATS). According to RGGI, "regulated power plants are required to report data necessary to quantify CO_2 emissions to RGGI participating states," and:

> *CO_2 emissions data from each regulated power plant is recorded in the EPA Clean Air Markets Division … database in accordance with state CO_2 Budget Trading Program regulations and U.S. EPA regulations at 40 CFR Part 75 and transferred to RGGI COATS.*[89]

RGGI recently relied upon the same data, in part, in developing its "CO_2 Emissions from Electricity Generation and Imports in the 10-State Regional Greenhouse Gas Initiative: 2009 Monitoring Report."[90]

RGGI regulators have safeguards to ensure the overall quality of the data upon which they rely. In addition to already being required to submit emissions data pursuant to federal law, in some cases these emissions sources are also subject to oversight for quality control and quality assurance purposes. For example, according to Massachusetts DEP, its relevant state air monitoring provisions (310 CMR 7.70) "include deadlines and procedures for the initial certification of, and, under certain circumstances, the recertification" of an approved approach to CO_2 monitoring from fossil plants 25MW and larger. In addition, and in keeping with federal regulations, Massachusetts DEP notes, "the monitoring section establishes procedures to apply conservative missing data routines in the event that a monitoring system fails to meet quality assurance and quality control requirements."[91]

C. Current Emissions Data Requirements in GATS and GIS

Federal air pollution control regulations produce up-to-date and reliable CO_2 emissions data, and state air regulators have access to and confidence in these data. However, the use of these data by the tracking systems being considered here is uneven.

On the one hand, GIS rules require the generators that are subject to 40 C.F.R. Part 75 to indicate so. They also require the GIS administrator to use Part 75 data in GIS, where available.[92] The GIS operating rules also require the GIS administrator to account for changes or updates in emissions data over the course of a calendar year. GATS, on the other hand, does not impose the same requirements.[93] GATS uses Part 75 data from the previous year if available and if not overwritten by user-entered data. Emissions

87 There are some exceptions to this statement: e.g., in Massachusetts there are some RGGI units that are not subject to Title IV.

88 According to EPA, under this program that is coordinated between the federal government and state environmental agencies, there are provisions for "initial equipment certification procedures, periodic quality assurance and quality control procedures, recordkeeping and reporting, and procedures for filling in missing data periods." See http://www.epa.gov/airmarkets/emissions/continuous-factsheet.html

89 For more information on U.S. EPA's emissions reporting requirements, see the U.S. EPA CAMD website at www.EPA.gov/airmarkets/emissions.

90 RGGI 2009 Monitoring Report, 2011.

91 Id.

92 GIS Operating Rule 2.5(e)(i). Quarterly Emission Adjustments.

93 See PJM-EIS presentation at http://www.pjm-eis.com/events-and-training/~/media/pjm-eis/events/20080910-agenda.ashx; see also GATS presentation to NJ RGGI Working Group, Newark, NJ, June 5, 2008.

data in GATS come from various sources; they can be self-entered by the generators. They can also be derived using various other methodologies.[94]

D. Coordinating Schedules

One reason that GATS does not use Part 75 data may be due to the discrepancy between its certificate production schedule and the EPA's schedule for producing emissions data. GATS mints certificates at the end of each calendar month. Part 75 data are reported quarterly, but the data are available one month after the end of the quarter. Because of this schedule, Part 75 data are not yet available to include in the certificates.

In response to requests of New England regulators, GIS established its schedule by adopting a long-enough period, between the time the electricity is generated and the time that the certificate is minted, to allow for acquisition of Part 75 data. GIS now produces certificates on a quarterly basis. In order to take advantage of the most up-to-date Part 75 data, GATS would need to undertake a similar change to that which GIS adopted.

Alternatively, GATS could continue under its existing schedule, relying on older Part 75 data, but require a subsequent true-up in emissions information when the more recent data become available. This approach, however, would make a key factor—emissions—less certain, rather than more so, for potentially responsible retail service providers and for regulators. Another alternative might be for GATS to continue with its RECs minting schedule but modify the schedule for fossil resources only, so that GATS might better coordinate with the production of Part 75 data.

Regardless of these particular scheduling accommodations that might be adopted to normalize the interaction between tracking systems and the most up-to-date emissions data production, it is recommended that the tracking systems avail themselves of these resources and their data. RGGI regulators have found these data to be of sufficient quality, and larger generators in both tracking systems are already submitting these emissions data to EPA under federal law. For RGGI regulators to encourage tracking system administrators to use the data, as GIS does already, should not create any additional reporting burden on generators outside of the RGGI region. All Part 75 generators already provide this to EPA, which makes it available to the public.

If states were to consider linking the tracking systems with the best emissions data sources, it would be prudent for them to review current state law related to tracking system mandates. Regulators should review current statutes, regulations, or orders that may have been drafted so specifically as to incorporate current tracking system schedules, and that might need to be redrafted.

E. Carbon Intensity of the Adjusted Residual Mix

There is an additional potential scheduling challenge raised by this proposal. This concerns coordination between the timing associated with tracking system determination of an adjusted residual-mix emissions factor and the end of the RGGI three-year compliance period, because the carbon intensity of residual mix certificates is not known until after certificate trading has closed for each trading period. For example, in GIS the residual mix value can vary from one calendar quarter to another, because LSEs are allowed to bank certificates and not commit them to a retirement account until the fourth calendar quarter of each year, with trading ending June 15 for the prior calendar year. Given the potential for movement in the carbon intensity figures for adjusted residual mix until approximately six months after the last quarter of the year, LSEs would be subject to a degree of uncertainty as to the ultimate carbon intensity of an residual mix emissions factor that might apply to their energy purchases.

It is likely that coordination with the tracking schedule would not become an issue until the third year of RGGI's compliance schedule. Because RGGI has a three-year compliance period, this time lag and associated lapse in certainty as to some of an LSE's compliance obligation in year three would require an adjustment of sorts from the

94 For example, GATS allows generators to derive emissions data using an emission rate (lbs./MWh) calculated by PJM-EIS using EPA unit-level annual emissions for generators in the Acid Rain Program based on "preliminary 2007 data." Generators can also use a lbs./MWh emissions rate based on the EPA's "Emissions & Generation Resource Integrated Database" (eGRID). The eGRID Version 2.1 contains 2004 emissions data. GATS also allows emissions data to be derived through the use of a "fuel type default" lbs./MWh approach.

tracking system or from RGGI itself. Adjustments could be made to the scheduling that allow the time frame for demonstrating RGGI compliance to extend for a sufficient time period after the three-year compliance period ends, to accommodate the tracking system.

For example, RGGI's first control period took effect on January 1, 2009 and extended to December 31, 2011. The deadline for CO_2 budget sources to provide CO_2 allowances for compliance and to certify compliance for the first control period was March 1, 2012. This program compliance deadline could be modified going forward—e.g., to July 1 after year three. An alternative, less intrusive change might keep the existing RGGI compliance schedule in place but allow for true-ups to an estimated carbon intensity figure that LSEs would submit within the current RGGI schedule, but would be allowed to true up by July 1 after year three.

F. Potential Additional Sources of Improved EPA Data

Another opportunity for the RGGI states to access improved emissions data from fossil units may present itself as EPA proceeds in the development of New Source Performance Standards (NSPS) for new, modified, and, ultimately, existing sources of CO_2 emissions from fossil electric generation. The Clean Air Act requires the EPA to establish categories of major polluters, and to develop performance standards for new or modified sources in each category. This list may include units that were not included with the units subject to the acid rain program's data requirements.

In December 2010, the EPA entered into a settlement in which it agreed to develop NSPS for new and modified electric generators, and emission guidelines for existing electric generators by the end of 2012. In March 2012, EPA released a proposed regulation establishing CO_2 emissions limits from new fossil fuel-fired electric utility generating units.[95] EPA has not indicated when it expects to issue an NSPS for existing sources.

G. Regulator Access to the Tracking Systems

As noted in the introductory discussion of GATS and GIS, these systems make available numerous reports to regulators and the public that characterize energy production and use, as well as related emissions attributes. Still, for RGGI to use GATS and GIS to track emissions in the manner being proposed here, regulators will need greater access to these systems.

GATS, for example, produces:

- **RGGI – CO_2 Emissions**, listing "CO_2, MWh, and weighted average emission rate (in lbs. CO_2/MWH) for the RGGI-affected units, Unaffected small fossil fuel-fired RGGI-region units, Other RGGI region units and Imports";
- **RGGI – Total CO_2 Emissions**, listing total "CO_2 Emission in Tons for the entire RGGI Region in PJM and then each individual RGGI State in PJM";[96]
- **Total Certificates Allocated to Load by State**, detailing "certificate allocation to load, by state and fuel percentage";[97]
- **Total Emissions by Generator**, reporting on "total emissions in pounds, by generating unit and fuel type, for the given month and year selected";[98] and
- **My Imports**, displaying "system and unit contract import transactions that the MSET" (PJM's Market Settlement System)[99] reports for a specific company "during the listed month."[100]

95 Electric utility generating units are those constructed for the purpose of supplying more than one-third of their potential output, and more than 25 MW net electrical output, to any utility power distribution systems for sale.

96 GATS Operating Rules, 2011. Appendix E. The GATS "Import Generators" report contains general information on all registered import generators and GATS's quarterly; and an annual "Energy Summary" contain general information including generation imports and exports. GATS also produces a report entitled "Import System Mix," that shows "import system mix for each year and month in which Certificates have been assigned, up to and including the next date on which Certificates will be created."

97 GATS Operating Rules, 2011. "Total Certificates Allocated to Load by State."

98 Id. Report entitled "Total Emission by Generator."

99 PJM Market Settlement System (MSET): The system used to perform monthly billing and settlements for the wholesale electricity market in the PJM Control Area. See note 60 above.

100 An additional report produced by GATS, "My Certificates Only Import," provides "general information for all Certificate Only Import requests for the open Annual Trading Period for the GATS Account Holder."

GIS provides New England regulators access, through a password-restricted Internet portal, to various quarterly and annual reports that contain data—including generator by fuel source, retail LSE accounts, total MWhs generated, and MWhs imported from each adjacent control area.[101] GIS rules require the administrator to notify regulators of "a list of the Imported Unit Energy transactions" on a quarterly basis."[102] These data include the location of the generating unit, the name of the importer, and the certificate numbers that were created in the system.[103]

GIS operating rules also recognize the important role to be played by regulators in ensuring the quality of data being used in GIS. For example, Rule 2.7(b) recognizes the need for approval of system import data on emissions and fuel sources by state environmental regulatory agencies.[104]

In addition to approval by regulators of certain data, GIS Rule 2.5(e)(v.) provides authority for regulators to audit any emissions data submitted by GIS generators or importing account holders. According to the rule:

> "If so directed in writing by any such Environmental Regulatory Agency, the GIS Administrator will insert the following disclaimer on the affected Certificates: "Air regulators for the state in which the generating unit creating this Certificate is located contest emissions information on this Certificate because it varies by more than one percent from emissions information reported to a local, state or federal environmental regulatory agency."[105]

While having access to system reports and the characterization of certain data used by the system, state regulators would still need to be able to ensure the quality of the application of those data by the systems themselves. If RGGI states were to adopt GATS and GIS as tracking platforms, and if the systems were to utilize up-to-date Part 75 data, it would still be critical to ensuring environmental integrity of the tracking system for regulators to be granted sufficient access to the calculations that the tracking systems perform, to ensure regulators' ability to verify appropriate use of the Part 75 data.

What is needed is a role that perhaps builds upon regulators' audit authority found in GIS rules, but provides a programmatic role for RGGI regulators. That level of access is not currently available to regulators.

RGGI regulators have a long history of working with these systems to meet regulatory needs, both as representatives of their respective states and as part of the RGGI program. For example, in 2007 and 2008, RGGI staff recommended changes to these systems and were successful in getting GATS and GIS to respond to these requests. Ensuring programmatic access to data and data characterization is a similar case, in which regulators would need to work closely with the tracking system administrators in order to ensure that these systems are operated in a more transparent manner that would meet regulators' needs. Building upon the type of authority to conduct audits as provided for in GIS rules may be the first step.

H. Data Characterizing Adjacent Power Systems

There are additional data challenges associated with characterizing emissions from resources located outside of the immediate wholesale markets that serve load in the

101 GIS produces various reports, and several examples are included here:

- GIS 5.4 (d) indicates that the GIS administrator can provide for each Retail LSE its "total Certificates Obligation over the four most recent quarterly Trading Periods and its total imports, in MWh, for the four most recent quarterly Trading Periods." GIS masks Retail LSE identity with the use of a code.
- GIS Rule 5.4 (e) requires GIS to produce publicly available reports that "include an aggregation and/or average" of "Certificate fields for all Certificates created during the quarterly or annual reporting period." The reports include "aggregate data separately for NEPOOL Generators, [and] Importing Account Holders."
- GIS Rule 5.4 (f) details provisions related to elements of data contained in each certificate. The publicly available reports include "all Certificates transferred during the quarterly or annual reporting period, aggregated separately by (1) fuel type, (2) each RPS and APS for the New England states and (3) the total number of Certificates transferred during the reporting period." Fuel type and RPS and APS categories correspond to the major categories contained in certificates themselves set out in the GIS rules.

GATS Operating Rules, 2011.

102 Id. at 2.7(d).

103 Id.

104 GIS Rule 2.7(b).

105 GIS Rule 2.5(e)(v.).

RGGI region. RGGI will need to determine if the manner in which it currently accounts for energy and attributes of imported energy is sufficient for tracking purposes.[106] Two key considerations need to be addressed as this goes forward. The first would address the need to recognize "line losses," and the second is how to reasonably acquire these data from unit resources and for system resources in this category.

I. Recognizing and Accounting for Line Losses

Electricity is produced by generators and made available across a system at high voltage, to enable efficient transportation over transmission and distribution lines. Electricity is then "stepped down" through a series of transformers to be at the appropriate voltage for ultimate consumption. As power is delivered over these distances, and the voltage is changed, power is lost. This is generally referred to as line losses—and in most systems, these account for between 5 and 10 percent of generation. Line losses should be reconciled in any RGGI import system that relies on sales data to compute obligations.

Currently RGGI allocations are based on generators that produce energy at transmission voltage. The tracking proposal here would rely on sales data to allocate the emissions attributed to net imports. In order to be comparable, the sales data should be "grossed up" to account for losses. For example, if line losses were 8 percent, then a generator would need to produce 108 MWhs for an LSE to be able to acquire 100 MWhs. The appropriate measure of emissions associated with that 100 MWh purchase would be emissions associated with 108 MWhs. In this way, it will be equivalent to the generator production data upon which the current RGGI system is based.

J. How the Tracking Systems Characterize Transactions

As noted above, the tracking systems have adopted protocols for acquiring relevant transaction data to reflect the two basic ways in which electricity can be imported: through unit-specific or system purchases. With the exception of imported electricity that could be bought under a unit-specific transaction (and would come with an e-tag reflecting that specific unit's emissions attributes), certificates for attributes associated with imported energy would be assigned the system-average environmental attributes for the control area from which they are purchased.

i Maryland and PJM

A Maryland LSE will have access to energy from PJM. From year to year this can be expected to be a combination of (a) energy produced within PJM and (b) net energy imported from adjacent systems, e.g., New York ISO and Midwest ISO (MISO).

Energy Produced in PJM	Net Imports into PJM
Part 75 Units: DE/MD/Other	(a) ISO New York, and (b) MISO
Non-RGGI Units: (a) smaller than 25MW fossil, and (b) non-fossil (e.g., nuclear)	

(a) Energy Produced in PJM

With the use of publicly available Part 75 data from EPA, GATS could provide regulators with a report on the energy produced and relevant emissions associated with PJM fossil generators that report to EPA. GATS is able to distinguish between the Part 75 reporting units that are part of RGGI and those that are not. Making this distinction is necessary in order to exclude Maryland and Delaware RGGI units and avoid double-counting them.

There are other sources of energy being produced in PJM, and these non-RGGI sources will also have to be accounted for. They include non-fossil (e.g., nuclear power) and smaller than 25MW fossil generation. Whether or not they are ultimately included under a policy or not, the energy (MWhs) produced by these generators should be identified and accounted for. For example, one assumption might be that smaller than 25 MW fossil units would not be part of an adjusted residual mix.

Establishing the amount of MWhs produced by these resources could be achieved by taking gross energy production numbers for PJM and subtracting all the energy produced by Part 75 reporting units and non-fossil units.

106 RGGI 2009 Monitoring Report, 2011.

This would leave a number of MWhs reflecting the energy produced by the remaining PJM generation—i.e., smaller than 25 MW fossil. Note that there is no need to identify attributes in this example if the goal is simply excluding the number of MWhs associated with smaller than 25 MW fossil resources.

(b) Net Imports into PJM

PJM may also have net imports from the New York ISO and the Midwest ISO (MISO). In the case where a New York generator provides energy into PJM under a unit-specific contract, PJM would account for that import as described above.[107] The transaction would require a system reservation, an appropriate number of NERC e-tags, and follow-up metering data to demonstrate that the actual generating unit ran and produced the energy being claimed. Where that demonstration cannot be made, GATS creates system mix certificates for these imports, reflecting the "emissions for the source control area of the import" rather than emissions associated with the specific unit.[108]

In characterizing emissions associated with system imports from the NY ISO into PJM, the same publicly available Part 75 data could be adopted and subjected to the same analysis described above for determining energy produced in PJM. Assuming that smaller than 25 MW fossil units would not be part of an adjusted residual mix, establishing the amount of MWhs produced by non-RGGI resources in the NY ISO could be achieved by taking a gross energy production number for the NY ISO and subtracting all the energy produced by Part 75 reporting units and non-fossil units. This would leave only the MWhs produced by the remaining generation: i.e., the smaller than 25 MW fossil.

Net imports from MISO could present a somewhat greater challenge. As noted in the New York discussion above, in cases where unit-specific generation comes across into PJM from an adjacent balancing area, the transaction would require a transmission system reservation and NERC e-tag. This transaction could be tracked and characterized as unit-specific, if meter data were provided to the GATS administrator in order to prove that the generator actually produced the scheduled the number of MWh during the relevant time period.

While GATS has the capacity to recognize and account for a unit-specific transaction, there is no automatic mechanism for MISO to adjust its control area emissions attributes to reflect the sale of a unit's energy outside the system if such a transaction were to occur. To the degree that the emissions of the unit have a greater carbon intensity than the overall MISO mix, that mix would subsequently have a lower carbon intensity. The opposite would also hold true: if the generation unit's emissions attributes were lower in carbon, then the transaction would render the MISO system average emissions more CO_2-intensive.

The inability to capture the effects of unit-specific sales from an adjacent power system on that system's overall emissions attributes applies more broadly to all the power systems adjacent to PJM, the New York and New England ISOs. To the degree that there are relatively few unit-specific imports into the RGGI region from adjacent systems, the absence of an automatic adjustment mechanism to system mix in those control areas to reflect these few transactions (other than a periodic administrative review of a system emissions factor[109]) may be insignificant. Establishing greater and more frequent emissions factor updates for adjacent systems would, in turn, require a more frequent determination of the amount and type of net imports that are actually occurring.

In cases where unit-specific information is not provided, GATS would produce system mix certificates for these imports, and they would reflect the "emissions for the source control area of the import" rather than emissions associated with the specific unit—a process similar to the one that would be followed in the case of an outright system power import.

107 See discussion above at pages 16-17.

108 GATS Operating Rules, 2011. With respect to the source of the emissions data, the GATS rules indicate that "[e]ach Certificate associated with Imported System Energy will reflect the most recently available overall mix of fuel sources and emissions of the source Control Area. Certificate fields for each adjacent Control Area shall be based on the average of the emissions and fuel source data for such Control Area as included in the most recent year's data in the EPA's E-GRID software."

109 See, e.g., the process describing the establishment of an emissions factor for imports from Quebec at note 73 and accompanying text.

ii. New York ISO

A New York LSE will have access to (a) energy produced in the NY ISO. It can also expect to use (b) energy associated with net imports into the NY ISO from the New England ISO, PJM, Ontario, and Quebec.

Energy Produced in New York	Net Imports into NY ISO
Part 75 Units: DE/MD/Other	(a) PJM, (b) New England ISO, (c) Ontario, and (d) Quebec
Non-RGGI Units: (a) smaller than 25MW fossil, and (b) non-fossil (e.g., nuclear)	

(a) Energy Produced in the New York ISO

Publicly available Part 75 data could be adopted and subjected to the same analysis described above with regard to determining energy produced in the NY ISO. Assuming that smaller than 25 MW fossil units would be excluded from an adjusted residual mix, establishing the amount of MWhs produced by non-RGGI resources in the NY ISO could be achieved by taking a gross energy production number for the NY ISO and subtracting all the energy produced by Part 75 reporting units and non-fossil units.

(b) Net Imports into the New York ISO

Access to import data from New England or PJM would work in the same manner as access to New York ISO data would work for PJM. Access to Ontario and Quebec, however, would work differently because none of the resources would be subject to EPA requirements. However, the Province of Ontario has a history of publicly available air emissions data tracking and climate policy development.[110] Ontario and other Canadian Provinces have participated in the Western Climate Initiative, and currently require electric generators and cogeneration units to report greenhouse gas emissions.[111] Environment Canada produced a "National Inventory Report 1990–2008: Greenhouse Gas Sources and Sinks in Canada," and RGGI relied on this data in part in producing "CO_2 Emissions from Electricity Generation and Imports in the 10-State Regional Greenhouse Gas Initiative: 2009 Monitoring Report."[112] The states also relied upon energy production information derived from the Ontario wholesale market regulator, the Ontario Independent Electricity System Operator (IESO). It is likely that relevant information would be available from Ontario, although not necessarily in a readily accessible format or similar to Part 75 data.[113]

Consequently, emissions and energy production data are available from both Ontario's environmental regulator and its wholesale energy market system operator. If emissions and MWh data are accessible, it will be important to be able to identify the degree to which smaller fossil resources are serving load, and the degree to which industrial sources that produce behind-the-meter generation are providing power to the system. Regulators will also need to agree on a process to do this, or, depending on the relative amount of these resources and degree of importance that regulators attach to this question, a reasonable alternative manner in

110 Georgakopoulos, Wong & Ting, undated.

> In 2000, the Ontario Ministry of the Environment (MOE) proposed an air quality initiative consisting of regulations "requiring the mandatory monitoring and reporting of air emissions from point sources," which applied to Ontario electric generation facilities and became Ontario Regulation 227 (O. Reg. 227/00 - "Electricity Generation—Monitoring and Reporting"). In 2001, O.Reg.227/00 was superseded by the "all sectors regulation" titled Ontario Regulation 127 (O.Reg.127/01, "Airborne Contaminant Discharge—Monitoring and Reporting." Id.) According to Georgakopoulos, et al., "O.Reg.127/01 is a prime mechanism for tracking the progress of the ministry's air quality initiatives designed to address smog, acid rain, climate change and other air issues."

111 See "Ontario Regulation 452/09 Greenhouse Gas Emissions Reporting," Section 2.1. http://www.e-laws.gov.on.ca/html/regs/english/elaws_regs_090452_e.htm#BK2

112 RGGI 2009 Monitoring Report, 2011. Data from Appendix 1 Summary of Data Sources, Tables 2, 3, 4. Environment Canada, "National Inventory Report 1990–2008: Greenhouse Gas Sources and Sinks in Canada," Environment Canada, April 15, 2010. In Part 3, see Table A13-5 "Electricity Generation and GHG Emission Details for New Brunswick"; Table A13-6 "Electricity Generation and GHG Emission Details for Quebec." Available at http://unfccc.int/national_reports/annex_i_ghg_inventories/national_inventories_submissions/items/5270.php.

113 Id.

which to characterize these separate resources.[114]

The same conclusions from above regarding availability of emissions data from Ontario would apply to Quebec. In the past, access to this information has required administrative steps, as described above in the Hydro-Quebec example, and can be expected to continue to require this.[115]

iii. New England ISO

A New England LSE will have access to (a) energy produced in the New England ISO. It can also expect to have access to (b) energy imported into the New England ISO from the New York ISO, Quebec, and New Brunswick.

Energy Produced in New England	Net Imports into NE ISO
Part 75 Units	(a) NY ISO, (b) Quebec, and (c) New Brunswick
Non-RGGI Units: (a) smaller than 25MW fossil, and (b) non-fossil (e.g., nuclear)	

(a) Energy Produced in the New England ISO

As noted with regard to PJM and the New York ISO, publicly available Part 75 data could be adopted and subjected to the same analysis to identify all resources producing energy in the New England ISO. Assuming that fossil units smaller than 25 MW would be excluded from an adjusted residual mix, establishing the amount of MWhs produced by non-RGGI resources in the New England ISO could be achieved by taking a gross energy production number for the ISO and subtracting all the energy produced by Part 75 reporting units and non-fossil units.

(b) Net Imports into the New England ISO

Quebec and New Brunswick imports, both unit-specific and system, would be treated in the same manner as imports from other adjacent systems. A unit-specific transaction requires a system reservation, an appropriate number of NERC e-tags, and follow-up metering data to demonstrate that the actual generating unit ran and produced the energy being claimed. Where that demonstration cannot be made, imports would not be treated as unit-specific, but instead as though they were a system purchase. It should be noted also that both Quebec and New Brunswick are lacking in any automatic mechanism for adjusting system emissions attributes to reflect any unit-specific sales of energy, and that a system's emissions factor is set administratively.

The same conclusions from above regarding availability of emissions data from Ontario and Quebec would apply to New Brunswick. If RGGI regulators can be assured of the quality of data that New Brunswick provides, that would enable them to characterize emissions attributes associated with the New Brunswick system or with a specific New Brunswick generator. As noted above, the authors of RGGI's "2009 Monitoring Report" relied on emissions data from Environment Canada's "National Inventory Report 1990–2008: Greenhouse Gas Sources and Sinks in Canada."[116] These data specifically included New Brunswick greenhouse gas emissions, although at a province-wide and not a unit-specific level.[117] In considering how best to characterize emissions data associated with New Brunswick power, RGGI regulators might also consider the steps currently taken by the State of Maine to characterize "Maritime control area" energy purchases as part of Maine's disclosure law.[118]

114 As noted above in the case of New York ISO imports into PJM, if RGGI were so inclined, as a policy matter, it could simply exclude the net imports into the NY ISO from Ontario depending on the province's participation in the Western Climate Initiative.

115 See note 73 and accompanying text. Hydro-Quebec is also active in the GIS process, having recently sought certain rule changes with regard to the characterization of system mix imports from adjacent systems. Quebec is also a member of Western Climate Initiative, and its cap-and-trade system is scheduled to start in 2013, regulating sources emitting over 25,000 metric tons of CO_2 equivalent. Belval, P., NEPOOL Counsel, memo to NEPOOL Markets Committee.

It is not clear that Hydro-Quebec has received approval for its request. See also Belval, P., memo.

116 See RGGI 2010 Monitoring Report, 2012. Appendix A, "ISO Monitoring Sources," citing to "Environment Canada, National Inventory Report 1990–2009: Greenhouse Gas Sources and Sinks in Canada," Environment Canada, May 16, 2011. In Part 3, see Table A13-5 "Electricity Generation and GHG Emission Details for New Brunswick"; Table A13-6 "Electricity Generation and GHG Emission Details for Quebec." Available at http://unfccc.int/national_reports/annex_i_ghg_inventories/national_inventories_submissions/items/5270.php.

Noting that "New Brunswick emission factors were updated for 2005-2009, as compared to the previous year's report." Id.

117 Id.

118 See note 31 and accompanying text.

K. Observations

- RGGI regulators could encourage tracking systems to employ data produced pursuant to 40 C.F.R. Part 75, where applicable.
- RGGI regulators could build upon their current audit authority in GIS—and, more important, their work history with tracking system administrators—to establish adequate regulator access to tracking system data and functions that could verify the accurate use of energy consumption data and related emissions data for purposes of a regulatory compliance program.
- RGGI regulators could consider coordinating tracking system certificate production schedules and EPA's schedule for producing emissions data by any one of the following:
  - Adopting a longer period between the time the electricity is generated and the time that the tracking system mints a certificate;
  - Establishing a true-up mechanism for the submission of all generator emissions information to reflect the availability of more recent Part 75 data; or
  - Establishing a true-up mechanism for the submission of fossil resource information only, to reflect the availability of more recent Part 75 data.
- RGGI regulators could review current state laws, regulations, and orders related to GATS mandates to ensure that their modification is not necessary in order to adjust existing GATS tracking system schedules, and normalize them with the schedule for the production of EPA's Part 75 data.
- RGGI regulators could consider the potential suitability of newly developed emissions monitoring data from EPA produced pursuant to the CO_2 NSPS.
- In addressing challenges associated with characterizing emissions, RGGI regulators could continue to draw upon their experience in:
  - Providing additional oversight for quality control and quality assurance purposes, including procedures for the certification and recertification of approved approaches to CO_2 monitoring from fossil plants;[119] and
  - Accepted methods for determining fuel mix and emissions characteristics of provider resource portfolios based on market settlement data or other relevant market data.[120]

119 310 CMR 7.70

120 CMR 65-407-306, section 3C.

Section 5. Conclusions

High-Level Summary

- The addition of a CO_2 monitoring and compliance requirement for imports can be expected to raise additional compliance issues for electric service providers. Companies will need to determine the best way to meet their compliance obligations based on the carbon intensity of their energy portfolios.
- Presuming that a carbon compliance obligation would necessitate the acquisition of RGGI allowances to reflect the carbon content of energy purchases, electric service providers should have a number of options to comply with this requirement, including:
  - Reducing carbon content of supply portfolios by identifying and requesting recognition for specified energy purchases;
  - Contracting with developers of lower-emitting generation;
  - Taking advantage of RGGI flexibility provisions, e.g., three-year control period and banking; and
  - Making greater investments in energy efficiency and other demand-side resources.
- There are a number of legal, regulatory, and administrative implications associated with developing a tracking system that can potentially support expanding the existing RGGI program to include emissions associated with the purchase of energy from outside the RGGI region.
- States would need to work with administrators at GATS, GIS, and the relevant tracking system authority in New York State to determine the changes necessary to the tracking systems in order for states to be able to regularly determine:
  - The amount of MWh each LSE uses to serve load in its service territory, and
  - The sources of that energy.
- Acquiring and populating the tracking systems with robust emissions data would be a central part of any such effort.
- Having sufficient access to the system for QA/QC purposes would also be necessary. States would need to confer with tracking system administrators in order achieve a level of access to processes and calculations that ensures state confidence in the soundness of the tracking systems.
- Each state would need to determine the extent of its authority to take necessary steps to expand its program.
- RGGI states should also consider whether or not their existing authority to implement electric supply portfolio standards for renewable or other resources might provide the authority to track emissions associated with such a compliance obligation.
- At a minimum, states would need to develop rules regarding:
  - The tracking of various transaction types;
  - The methodology for calculating adjusted residual mix and other tracking system features, including:
    - Articulating the fields required to be added to the tracking system, and
    - Publishing the necessary reports that will need to be produced.
- Regulators and tracking system administrators should develop a standard set of protocols for regulator access to tracking systems, and for addressing quality assurance and quality control concerns that regulators will have in using these systems to track energy use.
- RGGI states should also consider what other specific standardized procedures they will need to develop if they choose to proceed and use these systems for tracking purposes.
- In addition, RGGI states would need to determine the degree to which individual state rules (statutes, regulations, orders, etc.) will need to be addressed, and assess potential effects that the recognition of these emissions would have on existing state emissions budgets.

A. Introduction

RGGI is in a position to use existing energy tracking systems in the region to develop a platform that will allow it to track and account for all the energy use within the region. With this capacity in place, RGGI could then pursue the potential policy steps necessary to articulate a compliance obligation for emissions associated with the out-of-region electricity currently serving load in the RGGI region. As the discussion has shown, tracking carbon emissions with the use of GATS and GIS, while technically feasible, can be expected to pose a number of challenges for retail electric service providers and for regulators.

B. Some Implications for LSEs

This approach uses elements with which RGGI states and LSEs are already familiar, and combines them in new ways. LSEs in the RGGI region already track CO_2 for RGGI-affected units. This proposal would expand the tracking to imports from outside the RGGI region. The mechanics of tracking imports is something LSEs are familiar with, as they already use tracking systems to enable their compliance with various state renewable portfolio standards. Tracking carbon emissions to support a compliance obligation for emissions associated with out-of-region adjacent system electricity serving load in the RGGI region would, in large part, work similarly to the manner in which companies that rely on GATS and GIS currently track their compliance with state renewable energy or other portfolio standards. At the end of a trading period, LSE accounts would reflect the amount of MWhs purchased to serve load, along with the number of relevant certificates either directly purchased or assigned from the adjusted residual mix to those system purchases.

Tracking emissions for compliance with a carbon obligation would also work similarly to the manner in which companies currently track their compliance with other state portfolio standards. However, the addition of a monitoring and compliance requirement for CO_2 can be expected to raise a number of additional compliance issues for electric service providers. If an energy tracking program is adopted by RGGI states, then going forward, LSEs should be expected to be key stakeholders in the related planning and implementation processes to coordinate and establish similar protocols across the RGGI states.

In addition to participating in the development of the regulatory framework to implement a CO_2 tracking system, retail electricity providers will face additional challenges associated with an expanded RGGI compliance obligation. These challenges are, however, not out of the ordinary for LSEs. Just as companies today face some degree of uncertainty about the prices of RECs necessary for compliance with an RPS, companies with a newly-established CO_2 obligation will need, going forward, to determine the best way to meet those requirements based on the types of energy transactions in which they engage.

Presuming that a CO_2 compliance obligation would necessitate the acquisition of RGGI allowances to reflect the carbon content of energy purchases, electric service providers should have a number of options to comply with this requirement. Where applicable, for example, LSEs can reduce the carbon content of supply portfolios by identifying and demonstrating specified energy purchases that they have made. They should also be able to reduce the carbon content of their portfolios by investing in the development of lower-emitting generation. They could, further, make greater investments in energy efficiency and other demand-side resources to reduce the overall amount of energy in their supply portfolios. Finally, LSEs could benefit from current flexibility provisions afforded to RGGI generators, such as the ability to acquire allowances from other compliance entities and the ability to bank allowances.

C. Some Implications for State Regulators

The use of the GATS and GIS tracking systems to develop a platform to track and account for CO_2 emissions associated with all the energy use within the region will raise a number of legal, regulatory, and administrative issues. This section is not exhaustive, but endeavors to identify some of the major steps that states may need to take.

D. Adapting Tracking Systems

States will need to confer with the GATS and GIS administrators, and the relevant tracking system authority in New York State, to determine the changes necessary to the tracking systems in order for states to be able to reasonably determine, (a) the amount of MWhs each LSE

uses to serve load in its service territory, and (b) the various sources of that energy. As noted in the discussion above, acquiring and populating the tracking systems with useful emissions data, and allowing regulatory consultation in the system operation, will be important parts of such an effort.

E. State Authority

Each state would need to determine if authority exists to take necessary steps to expand its program to include a potential compliance obligation on emissions associated with imported electricity and the tracking modifications necessary to support it. It is beyond the scope of this paper to review each state's authorizing legislation. However, it is recommended that each state determine the extent of its current authority to participate in and administer the RGGI program, along with the extent to which that authority would allow the state to extend the program to tracking LSE electricity transactions.

F. Additional Issues

In addition to assessing existing authority, states would need to develop rules regarding:

- The tracking of various transaction types, and protection against potential gaming of the system;
- The methodology and system changes necessary for calculating adjusted residual mix;
- The coordination of environmental data production and tracking system schedules;
- A standard set of protocols for regulators to be able to consult regularly with system operators, and to ensure quality assurance and quality control in data and system use of data; and
- Other specific standardized procedures they will need to develop if they choose to proceed and use these systems for tracking purposes.

This proposal seeks to address an existing challenge, regarding tracking CO_2 emissions from imports into the RGGI region, with currently existing technology, the GATS and GIS tracking systems. We recognize that this is not without challenges, and would require concerted effort on the part of a variety of stakeholders. As RGGI seeks a means of tracking emissions associated with imports into the RGGI region, these tracking systems represent capacity that should not be overlooked.

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Appendix 1

California's Approach: The First Jurisdictional Deliverer (FJD) Mechanism

This section briefly outlines the mechanism by which California will be able to include emissions associated with electricity imports under its cap-and-trade system—the "First Jurisdictional Deliverer" (FJD) mechanism. Though this paper recommends a different emissions tracking platform for RGGI, California's approach is and will continue to be useful for RGGI regulators, to consider as a model regulatory approach for addressing emissions associated with imported electricity.

AB32 and the FJD Approach

California's cap-and-trade system was created as a part of Assembly Bill 32 (AB-32). As a part of this system, emissions associated with electricity imports are one of the components of what is included in statewide emissions. In-state electricity generation represents approximately 12% of total statewide emissions and is derived almost entirely from renewable, nuclear, or natural gas resources. Imported electricity generation also represents 12% of total emissions,[121] but the emissions profile for imported electricity is much higher on a per-MWh basis than in-state, as its sources include out-of-state, fossil-fired plants with which California utilities have an ownership share or long-term purchase agreement.

Source-based cap-and-trade is clearly sufficient to cover the emissions of in-state generators; but a plan was needed to account for the more emissions-intensive electricity imported by regulated entities. The state needed to determine:

- What transactions were to be regulated?;
- Who would be regulated as an "electricity importer"?;
- How these transactions could be tracked; and
- How to assign emissions to imported electricity, given the information that was readily available and tracked.

Only those transactions in which electricity is delivered to and consumed in California have a compliance obligation. Where electricity is shipped or "wheeled" through California but consumed in a different state, the transaction is not regulated. Also, where electricity is generated in a jurisdiction with a "linked" cap-and-trade program and then delivered to and consumed in California, related emissions are not counted by the FJD mechanism.

California Balancing Authorities and e-Tags

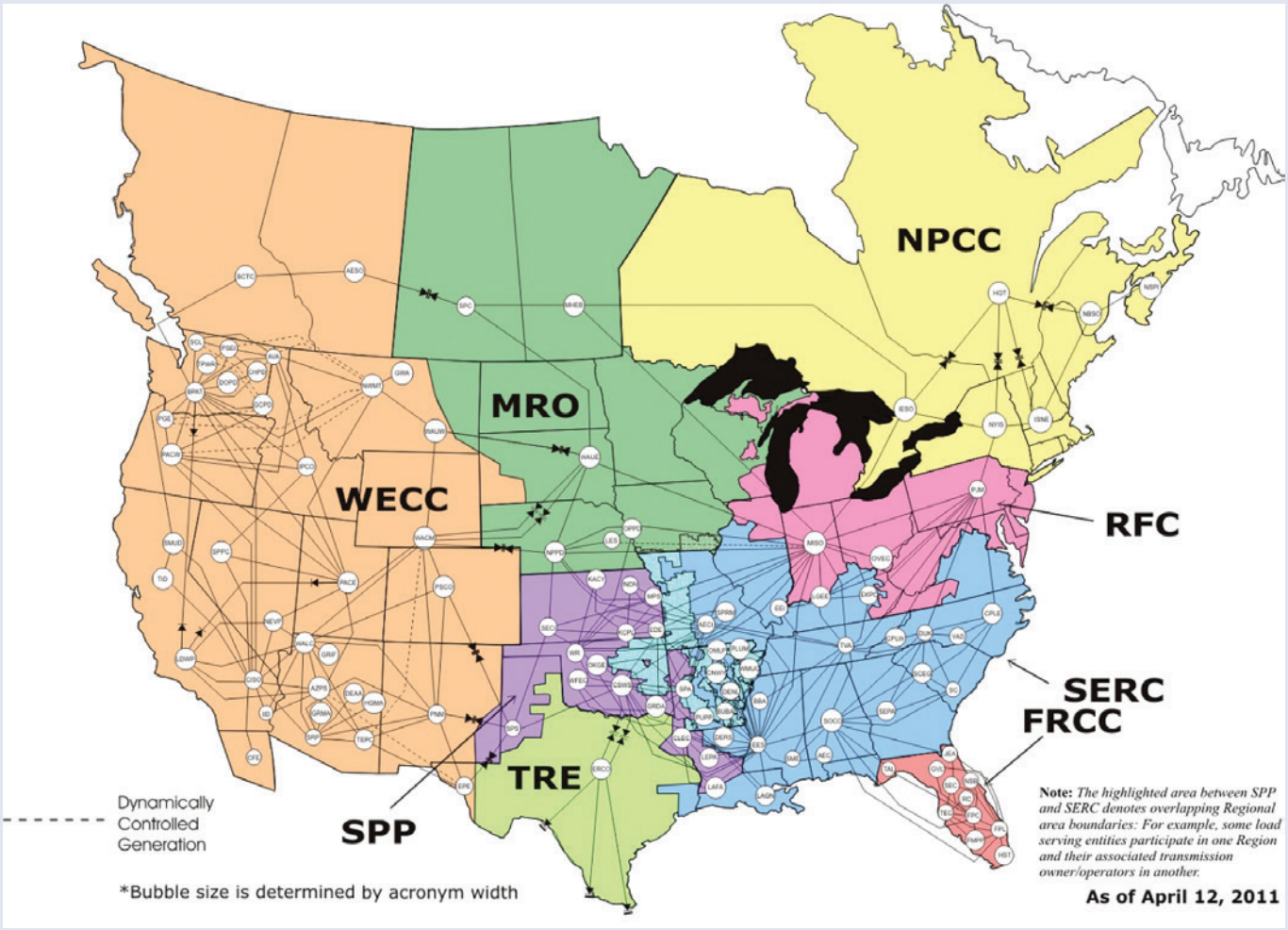
California's electricity grid is connected to all of the surrounding states as well as Baja California, Mexico. Multiple balancing authorities, the entities responsible for the balancing of load and supply, operate within the state. The largest is the California Independent System Operator (CAISO), which is responsible for most of the state, and its boundaries largely conform to state lines. Interior balancing areas include the Balancing Authority of Northern California (BANC), the Turlock Irrigation District (TID), and the Los Angeles Department of Water & Power (LADWP). The Imperial Irrigation District (IID) is responsible for some transactions between California and Arizona, and the PacifiCorp-West (PACW) is responsible for some transactions between California and Oregon.

In order for electricity to cross a balancing area boundary, a North American Electric Reliability Corporation (NERC) energy tag (e-Tag) must be created. This results in an "inter-balance-authority transmission record" that represents transactions on the bulk electricity market scheduled to flow between or across balancing authority areas. NERC e-Tags are initiated by a schedule coordinator when electricity delivery is scheduled on

121 California Air Resource Board. 2012.

Figure 9

Balancing Authorities [122]



the transmission system, and are used by transmission coordinators to match load to supply. This system was intended to help ensure that power providers are made aware when a distributor is counting on them, and that any transmission paths needed to get the power from the provider to the local distribution company are available at the time needed. A NERC e-Tag identifies an amount of power that at some future time will come from some specific source and go to a specific destination for some specific amount of time.[123]

The information in an e-Tag includes:

- Control area;
- Transmission provider;
- Purchasing-selling entity, also called the "first jurisdictional deliverer";
- Point of receipt, where electricity originated from, which could include an interconnection with another system or generator bus bar;
- Point of delivery;
- Scheduling coordinator;
- The amount of electricity involved in the transaction;
- Timing of the transaction; and
- Details on which transmission paths are used.[124]

122 NERC, Regions and Balancing Authorities available at: http://www.nerc.com/docs/oc/rs/BubbleMap_2011-04-12.jpg

123 NERC, 2008.

124 NERC/TSIN. 2002.

NERC e-Tags were not designed to show the generating facility, the final owner of the electricity, or ownership data for intra-balancing authority exchanges. NERC e-Tags also do not necessarily show all the owners in the chain of custody. Further, since delivery as specified on the e-Tag is not guaranteed, as it is a future occurrence, contract settlements occur later and may not match the NERC e-Tags exactly. E-Tags are sometimes canceled, and new e-Tags are sometimes created due to unexpected changes. E-Tags are intended as a reliability tool that tracks each MWh of inter-balancing authority electricity flow, and they are forward-looking. As a result, they only contain information necessary for the transmission coordinator to match load to demand.

Based on the information included on e-Tags, an electricity importer can be identified for each transaction. These would ultimately be categorized as among the state's "first deliverers"—entities that first deliver electricity to the California grid. As such, the entity importing and regulated via the FJD approach is not necessarily the entity serving load; it will, however, be the first entity to receive the electricity within the receiving balancing area where the electricity is being delivered. Consequently, there are generally two types of electricity importers: electric utilities, which use the imports for their own power supply, and wholesale power marketers.

Challenges for the FJD Approach and Limitations of e-Tags in California

California's FJD approach and the use of e-Tags for tracking electricity imports are not without their challenges. Complications can arise where electricity is imported across state lines, but within balancing authorities: i.e., where balancing area boundaries do not conform exactly to state lines. For example, electricity may be imported from a CAISO region in Nevada into California, in which case a NERC e-Tag would not be created. In such cases, supplemental information must be used beyond the NERC e-Tag to identify the regulated importer. Regulators may look to scheduling coordinators and settlement contracts to determine who imported what amount of electricity into California. Also, when California utilities own out-of-state generation with dedicated lines into California, this is considered part of the balancing area's base generation.

E-Tags are not always entirely accurate in their depiction of imports, as they are static forward instruments and originally designed as a system planning tool. Except in rare cases, they cannot be changed by a balancing area authority after the fact. The e-Tag does not establish or document the contractual relationship between the buyer and seller, but rather is designed to establish the chain of responsibility for scheduling power from one balancing area to another. To determine what is actually transmitted, one would have to look to the contract settlements process. Thus, there is a true-up step and additional time involved.

As noted above, in order to attribute emissions to electricity imports, California determined that it was necessary to differentiate between "specified" and "unspecified" transactions. In a specified transaction there is a contract with a specific power plant. Because the generating plant is identified, it is relatively easy to assign emissions.

Unspecified transactions, on the other hand, are for system power where it is unclear specifically where the power originated. In this case, California makes certain assumptions and adopts a default emissions factor. Assumptions include that most renewable facilities are not selling to wholesale power markets, and that facilities with high capacity factors (>60%) will be serving baseload needs, as they cannot easily be ramped up and down. In an effort to work through issues associate with the deliverers' representations of power purchases, California's Air Resources Board (CARB) has suspended enforcement of part of its rules related to "resource shuffling" (See Appendix 3) over concerns about potential misrepresentation of specified and unspecified energy transactions.

For imports of electricity from renewable sources, California requires both a contract for the power and retirement of RECs in order to report zero emissions.[125] Unlike GATS and GIS, the tracking system that serves California (WREGIS, the Western Renewable Energy Generation Information System) tracks only renewable energy generation and not all generation.

In addition to the challenges inherent to using e-Tags for a purpose for which they were not originally designed, focusing the point of regulation on the first jurisdictional

125 Western Renewable Energy Generation Information System, 2010.

deliverer in California resulted in concern over the potential manipulation of resources, including various strategies described as "resource shuffling." This term refers to any mischaracterization of generation "sources of imports that result in reported reductions in emissions that do not reflect real reductions in emissions."[126]

The California cap-and-trade regulation explicitly prohibits resource shuffling per §95852(b)(2), and requires certain attestations from first deliverers. In order to control for resource shuffling, the California Air Resources Board has proposed to allow certain specified transactions and set certain conditions on specified sources with emissions rates below the default emissions rate. As noted above, CARB's chair recently indicated that California would refrain from enforcing provisions related to resource shuffling pending further review of existing CARB rules.[127]

Observations

In addition to the challenges associated with e-Tags and the import-centric FJD approach mentioned above, the circumstances of electricity generation, balancing authority territory, and tracking systems in RGGI states would ultimately make an FJD approach using e-Tags modeled after California's approach unsuitable or a less desirable option as an RGGI policy. Since several RGGI states are located entirely within a balancing area (PJM), e-Tags are not created when LSE in those states acquire power. Still, RGGI states should closely follow the implementation process in California. Despite its basis for tracking emissions, the FJD approach provides an effective compliance model upon which RGGI could build.

California's ultimate decision on how to treat specified and unspecified transactions is also an important aspect of its program that has not been settled. The determination of those issues will be helpful to RGGI if and when it goes forward to develop an imports policy.

126 Murtishaw, 2011.

127 Based on discussions with CARB staff, further guidance on this issue should be forthcoming in the next few weeks. For more information see "California suspends CO_2 market rule on electricity imports," http://www.reuters.com/article/2012/08/20/us-california-carbon-idUSBRE87J06B20120820.

Appendix 2

New York State's Tracking System

At present, New York has a manual tracking system coupled with an online information-based service called the Market Information System (MIS).[128] This system is used for electricity emissions labeling, under New York's Environmental Disclosure Program (EDP), for "all entities subject to [the Public Service Commission's (PSC)] jurisdiction that supply retail electric service."[129]

In order to calculate and provide these disclosure statements, the PSC collects data on generation and spot-market purchases of electricity that are being delivered to electricity consumers. These data are sourced through the New York ISO, and are provided to the New York ISO by generator facilities (both inside and outside of the ISO), LSEs, and other users via template spreadsheets of generation data. Unlike GATS and GIS, New York's tracking system treats the electricity commodity and the related generation attributes as the same commodity.

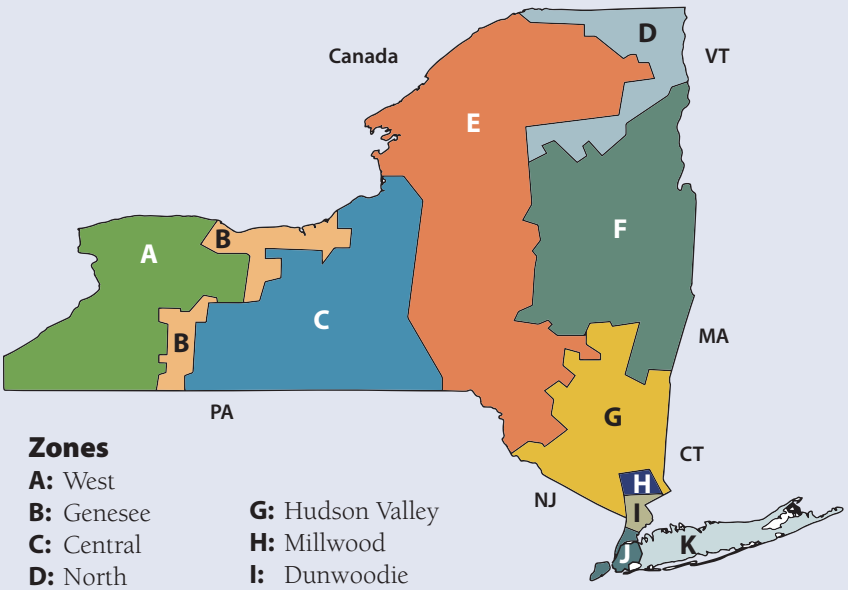
Current System Function

The MIS features detailed information on generators such as location, fuel type, generator limits, nameplate capacities, and other physical attributes of the facility, as well as information on LSEs. But unlike other tracking systems, it does not include or track generation data, leaving space for the development of an automated system. As such, MIS mainly gives marketers a forum to buy and sell facility generation and physical load. These bids are approved or denied by administrators for the relevant parties through the MIS.

In addition to using MIS information, the tracking system requires the use of a NERC e-Tag for all transactions that enter or exit the New York ISO control area, including wheeling arrangements, i.e., sales across a system. An e-Tag must be created before any import/export transaction can occur between two balancing areas. Either the buyer or seller of the electricity must be a New York ISO customer, and is the party responsible for submitting the anticipated transaction schedule into the e-Tag system. The tracking system is internal to the New York Public Service Commission

Figure 10

Map of Zones within the New York ISO [130]



128 The term "manual" is used to distinguish the New York system from those systems designed with automatic capacity. For example, "conversion transactions" and other data sources are reconciled through this process, rather than through a system that tracks and reconciles the data automatically by design.

129 Environmental Disclosure Program, 1998.

130 FERC, 2010.

(PSC), and calculations are done by individuals rather than automated software.

Generation that LSEs receive through bilateral contracts is straightforward to track and report, since the data can be verified using the MIS. Electricity purchased from the New York spot market must, however, first be assigned an average set of environmental attributes, so that such purchases can be represented on EDP disclosure labels. In order to assign attributes to spot market purchases, PSC staff collects annual data on the "amount of power each participating entity sold into the Spot Market for that quarter, by source power plant, and the amount of power each participating entity purchased out of the spot Market."[131] A mechanism called a "conversion transaction" further allows LSEs to identify and claim electricity from specific generator rather than having to use spot-market emissions attributes, so that the LSE can count the emissions from that generator toward its EDP labeling. Conversion transactions can be used for in-state generation and also for imports.

The New York residual mix calculation, a process that determines the emissions rate for spot-market electricity purchases, aggregates all spot market deliveries from all LSEs and net imports. It then subtracts resources covered by any conversion transactions or in-state bilateral contracts, leaving the environmental attributes of only resources that were not claimed by specific LSEs. All electricity purchased by an LSE that is not covered by a conversion transaction or in-state bilateral contract is assigned the annual average environmental attributes calculated for spot market electricity. The PSC audits the data on which the calculations are based against some of the information on bidding that is found in the MIS by administrators, where possible. Data are also confirmed with importing generators and agencies in neighboring regions where applicable.

Exports from New York are tracked by NYISO and are typically unit-specific rather than system power. In either case, the PSC is able to identify and isolate exports from its EDP calculations. If New York is a net importer from a particular region (which it currently is from all interconnected regions), exports are netted out. If New York were to be a net exporter to a particular region, NYISO data would again reveal that and allow the PSC to react accordingly. Conversion transactions are not necessary for exports.

Options for Integrating New York's System with GATS and GIS

The New York tracking system was designed differently than the GATS and GIS systems that are used in the other RGGI states. Fundamentally, New York's system is structured to recognize energy (MWh) and attributes (e.g., wind) as a single unit, rather than allowing for the separate trading of energy and attributes that is a basic design feature of GATS and GIS. Further, since the EDP's annual spot-market environmental attribute calculations are performed through manual data collection and calculation, integrating this system with systems like GIS and GATS that have automatic capacity would be difficult. As explained below, the automatic features of GATS and GIS in the RGGI region are capable of working more quickly than New York's tracking system. New York spot-market residual mix reporting and calculation, for example, experiences significant lags and would likely not be able to keep with the cycle of reporting in GATS and GIS.

According to a 2007 report from Lawrence Berkeley National Laboratory:

> Manual systems can be satisfactory for verifying RPS compliance, especially if it serves only one state, if only a few utilities are obligated to comply and they remain regulated, or if there are few market participants. On the other hand, if several states in a region have adopted an RPS, and renewable energy generators within the region are eligible to satisfy RPS requirements in multiple states, then it may make sense to adopt a more sophisticated web-based approach. A web-based tracking system offers greater confidence that double-counting has not occurred, more transparency, greater flexibility to users, and may be more cost-effective if there are numerous market participants.[132]

Given the distinctions between these systems, continuing with the status quo in New York and linking them would not be impossible, but would not be optimal. This is an approach that RGGI states used in developing "CO_2 Emissions from Electricity Generation and Imports in the 10-State Regional Greenhouse Gas Initiative:

131 Id.

132 Holt & Wiser, 2007.

2009 Monitoring Report." For this report, published in September 2011, the RGGI states used data from their different tracking systems and elsewhere to develop a picture of "observed trends in electricity demand, net electricity imports, [and] electricity generation from multiple categories of generation sources (including electricity imports)."[133] In undertaking this effort, states relied upon various sources to develop and reconcile the data they used to compile their report. Therefore, it is not out of the question that the RGGI states could link their existing tracking systems through similar efforts. This would involve significant inquiry, the specifics of which are beyond the scope of this paper.

There are alternative approaches that would involve New York's adoption of a tracking system similar to GATS and GIS, one of which would not require the replacement of the existing tracking system. RGGI states could replace their existing system, or simply adopt a compatible system as a pilot effort and operate it in parallel to their existing program.

On several occasions, New York has investigated the development of an automated all-generation tracking system intended to function similarly to, and be compatible with, both GATS and GIS. This would use a bifurcated commodity- and certificate-based attribute accounting system.[134] In 2007, several commentators reported that "New York has had a manual tracking system for several years, but the Public Service Commission has requested the development of a tracking system compatible with New England and PJM. This system should be ready for operation in 2008."[135]

In the spring of 2012, the New York Assembly passed Bill A6114C, which directs the state to adopt a system that would allow for generation attributes to exist "separate and apart from kilowatt-hours and/or megawatt-hours"—in other words, "a tracking system compatible with New England and PJM."[136] This bill was signed into law in August 2012.[137]

133 RGGI 2009 Monitoring Report, 2011, at 3.

134 DSIRE, *New York Renewable Portfolio Standard.*

135 Holt & Wiser, 2007. Citing to New York Public Service Commission, CASE 03-E-0188, *Proceeding on Motion of the Commission Regarding Retail Renewable Portfolio Standard, Order Authorizing Additional Main Tier Solicitations and Directing Program Modifications, January 26, 2006; and Order Recognizing Environmental Attributes and Allowing Participation of Projects with Physical Bilateral Contracts,* June 28, 2006.

136 According to the State Legislature's website, "A6114C-2011: Requires the development of a generation attribute tracking system by the New York state energy research and development authority." http://open.nysenate.gov/legislation/api/1.0/html/bill/A6114C-2011. Accessed May 22, 2012.

137 "An act to amend the public authorities law, in relation to requiring the development of a generation attribute tracking system by the New York state energy research and development authority." http://assembly.state.ny.us/leg/?default_fld=&bn=A06114&term=&Summary=Y&Memo=Y&Text=Y.

Appendix 3

Resource Shuffling

Focusing the point of regulation on the first jurisdictional deliverer in California has resulted in concern over the potential manipulation of resources, including various strategies described as resource shuffling. Despite CARB's current enforcement moratorium,[138] RGGI states should be aware of California's efforts to avoid the potential mischaracterization of generation resources.

"Resource shuffling" is a term used to refer to any mischaracterization of generation "sources of imports that result in reported reductions in emissions that do not reflect real reductions in emissions."[139] Here are various examples of resource shuffling, as illustrated in Table 6:[140]

- "Laundering" refers to MWhs of higher CO_2 intensity than a system's average or the default characterization of CO_2 intensity, being characterized as less carbon-intensive.
- "Swapping" is a practice whereby MWhs of high CO_2 intensity are characterized as being from a resource with less or no direct CO_2 emissions.
- "Cherry picking" is a term used to describe MWhs whose attributes reflect the system average CO_2 intensity, but are characterized as cleaner than that average.

The characterization of resources as "specified" and "unspecified," an approach being considered in California, would provide reasonable protection against resource shuffling in RGGI. By requiring unspecified MWhs to take the attributes of the residual system mix, the incentive and ability to resource shuffle is diminished, if not entirely taken away. In each of the examples of shuffling, the seller would need to meet the exception to the rule associated with imports. To be characterized in connection with a

138 See Appendix 1.

139 Murtishaw, 2011.

140 Id.

Table 6

Examples of Resource Shuffling

Shuffling Strategy	An Example	Carbon Intensity: High	Average	Low	Zero
Laundering *(changing existing high carbon-intensity to system average)*	MWhs produced by a coal plant claimed to be system average				
Swapping *(changing existing high carbon-intensity to zero-carbon)*	MWhs produced by a coal plant sold to a nuclear plant, and nuclear plant MWhs sold				
Cherry picking *(changing system average to zero-carbon)*	System power MWhs sold to a nuclear plant, and nuclear plant MWhs sold				

specific generator, the import is required to have either an historical contract path into the region (and in RGGI to have accompanying certificates for each MWh), or it has to be new or incremental (also with matching certificates).

With these requirements in place, each example of resource shuffling would be impossible to accomplish. Neither laundering, swapping, nor cherry picking would be possible if a similar decision rule were adopted: imports are unspecified, and receive residual system mix attributes unless they can meet one of the criteria for being treated as specified.

If similar requirements were adopted in RGGI, the ability to engage in contract shuffling would be eliminated. Imports would be unspecified unless the LSE could demonstrate otherwise.

Appendix 4

GIS Reports for Regulatory Agencies and System Operator

GIS Rule 5.3 — Reports for Regulatory Agencies and System Operator

(a) Each of the regulatory agencies listed on Appendix 5.3 (the "Regulators") and the System Operator shall have access, via a secure, password restricted Internet portal, to quarterly and annual reports generated by the GIS Administrator. Quarterly reports shall be provided by the 5th day after the close of a Trading Period and shall relate solely to such Trading Period; and annual reports shall be produced by July 1 of the year following the year to which the report applies. Annual reports shall include amounts for the generation occurring and Certificates Obligations arising during the applicable calendar year and shall include Certificates transactions that occurred during the portions of the Trading Periods that occurred following the end of such calendar year.

(b) Each report provided to the Regulators and the System Operator shall include the following information:

(i) List of GIS Generators identified by name, date commercial operations were commenced and date of any repowering and/or capacity addition, categorized by fuel source;

(ii) List of Retail LSEs with GIS accounts, identified by name and categorized by state(s) for which they hold subaccounts;

(iii) Total MWh of Energy generated in the Control Area during the reporting period;

(iv) Total MWh of Energy conserved by C&LM Resources and DR Resources in the Control Area during the reporting period;

(v) Total MWh of Energy imported into the Control Area from each adjacent Control Area during the reporting period;

(vi) Total number of Certificates created during the reporting period;

(vii) Allocation of Certificates among retail load in each state during the reporting period, categorized by fuel source;

(viii) Total number of Renewable Certificates created during the reporting period;

(ix) Total number of Banked Certificates at the end of the reporting period;

(x) Total number of Banked Certificates from prior Trading Periods that were used to satisfy a Certificates Obligation, used for an export transaction or used in a Reserved Certificate transaction in the Trading Period that most recently ended;

(xi) Total Unsettled Certificates retired at end of Trading Period, by fuel source and with average emissions;

(xii) Average, in pounds, of each of the emissions listed in Appendix 2.4 that is attributable to load in each state as a result of the Certificate allocation (other than Conservation Certificates) during the reporting period;

(xiii) For each GIS Generator (other than Class III Cogeneration Resources), the pounds of each of the emissions listed in Appendix 2.4 for such reporting period;

(xiv) List of GIS Generators (other than Class III Cogeneration Resources) and Importing Account Holders reporting emissions by specific fuel type for multi-fuel generating units pursuant to Rule 2.5(d);

(xv) Total MWh of Energy exported from the Control Area into each adjacent Control Area during the reporting period;

(xvi) Total number of Reserved Certificate transactions for the reporting period, together with the Account Holder transferring each such Reserved Certificate and the transferee of each Certificate or Forward Certificate subject to such a Reserved Certificate transaction;

(xvii) a list of all Certificates designated as Reserved Certificates at the end of the reporting period together with access via the Internet portal to such Certificates;

(xviii) a description of the Residual Mix Certificates during the reporting period, with and without giving effect to the Reserved Certificate transactions during that reporting period;

(xix) Total MWh of Energy consumed by load within the Control Area during that reporting period;

(xx) Total net MWh of Energy imported or exported into the Control Area from each adjacent control area during the reporting period;

(xxi) Total pounds of carbon dioxide emissions by all GIS Generators in the Control Area during the reporting period;

(xxii) Total MWh of Energy and total pounds of carbon dioxide generated during the reporting period by GIS Generators in the Control Area in each of the following categories (reported separately for each category), (A) all RGGI-Affected GIS Generators; (B) all GIS Generators that are not RGGI-Affected solely because they have a generating capacity of less than 25 MW; and (C) all GIS Generators in the Control Area that are not RGGI-Affected because of their fuel source;

(xiii) Average carbon dioxide emissions for the net imports into the Control Area from each adjacent control area, reported on the basis of pounds per MWh of net imports of Energy (which shall be based on information provided to the GIS Administrator by the system operators and/or the regulatory agencies listed in Appendix 2.7B in each adjacent control area, and the GIS Administrator shall not report this data for any control area in a reporting period for which it does not receive such information); and

(xxiv) Average carbon dioxide emissions, reported on a pounds per MWh of Energy basis, for each of the following categories (reported separately for each category); (A) all RGGI-Affected GIS Generators in the Control Area; and (B) all GIS Generators in the Control Area that are not RGGI-Affected.

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